

Export-Led Industrial Policy for Developing Countries

Is There a Way to Pick Winners?

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Abstract

Industrial policy prioritizes growth in specific sectors. Yet there is little agreement about how to target sectors in practice, and many argue that governments cannot pick winners. This essay observes that governments can and do identify tradable sectors where public inputs accelerate growth and generate economic benefits. These strategic sectors are: (i) those that are relatively more productive, and (ii) those that are relatively less productive but require technology like the country's existing technology and have rapidly growing markets and limited international competition. Since

developing countries are productive in fewer sectors and have less technology, targeting can be more valuable for them. Export promotion agencies are institutions that have demonstrated effectiveness in coordinating public inputs to grow these sectors. Compared to protectionism, this alternative approach to 'industrial policy' is cheaper, less susceptible to capture by unproductive firms, and permissible under the rules of international trade agreements. Many countries' development strategies adopt this approach.

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Export-Led Industrial Policy for Developing Countries: Is There a Way to Pick Winners?

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Developing countries have benefited from openness and participation in international trade, and export growth to higher-income markets is the best-understood route to sustained poverty reduction at the national level. The twentieth-century growth experiences of Japan and the Republic of Korea coincided with their early membership in the General Agreement on Trade and Tariffs, just as the twenty-first-century experiences of China and Viet Nam coincided with new membership in the World Trade Organization. More recently, growth in Africa, the second-fastest growing region after Asia, has been driven by commodity exports to the growing economies of Asia. While much has been written recently about the effects of trade on inequality within countries, the era of hyper-globalization coincided with an extraordinary decline in global inequality. Between 1980 and 2016, the incomes of the bottom 40 percent of the global income distribution more than doubled, twice as much growth as for the middle classes in high-income economies (Alvaredo et al. 2018).

For a model that seeks to explain these patterns, say that economic development occurs when firms pay a fixed cost to upgrade to a more productive technology. The more productive technology raises the wage, as did jobs in the manufacturing export sector in Asia, as did jobs in the service sector adjacent to the commodity export sector in Africa. The fixed cost captures economies of scale in production or the costs of innovation and transferring foreign technology and management expertise to local firms. In the presence of this fixed cost, a large market size is necessary for development. In Goldberg and Reed (2023a), using this model, the threshold market size is estimated to be about 325 million people, more than the population of most countries.

Governments guided by this model could—and frequently do—undertake some form of export-led industrial policy, defined as government policy designed to grow industries that sell to the international market. A government guided by this model would not target industrial policy toward import substitution in the absence of a populous middle class whose demand would allow firms to achieve scale locally. The menu of export-led industrial policy instruments is broad in scope, and includes many that could be untargeted and offered to all industries, in principle. Yet, because governments have scarce resources and because policy is tailored to some extent to the needs of beneficiaries, in practice these instruments are targeted where they are expected to have the greatest economic return. For instance, with a fixed amount to spend on road construction, a government may prioritize projects that connect an export industry to the international market,

given the large corporate tax yield expected as that industry grows. With a fixed amount to spend on tertiary education, a government may prioritize programs that cultivate skills demanded by specific export industries, since workers trained in those skills are most likely to find remunerative employment. Temporary import tariff protection and other subsidies like grants and tax credits are designed to allow local firms to achieve dynamic economies of scale, but with insufficient domestic demand, those scale economies are only possible in the international market, so subsidies are targeted at industries with the most potential to become internationally competitive. Targeted industries are identified explicitly as strategic sectors in development plans, and implicitly by the special attention given them by government officials who must learn about their details to implement policy.

This essay is divided into two parts, corresponding to the What and the How of export-led industrial policy. The What section looks at five measures that have been used as a justification for targeting a certain industry or sector: international market growth, international competition, comparative advantage, technological relatedness, and competitive advantage. Certain measures, like a lack of international market growth or high competition, can deter a country from targeting an industry at all. Other measures may offer a justification for industry targeting, but receive different weights depending on how a government calibrates its preference for risk. The risk is that industrial policy fails because the targeted industry is not economically viable. Targeting industries where the country has already demonstrated a comparative or competitive advantage is relatively low risk. If a country wishes to build new advantages in areas with growing international markets, low competition, and technological relatedness, it takes on a medium-level risk. High-risk industrial policy would target industries with growing markets and low competition, but without technological relatedness. Ultimately, the discussion suggests that, as in private investment, while it is not possible to pick winners with certainty, governments and development agencies can and do build business cases for projects that benefit specific tradable industries, and reject projects supporting industries where growth appears infeasible. Is there a way to pick winners? My tentative answer is sort of, yes—or at a minimum government can reduce its chances of picking losers. This is what successful export-led industrial policy has achieved in the past.

The How section begins by looking at how trade rules constrain developing countries from pursuing industrial policies that discriminate against foreign commercial interests. It then

describes some instruments governments use for industrial policy, while still operating within the legal constraints of the international trading system; for example, governments can provide targeted industries or sectors with improved access to new customers or input suppliers, training, physical and regulatory infrastructure, or product quality certification. Some interventions along these lines have been evaluated in recent literature on firms, trade, and development (for discussion, see the surveys by Verhoogen 2023; McKenzie 2024). Potentially important institutional details of export promotion agencies are highlighted, drawing on the case of Costa Rica, a small country that has grown rapidly through exports and foreign investment, while reducing poverty and protecting the environment. Though the discussion focuses on export promotion, I expect these institutional details have external validity for industrial policy targeting production for the domestic market, especially in countries with a large middle class.

The approach to export-led industrial policy described here—choosing sectors to target based on trade data and choosing instruments that do not violate existing trade rules—is similar in spirit to what countries around the world have already adopted. As one example, it is somewhat like the Enterprise Map Project of John Sutton, which detailed the capabilities and ambitions of leading firms in several African economies, yielding messages about what government inputs could help them grow. Of course, if any industrial policy is to succeed, it requires a high-bandwidth government agency capable of doing the analysis and putting the public good ahead of rent-seeking behavior by large firms.

The What: Growth, Competition, and Productivity Potential as Guides for Industrial Policy

Within the broad category of exports, there is no shortage of theories that certain sectors are more beneficial for development than others. Manufacturing has long received focus, though that has given way to an alternative focus on tradable services. Other theories emphasize products exported by countries with a high GDP per capita (Hausmann, Hwang, and Rodrik 2007), products exported by countries with a similar GDP per capita (Lin 2011), complex products (Hidalgo and Hausmann 2009), or upstream products (Liu 2019). Some products are promoted because they are green, in the sense that they have an end-use related to decarbonization, or are produced without carbon emissions.

