The Changing Nature of International Trade and its Implications for Development*

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Abstract

This chapter revisits the relationship between international trade, trade policy, and development in light of the structural, policy, and geopolitical shifts that have transformed globalization over the past decade. While trade has historically supported development through both static and dynamic channels, we argue that the latter—those inducing structural transformation and institutional change—have been far more consequential for long-run development. Through access to global markets, participation in global value chains, and knowledge and technology transfers, and by providing an anchor for reform, trade and trade agreements have contributed to productivity gains, technological progress, quality and skill upgrading, and institutional change in many low- and middle-income countries. Yet, the conditions that enabled these effects—technologically driven declines in transportation and communication costs, fragmentation of the production process, liberal trade regimes, multilateralism and geopolitical stability—are changing. Automation, digitization, climate change, the return of industrial policy in advanced economies, and the rise of geopolitical rivalry are reshaping the global trade environment. In this new context, the scope for replicating past export-led growth successes is unlikely. We discuss whether trade in services or the green transition could provide alternative paths and emphasize that future development prospects will increasingly depend on the policy choices of advanced economies and the ability of developing countries to adapt to a more fragmented global system.

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1. Introduction

In recent decades, many developing countries have experienced historically unprecedented rates of growth. Within a couple of generations, some countries transitioned from low- to upper-middle or even high-income status. This growth, particularly in East Asia – and especially during the 1990s, a period known as the era of hyper-globalization – is frequently described as "export-led growth," a term first popularized by Bela Balassa (e.g., Balassa, 1971, 1988). This pattern is at least partially attributed to trade and openness, and many economists credit globalization with enabling these "growth miracles" (e.g., Baldwin, 2016; Goldberg and Reed, 2023a; Hausmann et al., 2005; Irwin, 2019, 2022; Sachs and Warner, 1995; Stiglitz 1996; World Bank 1993, 2020).

The last decade, however, has seen a rapid and decisive shift in the nature of globalization and trade, driven by structural factors, policy changes, and geopolitics. The primary structural changes have been advances in technology, including automation, digitization and the increasing deployment of artificial intelligence tools, and the accelerating impacts of climate change. The key policy changes have been the rise of protectionism and economic nationalism, the increasing prevalence of industrial policy, and the various policy responses to climate change. Geopolitically, the last decade has seen increased tensions and rivalry among large economies, namely the US and China.

These changes raise important questions about the future prospects for economic development. In the new global environment, can trade still support growth and development? More specifically, can low-income countries today expect a repeat of the export-led growth miracles of the past?

Answering these increasingly urgent questions requires an understanding of the mechanisms through which trade and globalization have historically influenced development. In general, academic literature on international trade and development focuses on two development outcomes: growth and welfare. Theoretical models have identified several mechanisms, old and new, through which trade promotes growth and raises real incomes. However, there is a persistent puzzle in the literature: none of these mechanisms, when quantified, can plausibly account for the extraordinary *magnitude* of growth experienced by many developing countries in recent decades.

In the 2014 *Handbook of International Economics*, for example, Costinot and Rodríguez-Clare conduct a comprehensive review of several trade models of static comparative advantage. Their review includes the latest generation of models, featuring intermediate inputs,

monopolistic competition, and heterogeneous firms. Yet even in the most favorable case for trade – the hypothetical example of Slovakia moving from autarky to free trade – the estimated welfare gain is just 96 percent (see Table 1 below; from Costinot and Rodríguez-Clare 2014, Table 4.1). While nearly a doubling of real income is substantial, it falls far short of observed outcomes in several countries. Between 1960 and 2020, for instance, Korea's GDP per capita (in constant 2015 US$) increased *thirty-fold*. Moreover, Korea's trade liberalization during this period was far less extreme than a move from autarky to free trade.

Table 1. Welfare Gains from Trade

	G_j Expressed in Percentages Computed Using:						
	One Sector (12)	Multiple Sectors, No Intermediates (23)		Multiple Sectors, with Intermediates (29)			
		Perfect Competition	Monopolistic Competition	Perfect Competition (Data Alphas)	Perfect Competition	Monop. Comp. (Krugman)	Monop. Comp. (Melitz)
Country	1	2	3	4	5	6	7
BRA	1.50%	3.70%	4.30%	6.30%	6.40%	9.70%	12.70%
CHN	2.60%	4.00%	4.00%	11.50%	11.20%	28.00%	77.90%
CZE	6.00%	16.80%	21.20%	34.00%	37.20%	65.10%	86.70%
HUN	8.10%	29.80%	31.30%	53.50%	55.30%	75.70%	91.00%
IDN	2.90%	5.50%	4.00%	13.10%	11.60%	11.20%	14.60%
IND	2.40%	4.60%	4.30%	9.20%	8.60%	9.50%	11.70%
IRL	8.00%	23.50%	14.20%	37.10%	38.90%	28.10%	29.10%
KOR	4.30%	3.90%	8.60%	12.50%	11.40%	44.10%	70.20%
MEX	3.30%	11.10%	12.10%	18.40%	18.60%	24.30%	28.40%
POL	4.40%	18.40%	19.70%	33.80%	34.50%	46.90%	57.00%
PRT	4.40%	23.80%	20.60%	35.90%	37.40%	36.70%	40.30%
ROM	4.50%	17.70%	12.70%	26.40%	29.20%	20.80%	20.70%
RUS	2.40%	18.00%	0.90%	35.90%	30.70%	-2.10%	-7.10%
SVK	7.60%	22.20%	23.60%	48.30%	50.50%	78.60%	96.40%
SVN	6.80%	39.60%	39.30%	57.80%	61.60%	71.30%	79.70%
TUT	2.90%	11.90%	13.30%	20.00%	20.90%	26.40%	29.50%
TWN	6.10%	9.60%	9.90%	19.90%	19.40%	28.60%	37.80%

Source: Costinot and Rodríguez-Clare, 2014.