The drawback of these product-specific theories is they rank sectors in general, but not the market potential facing a given country. This section explores empirical measures that can target industrial policy in each country context, and illustrates how some of these measures are already being used for this purpose. The value of measures is not that they quantify the social return to industrial policy per se, but rather that they identify the potential of an industry to grow in a specific context, a necessary condition to realize social returns from supporting that sector. I focus on measures with a close linkage to export-led growth: international market growth, international competition, comparative advantage, technological relatedness, and competitive advantage.

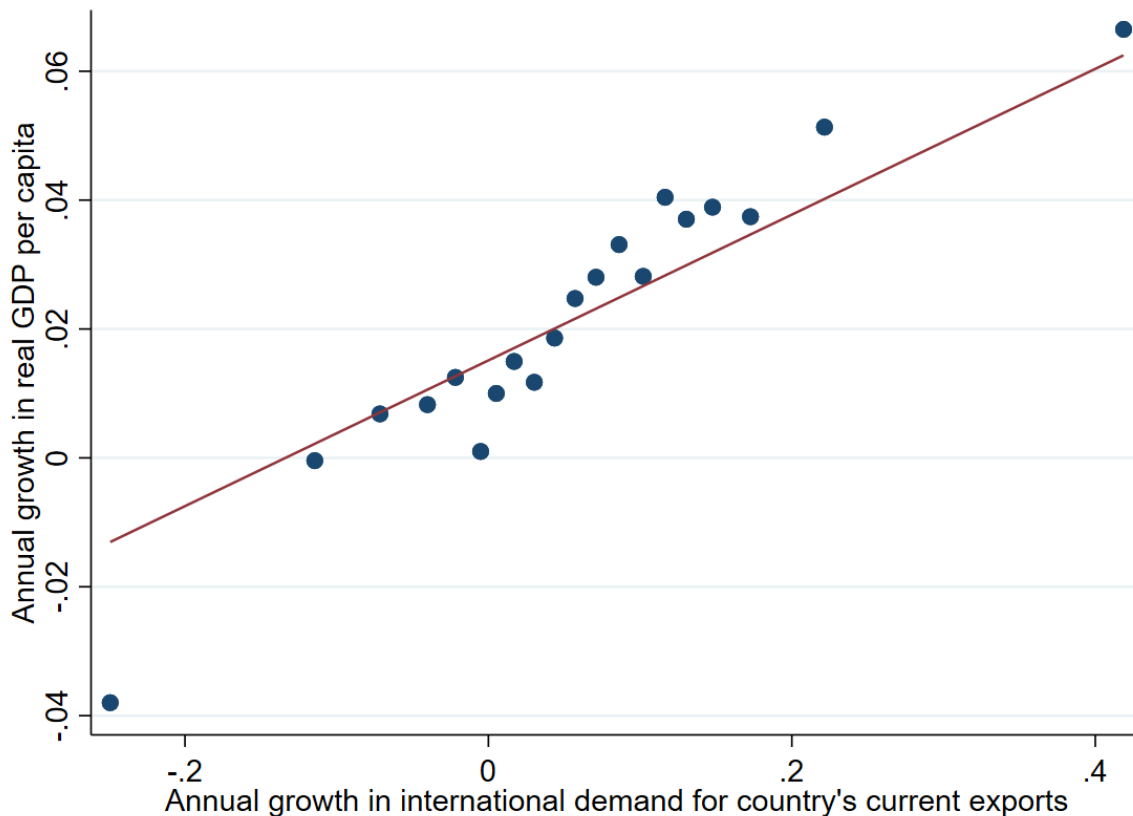
International Market Growth

A useful measure for some countries has been the expected growth rate of the international market for particular products. Figure 1 shows the correlation between annual growth of GDP per capita and the annual growth rate of world imports from the country's current export basket, which measures annual growth in international demand for the country's current exports. For each country, demand growth is the weighted average growth rate of world imports of each four-digit Standard International Trade Classification (SITC, Revision 2), where the weights are the share of the country's export value in that classification. The country's own import growth is excluded from the calculation of growth in international demand, to address some concern about reverse causality. The four-digit SITC classification, developed by the United Nations, groups goods with similar processing or manufacturing processes, and is narrow enough to cover one or several product lines in a firm. For instance, the three-digit SITC 782 classifies "motor vehicles for the transport of goods or materials and special purpose vehicles," while the four-digit SITC 7821 classifies "motor vehicles for the transport of goods or materials" and the four-digit SITC 7822 classifies "special purpose motor lorries and vans such as breakdown lorries, fire-engines, fire-escapes, road sweeper lorries, [. . .]".

Figure 1 shows a clear relationship: growing economies export to growing markets. The extremes in the upper-right-hand corner and lower-left-hand corner include commodity price booms and busts, oil exporters during the 1974 oil embargo and the 2008/09 financial crisis. The intermediate points include export-led success stories, such as Viet Nam in 2010, when real GDP per capita grew at 11.5 percent and international demand for current exports grew at 15 percent.

This point is almost tautological, as foreign demand enters directly into GDP as exports, but often neglected. Government support has been given historically to declining sectors (Baldwin and Robert-Nicoud 2007). Hides and skins are exports targeted by some low-income countries that today face declining demand.

Figure 1: Economic growth and exports to expanding markets



Sources: Real GDP per capita at purchasing power parity is from the Penn World Tables 10.1 (Feenstra, Inklaar and Timmer, 2015). Exports and imports are from COMTRADE via the Growth Lab at Harvard University (2019).

Notes: Sample is 9,123 observations of country years, including 183 countries, spanning the years 1963 to 2019. Dots shown on scatter plot are averages within 20 bins that partition the axes and include an almost equal number of observations. Growth is approximated by differences in log values between years. The slope of the best fit line is 0.11 (standard error = 0.01) and the R-squared is 0.04.

The pattern in Figure 1 suggests countries seeking to grow should target entry and expansion of exports in growing markets. This goal can be challenging, of course, as growth forecasts are notoriously difficult. An observed boom in coal exports induced by the loss of natural gas supply elsewhere does not mean that coal exports offer a long-term value proposition. Nonetheless, recent industrial policy initiatives have reflected this approach, targeting for instance electric vehicles. China and Korea, which today have captured this growth through exports, also anticipated it in their industrial strategies over a decade ago. The fastest growing four-digit products between 2018 and 2021, the most recent three-year period with global import data in COMTRADE, are roasted iron pyrites (SITC 2814); hemp, raw or processed but not spun (SITC 2652); and castor oil seeds (SITC 2235), all with global demand growing above 40 percent per annum. A challenge in targeting these industries is that they are commodities. In the electric vehicle example, countries targeted an industry in which it was feasible to develop a differentiated product that is protected to some extent from competition, given heterogeneity in consumer preferences.

International Competition

The presence of tough competition suggests targeting growth or entry in an export sector is higher risk. Simple measures of the toughness of competition are the number of exporters (or the inverse of the Herfindahl index of national export shares). Atkin, Costinot, and Fukui (2024) observe that complex products are exported by a larger number of countries, raising a question about whether industrial policy targeting complex products rather than simple products can be successful. This result is a consequence of the fact that product complexity is defined based on whether the product is exported by countries that export many other products. Industrial policy targeting products exported by countries with high GDP per capita face the same issue, since countries with high GDP per capita export a greater variety of products (Hummels and Klenow 2005).

Of course, just because there are few competitors in a market does not mean it is easy to enter. Weak competition could reflect that the market leader has a significant cost or quality advantage, as is apparent for instance with solar panels from China. In such cases, a country considering entering that market can assess whether it can achieve similar cost and quality as the

market leader, or else develop a niche with a distinct combination of cost and quality that consumers value. Many developing countries have tried to use the disruptive entry strategy: offering low cost and low quality, when only high cost and high quality is available. Today, middle-income exporters increasingly offer high quality and low cost.

Comparative Advantage

Trade theory provides a method to infer a country's current cost and quality advantage by looking at its current specialization in exports. This cost and quality advantage is often referred to as productivity, but in a way which refers to a broader concept than production efficiency (say, as measured by labor productivity or total factor productivity) that encompasses all factors allowing an exporter to capture market share. One approach countries have taken is to target industrial policy towards sectors in their economy that are relatively more productive, considered in this way.

At first blush, this approach may seem obviously wrong. One might argue that already-exporting sectors are least in need of government support. Nonetheless, market failures may still exist in these sectors, making them smaller than they could be. Moreover, in a large class of models, the welfare benefit of an increase in productivity in a sector is proportional to the size of that sector (using Hulten's theorem). If a government's industrial policy is focused on increasing productivity—some might call this approach productivism or productive development—it makes sense to check whether there are opportunities to increase productivity in the largest sectors.

Sectors that are more productive relative to some benchmark country and a benchmark sector within the economy are known as sectors of comparative advantage. Every country has some comparative advantages. For example, Costinot and Donaldson (2012) show that countries with natural inputs (such as soil characteristics, water availability, and climate) that increase yields of crops produce relatively more of those crops. The opportunity cost of market failure is greater in sectors with comparative advantage. If firms producing crops with abundant natural inputs lack access to finance—small firms, for example, which markets might fail to serve due to imperfect information—there could be returns to subsidizing finance for these firms, as it could allow them to achieve scale in the international market. In contrast, if a country were to subsidize finance in a sector without a relative productivity advantage, which is thus not involved or barely involved in global trade, the benefits seem limited. Such a sector can only grow to serve the

domestic market, and perhaps only then if the domestic market is protected from imports by trade costs or tariffs. The success of industrial policy in relatively less productive sectors depends on dynamic effects (say, significant improvements in efficiency or quality, or reductions in input costs). For this reason, industrial policy in the sectors with the highest levels of comparative advantage can be considered low risk, whereas interventions in sectors with lower levels of comparative advantage can be considered high risk.

The measurement of comparative advantage from export data, which is widely practiced and rests on the assumptions of the Ricardian trade model, warrants some discussion. The most widely used measure of comparative advantage is the share of national exports in a sector divided by the share of world exports in that sector. This measure is called Balassa-revealed comparative advantage, after Balassa (1965). In 2019 in Costa Rica, for example, 16 percent of exports were business services, while for the global economy, only 2 percent of exports were business services. In this example, the statistic is greater than one ($16/2 = 8$), indicating that Costa Rica is more specialized in exports of business services compared to world exports. One infers from this that Costa Rica is relatively more productive in business services, compared to other sectors in which the country does not specialize.

Despite the widespread use of Balassa-revealed comparative advantage as a proxy for relative productivity, the measure has received significant critical scrutiny in the international trade literature; indeed, French (2017, p. 83) argues that Balassa-revealed comparative advantage is “not generally useful.” What are the issues, and what do they imply for how and whether the measure is used to target policy?

Balassa-revealed comparative advantage is frequently used to make statements like “this country is more productive in product k ” in an unqualified sense, perhaps implying “relative to the world” and “relative to other products.” In a two-country world, where there is a home country and all other countries are grouped together as “rest of world,” this statement makes sense. Industries can be ranked within a country by the average Balassa-revealed comparative advantage of their products, and those with a higher ordinal ranking are more productive relative to those with lower values.

It is more complicated to compare values of Balassa-revealed comparative advantage across countries since the definition of “rest of world” changes across countries, and data availability varies. To address these issues, an approach is to double-index revealed comparative advantage

to a benchmark country (e.g., the United States) and a benchmark product (e.g., live animals):

$$\text{Revealed Comparative Advantage} \equiv \frac{\left(\frac{x_{i,World}^k}{x_{USA,World}^k} \right)}{\left(\frac{x_{i,World}^{live\ animals}}{x_{USA,World}^{live\ animals}} \right)}$$

where $x_{i,World}^k$ are the total exports by country i of product k .¹ A practical advantage of this measure is that it requires only the exports of country i and the benchmark country, and so can be calculated without data on total exports of product k by the world, as required by Balassa-revealed comparative advantage. Large economies like the United States or China are good benchmarks because they export most products, and report product-level export data almost immediately, whereas data on total exports of product k by the world are only available with a two- or three-year lag in the export series from COMTRADE, CEPII BACI, and the Growth Lab at Harvard University.² The relevant benchmark country may vary depending on the question one has. If a country is negotiating a bilateral trade agreement that lowers trade costs, indexing comparative advantage to the other country in that agreement identifies which industries are expected to grow in the context of that agreement. A country may also index to a country viewed as a local competitor, or aspirational peer. Vietnam might benchmark to higher-income Malaysia, for instance. One could conceivably pick a different benchmark depending on the product. If a country has a comparative advantage in a product relative to the leading exporter of that product, it is likely it could succeed in exporting some of that product.

Another approach argues measures of comparative advantage should control for market potential as determined by trade costs and foreign demand, which the Balassa-revealed comparative advantage measure does not. Modern trade models are designed to reflect the empirical regularity that exports follow a gravity pattern: countries export more both to markets that are closer geographically, culturally, or linked by trade agreements and to larger markets. Costinot, Donaldson, and Komunjer (2012) proposed a measure of comparative advantage that

¹ One may alternatively define $x_{i,World}^k$ as net exports, equal to total exports minus total imports by country i of product k , to ensure that revealed comparative advantage does not identify products with minimal domestic value added. This is a concern especially in entrepôt countries, like Djibouti and Singapore. There are other approaches to identifying export value added that rely on inter-country input-output matrices, though these are available only at a high level of product aggregation.

² The latter two databases are most popular because they impute frequently missing export values for developing countries in COMTRADE with so-called mirror data on imports reported by other countries.

uses a regression of bilateral exports on fixed effects to isolate the component of productivity not driven by bilateral trade costs (an importer-exporter fixed effect) or foreign demand (an importer-product fixed effect). The remaining exporter-product fixed effect identifies “regression-revealed comparative advantage.”

While theoretically consistent, regression-revealed comparative advantage may miss certain opportunities for export success. For instance, for geopolitical reasons, the United States may increase demand for imports from Mexico as it pursues a policy of friend-shoring (on potential consequences of friend-shoring, see Goldberg and Reed 2023b). Ranking sectors within Mexico by regression-revealed comparative advantage could potentially down-rank sectors with exports concentrated in the US market, since US demand is ignored. But the Mexican government, particularly at a moment of increased US demand, might reasonably prefer to prioritize sectors that benefit from that demand. Another challenge is that regression-revealed comparative advantage can be undefined, both in small countries that export a product to only one other country; and in the case of services exports, which in developing countries are often reported as flows to the world rather than as bilateral trade flows, given challenges in quantifying them through surveys.

Any measure of productivity based on realized export values could reflect economic distortions instead of actual productivity in a competitive market. There are two types of distortions: distortions in other economies and in one’s own economy. Developing countries complain about subsidies for agricultural production in other countries (for recent estimates of these see World Bank (2023)). Low revealed comparative advantage in rice or cotton, for instance, could reflect not low productivity relative to other countries in a competitive market, but a country’s inability to compete with subsidized exports from the United States. Still, given that a country cannot immediately change the subsidy policies of other countries—the Doha round of negotiations covering agricultural subsidies has indefinitely stalled—this quality may be an advantage of revealed comparative advantage. The measure shows what sectors are competitive, holding fixed the policies of competitors.

Distortions in one’s own economy can lead to a situation in which low revealed comparative advantage could reflect market failures, but high revealed comparative advantage could reflect own-government subsidy programs with low benefits net of costs that nonetheless persist for political reasons. This observation reinforces the point that if revealed comparative

advantage is used to target industrial policy, that policy, like any policy, should still be disciplined by cost-benefit analysis. A modified regression-revealed comparative advantage measure that controls only for domestic subsidies, but still does not control for fixed effects outside a government's own control, can potentially identify the extent to which revealed comparative advantage depends on domestic subsidies.

Despite all these critiques, many countries do use revealed comparative advantage to target industrial policy. Looking at countries around the world, Juhász et al. (2022) show that industrial policy has been much more common in country-sectors with Balassa-revealed comparative advantage greater than 1. For instance, Senegal's national development plan argues that mining of phosphate, an input into fertilizer, is "growth and employment-generating" and sets specific targets of "strengthening of exports and positioning of Senegal as one of the leaders with, in the short term, a production of more than 3.5 million tons of lime phosphates and 800,000 tons of acid; in the medium term . . . doubling of phosphate production by 2020" (République du Sénégal 2018, note 65), while a program of domestic fertilizer subsidies has sought to increase demand for local production. For diphosphorus pentoxide, Senegal has Balassa-revealed comparative advantage equal to 343.

A benefit of targeting industries with already high productivity is that it can avoid the capture of policy by less productive firms. Despite this benefit, one might argue that industrial policy targeted towards revealed comparative advantages can reduce dynamism, as government support for one sector might divert entrepreneurs from new opportunities. This argument is less persuasive given that comparative advantage is slow-moving. Hanson, Lind, and Muendler (2016, p. 32) estimate the time path of regression-revealed comparative advantage and find "it will take 5.5 years for half of the initial shock to log comparative advantage to dissipate and 18.4 years for 90 percent of the initial shock to dissipate." To reduce dynamism, a program of support would have to persist for longer than four or five years, the typical length of an executive's term in a democracy.

Technological Relatedness

When many people think of industrial policy, they have in mind a policy that favors industries or firms that are not yet exporting. In addition to constraining growth of currently productive sectors, market failures may stop industries from emerging at all. An industry that

could be productive in the absence of market failures, which Harrison and Rodriguez-Clare (2010) call “latent comparative advantage,” will not be observed in current export data. Might countries be able to predict sectors in which they are likely to gain comparative advantage in the future, based on the experience of other countries?

Hausmann and Klinger (2006) developed a country-sector level measure of product space that is used for this purpose. The product space is a matrix with rows indicating countries and columns indicating products, where the elements are either 1 if the country has a revealed comparative advantage in that product, and 0 otherwise. The authors collapse a country’s position in the product space into a scalar called product space density. For a given country-product, this measure is equal to the probability that a country with similar comparative advantages as the country in question has a comparative advantage in the sector. The measure captures technological relatedness. It is a probabilistic description of what advantages a country might have, given its existing advantages. For instance, a country with a revealed comparative advantage in piston engine parts (SITC 7139) has 78 percent chance of also having a revealed comparative advantage in other parts and accessories for passenger motor vehicles (SITC 7849). In contrast, the same country has only a 4 percent chance of having a revealed comparative advantage in computers (SITC 7522). Over time, the measure is a robust predictor of which new products countries move into, controlling for other factors (Bahar et al. 2019). From this perspective, industrial policy targeted at sectors that currently do not have high productivity, but do have high technological relatedness, can be considered medium risk. An example of this approach would be Costa Rica’s successful promotion of avocado and pineapple exports, which rely on similar agricultural technology as bananas, the country’s long-term comparative advantage. The potential to reduce risk using product space density can explain its enduring popularity.

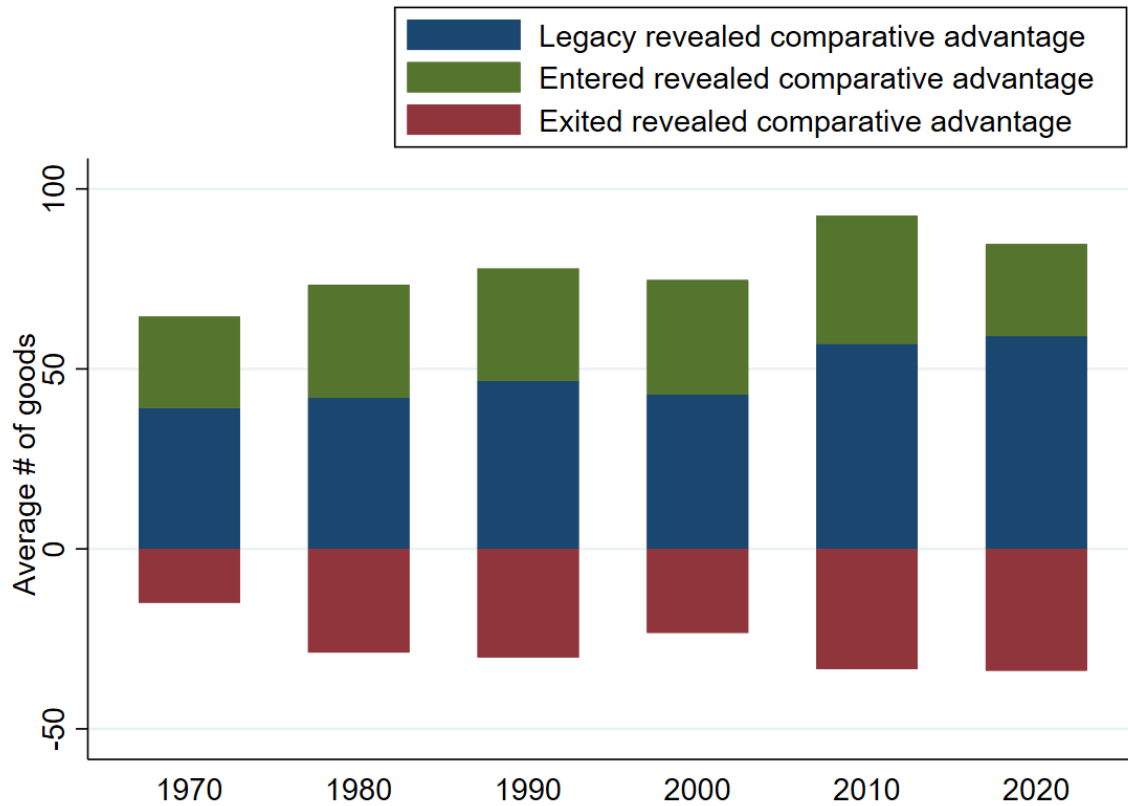
In comparison, high-risk industrial policy would target sectors that both have currently low productivity and low technological relatedness, as measured by product space density. Not all new advantages are predicted by product space density. In fact, GDP per capita growth is faster in countries with less path dependence, in the sense that they develop more advantages that are not predicted by product space density (Coniglio et al. 2021). An example of this pattern would be Costa Rica’s jump from exporting bananas and pineapples to exporting semiconductors, medical devices, and business services. High-risk industrial policy that reaches beyond existing

technological relatedness, if successful, could also have returns. However, such success is harder to predict.

The concept of product space may be especially useful for developing economies. As economies shift comparative advantage over time, higher-income countries have a better chance of producing any given product, because they have a denser preexisting product space and already know how to produce many products. Larger developing economies, like India and Indonesia, also have a preexisting pattern of producing many products. The product space is most useful when it is least dense, and it can help countries distinguishing medium-risk target industries where they have a higher degree of technological relatedness from high-risk target industries where such relatedness does not exist.

To give a sense of the balance a government could strike between targeting current and latent comparative advantage, Figure 2 shows the dynamics of Balassa-revealed comparative advantage over past decades in developing countries, defined here as those with less than \$10,000 in GDP per capita measured in 2017 dollars at purchasing power parity in a year. Products are defined by the four-digit SITC, so there are about 1,000 possible goods in each year (service exports are excluded, as the series are not available in early decades). In the first year of each decade, Figure 2 reports for the average country the count of goods within three categories: (1) legacy revealed comparative advantage, or goods that had an advantage in that year and also did ten years ago; (2) entered revealed comparative advantage, or goods that had an advantage in that year but did not ten years ago; and (3) exited revealed comparative advantage, or goods that do not have an advantage in that year but did so ten years ago. In any decade, roughly half of revealed comparative advantages are legacy, and the other half are recent entrants, reflecting the dynamic yet slow-moving nature of industry productivity.

Figure 2: Dynamics of comparative advantage in developing countries



Source: COMTRADE via the Growth Lab at Harvard University (2019).

Competitive Advantage

Some policymakers have sought to describe the targets for export-led industrial policy in terms of competitive advantage, rather than comparative advantage. In business strategy, competitive advantage refers to a firm's ability to grow profits sustainably, ideally by growing market share or retaining market share in a growing market. In *The Competitive Advantage of Nations*, Porter (1990) measured a country's competitive advantage in a sector by its share of world exports in that sector.

The transparency of this measure explains its enduring popularity. Market share proxies for absolute advantage in trade theory, or the rank of a country's productivity compared to other countries within a sector.³ A gain in market share indicates that a country has improved its

³ Neary (2003) suggests an alternative definition of competitive advantage, measured by the number of firms in

ability to provide a combination of cost and quality preferred by consumers.

A potentially beneficial approach is to target industries that are relatively more productive or potentially more productive compared to others (that is, an industry with high comparative advantage or high technological relatedness), but that has a low market share compared to other countries (that is, an industry with low competitive advantage). Such industries may have room to grow. In contrast, an approach of targeting sectors with the greatest competitive advantage, as measured by large international market share, will target sectors that are already very large.

Gain in competitive advantage measured by world market share is neither necessary nor sufficient to measure the net benefit of industrial policy. If a country succeeds at lowering cost or quality, this could increase global demand, allowing exports to rise while market share remains constant. Alternatively, market share could rise as exports hold constant in a declining global market. There are also international considerations. An industrial policy with positive net economic benefit targeting market share expansion may nonetheless cause conflict with other countries if the policy takes market share from those countries.

The How: Implementing Export-Led Development Strategy

Once a country has targeted sectors, what should it do to encourage their export-led growth? I begin here by describing how many industrial policies, including those that have been used by developing countries, are prohibited under the rules of international trade agreements. I then discuss industrial policy instruments that are not prohibited and institutional structures like export promotion agencies. Many of the policies described here may appear to be untargeted towards any sector, and so one might argue they are not industrial policy per se. Yet, even if these policies can be applied to the whole economy in principle, governments with limited resources make choices about who will be the main beneficiaries, and tailor these policies to address specific constraints in those beneficiaries' industries. In practice, selected beneficiaries of these policies are often those in sectors with international market growth, weak international competition, technological relatedness, and/or comparative or competitive advantage.

the domestic product market. Lower entry costs or antitrust enforcement could increase the number of firms, reducing markups and allowing the country to offer lower prices, holding efficiency, costs, and quality constant. In practice, the business strategy definition of competitive advantage based on market shares has dominated.

Different Rules for Developing Countries

An export-led development strategy requires access to global markets, and market access requires good relations with trading partners and continued engagement in trade agreements. But while developing countries have benefited from participation in the world trading system, there is an irony. The rules of the trading system are biased against them, both *de jure* and *de facto*.

De jure, developing countries still face higher tariffs compared to wealthy countries. Calculations of actual tariff rates include preferences under bilateral and regional trade agreements (such as a free trade area or customs union) and provisions like most-favored nation status. Using the 2017 tariff data from the World Integrated Trade Solution (WITS), which are complete for almost all countries, the pattern that has emerged over time is that for nonagricultural goods (HS Chapters 25–89), value-weighted applied tariffs are 1.4 percent for low-income countries and are 2.1 percent for high-income countries, using the World Bank income classification. They are largest for lower-middle income countries at 2.5 percent. Low-income countries retain some market access privileges given their income status, but these privileges are not available to middle-income countries. Trade agreements have allowed countries to retain higher tariffs especially in agriculture, which is the comparative advantage of many developing countries. Guatemala’s national development strategy is direct about the issue (República de Guatemala 2023, p. 472):

Despite the positive results shown by exports in the last twelve years (with some important ups and downs in some periods), the country has had to put up with the high levels of tariff protection in sectors of special interest—particularly the primary sector—that they persist in the main trading partners (U.S. and Europe), despite the intensification of trade relations.

De facto, developing countries have less leeway to discriminate against trading partners and to flout the rules of trade agreements. One example is that because litigation of trade rules requires significant resources, wealthy countries are more able to undertake litigation compared to developing countries. For instance, a common trade dispute involves dumping, which

describes a situation in which company is alleged to have exported a product at a price lower than the price it normally charges on its domestic market. Trade rules allow countries to charge tariffs to offset dumping, which can be large, on average 10–20 times higher than tariffs imposed under most-favored-nation status. Nunn (2019) shows these are much more frequently initiated by wealthier countries against developing countries, rather than the other way around.

In other cases, high-income countries enact policies that openly conflict with international trade rules. Global Trade Alert is a nonprofit organization which compiles perhaps the most comprehensive lists of trade-limiting policies. Juhász et al. (2022) use these data to catalog “the who, what, when, and how of industrial policy,” with a focus on policies that “discriminate against foreign commercial interests” and finds these are most implemented by high-income countries. An example is the provision in the US Inflation Reduction Act of 2022 that, if a consumer is to receive a tax credit after purchasing an electric vehicle, a percentage of the value of minerals in the battery must be extracted or processed in the United States, or a country with which the United States has a free trade agreement. The intention of this requirement is to stimulate battery manufacturing in the United States and the 20 countries with which it has free trade agreements. Such a requirement appears to conflict with the World Trade Organization Agreement on Subsidies and Countervailing Measures, which prohibits any subsidies that are available contingent on the use of domestic inputs or “local content.” WTO rules also prohibit industrial subsidies contingent on export performance, which were used historically as an industrial policy tool—for example, in Korea.

An underlying principle behind international trade agreements is to avoid subsidy races, in which dumping or domestic content rules spread from country to country. This fear has some foundation. Using data from the Global Trade Alert and other sources, Evenett et al. (2024) show that implemented industrial policy “measures are correlated with the past use of measures by other governments in the same sector, pointing to the tit-for-tat nature of industrial policy.”

Industrial Policy within the Rules

Is there a way for developing countries to pursue industrial policy, while still adhering to their commitments under trade agreements? Here, I offer some examples.

1) *Tariff negotiations.* A major factor in the decision of multinational firms to produce in and export from a country is whether they will have preferential access to the largest markets,

typically the United States and Europe. For example, after the US–Viet Nam Bilateral Trade Agreement, employment in Viet Nam grew faster in industries most exposed to US tariff reductions, driven by foreign affiliates of multinationals (McCaig, Pavcnik, and Wong 2023). This growth was not necessarily the result of industrial policy. Viet Nam has many natural advantages, including proximity to East Asian value chains and a relatively young and educated population for its level of development. Still, the example suggests that tariff reductions through preferential trade agreements could complement policies that effectively develop a comparative advantage. Targeting tariff reductions in specific sectors can be considered industrial policy in the sense that the policy is intended to accelerate growth in these sectors relative to others.

2) *Access to new customers and suppliers.* Trade is characterized by significant information frictions; in particular, many domestic firms do not know the preferences of, or how to contact, all potential buyers. Many countries use export promotion agencies to address these frictions, with a variety of services. Martincus and Carballo (2008, p. 90) describe PROMPEX, the export promotion agency of Peru:

[The agency] trains inexperienced exporters on the export process, marketing, and business negotiations; performs and disseminates analyses on country and product market trends; provides specific information on trade opportunities abroad as well as specialized counseling and technical assistance on how to take advantage of these opportunities; coordinates and supports (and in some cases co-finances) firms' participation in international trade missions and trade shows, and arranges meetings with potential foreign buyers in particular; organizes these kinds of trade events; and sponsors the creation of consortia of firms aiming at strengthening their competitive position in external markets.

This work can be considered industrial policy because it requires collecting information about opportunities and constraints in specific sectors, and targeting interventions towards those sectors. An older generation of studies suggested that export promotion agencies had been ineffective (for example, Hogan et al. 1991), but recent research has called this blanket conclusion into question. The Martincus and Carballo (2008) study of Peru's PROMPEX shows

services from the agency helped exporters grow, using a matched difference-in-differences strategy with firm fixed effects. The effects were greater on the extensive margin, where firms increased the number of products exported and the number of countries served, rather than the intensive margin, where firms increased sales of existing products to their current markets. In a cross-country analysis, Lederman, Olarreaga, and Payton (2010) use instrumental variables to show that export promotion agency budgets cause increases in exports.⁴ Randomized experiments have evaluated the effects of specific interventions that can be implemented by these agencies. In a study of a nongovernmental organization providing new export orders to rug manufacturers in the Arab Republic of Egypt, Atkin, Khandelwal, and Osman (2017) find that the new orders led to increased exports and productivity after three years, with some evidence of learning-by-doing. In a study of providing training and consulting in digital marketing to firms in the Balkans, including search engine optimization and improved Facebook content, Cusolito, Darova, and McKenzie (2023) find a significant increase in the intensive margin of export sales in a destination-product market.

3) *Quality certification and standards.* As tariffs have fallen, quality regulation has become a prominent constraint on trade. Countries set minimum quality standards for a good to be imported, which is permitted under trade rules if standards are applied both to foreign and domestic firms. Such standards often apply in health-related sectors like food and pharmaceuticals, but also apply more broadly. For example, units of measure reported by machinery and equipment must be verified for accuracy before sale and labeling requirements can require the verified energy consumption of a product to be displayed on packaging. Most recently, the European Union's Carbon Border Adjustment Mechanism (CBAM) requires firms to declare the emissions embedded in imports of carbon-intensive products (like cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen) and to pay duties on that carbon equivalent to those paid by firms within the European Union. Rather than regulating the quality of a product, the CBAM regulates the quality of the production process. Governments in exporting countries can play a role in helping firms conform to these standards, for instance by coordinating local inspections by authorities from importing countries.

Understanding how quality regulation affects exporters is an area of active research.

⁴ Contemporary research has found positive effects of export promotion agencies in specific high-income contexts: Belgium (Broocks and Van Biesebroeck 2017), Canada (Van Biesebroeck, Yu, and Chen, 2015), Denmark (Munch and Schaur 2018), and the United States. (Kabir et al.2024).

When a set of middle-income Latin American countries imposed quality standards, Zavala et al. (2023) show a result of increased imports—which is consistent with a belief that regulations can give greater confidence to consumers, shifting demand out. Similarly, Zavala et al. (2023) show that certain standards, like labelling requirements, where compliance is relatively easy, can help developing countries gain market share relative to wealthy countries. But other standards, in particular food safety requirements, have caused developing countries to lose market share to exporters in high-income countries that have more experience complying with these standards. An issue here is that many developing countries do not regulate quality in the local market, so that firms in those countries retain an option to sell low-quality goods domestically and have a reduced incentive to upgrade quality for the export market. Macedoni and Weinberger (2022) argue that applying quality regulation in the domestic market can enhance domestic welfare, even if it leads some firms to exit, but their model does not include the spinoff effect that enforcing quality regulation in the domestic market could provide greater market access for exporters. For example, a recent effort in Myanmar to ban the use of harmful herbicides and pesticide had health benefits for domestic consumers, but also made it easier for Myanmar’s exporters to guarantee their products did not contain chemicals that are banned in other markets.

4) *Sector-specific physical and regulatory infrastructure.* Many sectors rely on very specific infrastructure. In India, Asher et al. (2022) show that irrigation canals increased agricultural productivity and set off a process of structural transformation. Export processing zones are often used to concentrate specific inputs needed by multinationals and exporting firms, like large volumes of electricity, natural gas, or purified water. Wang (2013) shows these zones can increase productivity in China, though this research does not distinguish between the effects of infrastructure and liberalized regulation within the zone with respect to property rights and tax incentives. Subsidies for on-the-job training or the development of new degree programs to suit the needs of industry, or international schools for the children of expatriate workers are other examples.

Constructing sector-specific infrastructure is not restricted under trade rules. The Trade Facilitation Agreement under the World Trade Organization also lays out regulatory provisions countries can take to accelerate the movement, release, and clearance of exports, such as the creation of a digital “single window” through which all firms submit required documents to the customs authority. Single-window processes may vary across sector, for instance if the product

in question is perishable, or faces quality regulation abroad. So far, it has been difficult to identify cross-country variation in time to export or logistics performance that is explained by these provisions rather than other factors like GDP per capita and geography (Hillberry and Zhang 2018). Nonetheless, physical and regulatory infrastructure may be complementary to other export promotion efforts. Looking at export promotion in Tunisia, Cadot et al. (2015) find that it helped firms grow and diversify, but that the effects dissipated after three years. The authors argue the effects' short-lived nature reflects the program's focus on accessing new customers, rather than on long term investments in infrastructure.

5) *Sector-specific public-private dialogue*. Many sectors must interact with multiple regulatory agencies that fail to coordinate with one another, leading to redundant regulatory requirements. Further, governments may fail to elicit information from private firms about the constraints they face, leading to low-return public investment. Peru and several other countries have sought to resolve these challenges by establishing temporary fora for public-private dialogue known as *mesas ejecutivas*, which focus on improving productivity in a specific sector (Ministerio de la Producción del Perú 2016). Rather having a generic conference on the broad issue of national competitiveness, *mesas ejecutivas* brought together key regulators and executives in promising sectors for weekly meetings to identify and solve problems in those sectors. For instance, an aquaculture working group worked to remove regulation it deemed unnecessary, like wastewater discharge permits, and established innovation and technology transfer centers in key regions to distribute competitive research and development grants. Projects funded included the development of genetically improved fish eggs, so that local firms were no longer reliant on foreign eggs for breeding.

6) *Subsidies without export or local content contingencies*. Developing countries often cannot afford substantial subsidies, but it is worth noting that subsidies without local content requirements or export contingencies are not prohibited under trade rules. This leaves scope for temporary production or investment subsidies to nascent sectors, and even conditioning these subsidies on performance targets like growth in employment or value added. Under WTO rules, subsidies are "actionable," meaning that other countries can levy countervailing tariffs if they demonstrate harm to their producers. But for smaller developing economies, such subsidies could potentially benefit their domestic economy without causing measurable harm to producers in other countries.

Institutional Design and Export-Promotion Agencies

Industrial policy can be considered what Hausmann (2008) calls “high bandwidth development policy,” in which the challenge is to identify “the right mix of public inputs for each sector, and more importantly, what is a valuable change from the current provision.” The instruments just described are examples of public inputs. Doing this work well requires a high-capacity agency, with skilled staff. What form should such an agency take?

Given the focus of this essay on export-led industrial policy, a government’s export-promotion agencies appear uniquely positioned to respond to the idiosyncratic needs of specific sectors and to coordinate the provision of public inputs by the rest of the government. With dedicated domestic and foreign liaison offices, they have dedicated staff that interact with firms and their international customers and suppliers. Yet in developing countries, these agencies have smaller budgets and fewer employees compared to high-income countries: the median agency in a low-income country has 30 employees, in a middle-income country, 50 employees, but in a high-income country, 300 employees (Choi et al. 2023).

A productive line of research would be to identify commonalities among the best- (and worst-) performing export-promotion agencies, to guide capacity building in these institutions. The export promotion agency in Costa Rica provides one example that has succeeded in medium-risk and high-risk industrial policy, all while the country steadily reduced the share of the population living in extreme poverty. Building on a comparative advantage in plantation agriculture (see Méndez and Van Patten 2022), in the 1980s the country successfully diversified into other food products. In the 1990s, the country attracted Intel, the semiconductor manufacturer, to locate an export production facility there, building on a well-educated population and proximity to the US market but in the absence of export industries with related technology. By 2006, semiconductors would comprise about 20 percent of exports, and today the country has diversified into other high-value exports like medical instruments and offshore back-office functions for multinational corporations. The Intel deal was notable because “the absence of firm-specific concessions for Intel, side-deals, or large government grants stands in contrast to the tactics many countries use to land large investments” (Spar 1998, p. v). Though Costa Rica does offer tax-exemptions to foreign investors generally, such subsidies are also offered by other countries and were not decisive for Intel. The government’s success was more

likely due to its ability to provide a rapid and coordinated response to Intel's requirements, led by President José María Figueres. For instance, the Ministry of Transportation agreed to grant additional licenses to foreign air carriers if there were not sufficient flights, and accelerated development of a new cargo port; the Ministries of Education and of Science and Technology in collaboration with Intel's human resources staff and local academics developed a new associate degree program that would prepare locals for work at Intel.

Several institutional design features stand out at PROCOMER, Costa Rica's export promotion agency:

1) Cabinet-level leadership able to coordinate across agencies. The President of the agency's board is the Minister of Foreign Trade, who reports to the President of the Republic, and who can coordinate directly with other Ministers whose agencies are responsible for specific inputs. This type of leadership aligns with the principle of Rodrik (2004) that industrial policy should be "monitored closely by principal with a clear stake in outcome and who has the highest level of political authority."

2) Joint governance by the public and private sectors. The agency's board has nine directors: five from the private sector (typically chief executives) and four from the public sector (including the Minister of Foreign Trade). Participation of the private sector provides continuity between elections, and ensures that needs articulated by the private sector have a voice. Participation of the public sector ensures that policy is directed towards increasing productivity rather than only profitability. Sector working groups along the lines of *mesas ejecutivas* have been employed.

3) Close collaboration between export and foreign investment promotion agencies. Costa Rica is a country of 5 million people, so almost all foreign investment is export-oriented rather than intended to serve the local market, and many exports are done by multinational affiliates. As a result, the export promotion agency and the foreign investment promotion agency, CINDE, jointly coordinate the government response to foreign companies that are potential exporters. In fact, CINDE attracted Intel, while PROCOMER was established the year Intel arrived. There is evidence that foreign direct investment promotion agencies are themselves effective. Harding and Javorcik (2011) show using a difference-in-differences approach that when sectors are targeted by investment promotion agencies, they receive more foreign investment from the US economy compared to other sectors. This effect is concentrated in

countries with the most cultural distance from the United States, and those countries with less effective governments and higher corruption—indicating that effects are biggest where red tape and information asymmetries were previously most severe.⁵ A fruitful line of future research is to measure the complementarity between these two agencies, with a focus on the potential interactions between domestic and multinational firms. Some larger countries have investment promotion agencies with mandates to promote both domestic and foreign investment. An open question is whether the absence of a dedicated foreign investment promotion agency in these countries diverts government attention from attracting export-oriented multinationals.

4) *Dedicated revenue with regular evaluation.* PROCOMER was originally funded by a levy on exports from firms operating in Costa Rica's free trade zones, but the revenue base was later expanded to a levy on all exports. This dedicated revenue gives firms who pay the tax an interest in ensuring the agency provides value. The budget is also evaluated annually. Most recently, tax exemptions for investors were compared to benefits in terms of additional tax revenue, incremental wage increases, and pension contributions, and it was found the agency generates about \$2.50 of those benefits for every \$1 in tax incentives offered to foreign investors (República de Costa Rica, 2022). Ideally, this analysis should be completed by an independent government agency, like the Ministry of Finance or Treasury.

5) *Unique online portal for potential exporters and buyers.* Effective export promotion agencies have client relationship management tools that help them respond to the idiosyncratic needs of firms at scale. In Costa Rica, this system is built on web-based surveys available to potential exporters and investors that evaluate each group's readiness to start exporting. Some measures of readiness are generic, including whether the firm has identified a foreign distribution agent, but others are sector-specific, having to do with conformity to quality regulation in the foreign market. The tool helps the agency to focus its efforts on where the social payoff is likely to be greatest. Another tool used is database for international buyers that allows them to browse the offerings of exporters.

6) *Use of private sector competition to deliver hard and soft infrastructure.* In Costa Rica, over 30 privately-owned export processing zones compete to cater to the needs of exporters and investors. Some of the zones provide plug-and-play office and production space, as well as

⁵ Evidence from Europe suggests foreign investment promotion agencies can also be effective in high-income countries, especially in attracting investment to less-developed regions of those economies (Crescenzi, Di Cataldo, and Giua, 2021).

schooling for the children of employees, and all offer renewable energy. By relying on the competitive market to deliver infrastructure, the investment and export promotion agencies have enriched their offering, without additional expenditure.

Conclusion

Most discussion of industrial policy these days has focused on actions by the largest economies, like China and the United States, and a narrow set of industrial policy instruments, specifically production and investment subsidies. This discussion is not relevant to governments in countries with small domestic markets pursuing export-led development strategies that require them to abide by international trade rules, and who lack fiscal space for large subsidy programs. Yet, these countries nonetheless need an approach to target policy instruments that resolve market failures specific to certain export sectors, and exploit latent opportunities for productive diversification. Such policy instruments can be called industrial policy because they require sector-specific information to implement, and are targeted at specific sectors. I have provided an outline of the approach many countries are taking and examples from a rich toolkit of policy instruments available, some of which have been validated by research in specific contexts.

The phrase developing countries used to be a euphemism for poor governance, some of which was linked to support of the wrong sectors or people. With recent improvements in governance and democratic accountability, there is cause for some optimism that the industrial policy of the future—with developing countries now licensed by economists to use it—can succeed. Even so, like all development policy, I expect this will be very hard to get right.

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