Note: Table depicts welfare gains from trade across trade model specifications, for selected countries. Only a subset of countries from CRC 2014 are depicted.

This comparison underscores a tension: the widely held belief that trade drove postwar growth in many developing economies appears difficult to reconcile with the quantitative predictions of standard trade models. As Ossa (2015) suggests, one way to potentially resolve this tension is by turning to models that incorporate multiple sectors and low substitution elasticities where trade can theoretically unlock significant productivity gains (this will be the case for example, if production involves Leontief technologies, and certain critical inputs, e.g., energy, can only be imported). Placing greater emphasis on the role of intermediate inputs, especially energy

inputs or critical minerals, can produce much larger effects than standard trade models. However, this rationale does not seem to help explain the growth miracles of the past. Many developing countries are rich in natural resources or energy independent (see Figure A.1 in the appendix), and the mining and processing of critical minerals are spread across countries at varying stages of development. It seems unlikely that production structures or intermediate inputs alone were responsible for the scale of growth observed in countries like Korea or China.

A more promising path toward reconciling trade theory with empirical realities is to focus less on static comparative advantage and more on how trade interacts with domestic distortions. Beyond tariffs and other trade-related distortions, most developing countries are characterized by many non-trade domestic distortions, such as corruption, excessive regulation, or labor market frictions. In the 2022 *Handbook of International Economics*, Atkin and Donaldson emphasize that trade liberalization (i.e., reducing trade-related distortions by employing appropriate trade policy tools) can help alleviate the consequences of non-trade domestic distortions or even reduce them directly. Atkin and Khandelwal (2020) reach similar conclusions. Non-trade distortions are likely more prevalent in developing economies, so reducing them can have large effects on growth and development. As such, the indirect gains from opening up to trade could significantly exceed the direct effects predicted by standard models.

However, not all distortions matter equally, as Atkin and Donaldson emphasize. For example, extensive research shows that trade liberalization can reduce market power by exposing domestic monopolies and oligopolies – a common feature of developing economies – to import competition (De Loecker et al., 2016; Harrison, 1994; Krishna and Mitra, 1998; Levinsohn, 1993; Lu and Yu, 2015). As trade barriers fall, domestic firms face greater competitive pressure from foreign competitors, leading them to reduce their markups to remain competitive. While such effects are well-documented, Atkin and Donaldson find that reductions in market power tend to yield only modest welfare gains. More importantly, there are also many instances in which trade can increase market power (see, for instance, the growth of multinationals). In fact, Atkin and Donaldson point out that the effect of trade on domestic distortions is not unambiguous – trade can reduce, but also amplify domestic distortions. This raises a broader point: *a priori*, it is difficult to determine which distortions are most consequential for growth and development.

Against this background, this chapter adopts an alternative framework for understanding the effects of trade on development. We begin with the observation that development is not synonymous with growth or welfare – the two outcomes most commonly emphasized in international trade theory. As Goldberg and Reed (2023a) demonstrate, growth does not necessarily translate into poverty reduction, a core indicator of development. The two variables

are positively correlated (with a correlation around 0.8), which is why most economists advocate for growth in developing countries. Yet there are numerous cases where rapid growth has failed to produce sustainable poverty reduction.

A more comprehensive definition of development is reflected in the Sustainable Development Goals (SDGs) adopted by United Nations member states in 2015. The SDGs articulate objectives that go well beyond economic growth – including poverty reduction, education, clean air and water, and gender equality – capturing the key dimensions of well-being typically associated with "developed" countries. The drawback is that it is hard to keep track of 17 different goals and 169 targets, much less aggregate them to a single measure that can be meaningfully linked with trade or other macroeconomic forces. While this chapter offers no solutions for overcoming such challenges, it treats throughout the discussion "development" as a complex and multidimensional process rather than a single economic variable. Real income growth is a central aspect of that process, but it is neither the sole objective nor a sufficient measure of everything that development entails.

Given this multidimensional conception of development, we distinguish between the static and dynamic effects of trade and globalization. Static effects operate primarily through the classic channel of static comparative advantage, taking a country's existing endowments and technology as a given. Dynamic effects, by contrast, are processes that set in motion key structural transitions – reducing a country's distortions but also altering its endowments (e.g., human and physical capital), technologies, and institutions in ways that support long-term development. This perspective draws on the structural transformation literature in development economics (Chenery, 1960; Chenery and Syrquin, 1975; Kuznets, 1957, 1973; Lewis, 1954), where a positive income shock – such as a rise in agricultural productivity or the discovery of oil or natural resources – has the potential to jumpstart the economy and trigger long-run changes in its structure (Duarte and Restuccia, 2010; Herrendorf et al., 2014; McMillan et al., 2014; Murphy et al., 1989; Rodrik, 2016).

This chapter's thesis is that dynamic effects are the most consequential for growth and development. While trade's effect through the static channel of comparative advantage has been relatively modest, its contribution through the dynamic channels has been significant. An illustrative case is the effect of trade on market power. As noted, Atkin and Donaldson show that even when trade reduces domestic firms' market power, the direct welfare effect is small. However, if greater international competition leads domestic firms to adopt new technologies, the resulting dynamic effects can be substantially larger. This is not to suggest that trade will always have these effects. Indeed, with the market power example, there are cases where increased competition from abroad drives out the domestic industry. Rather, our argument is

that the most consequential distortions for development are those whose removal initiates a virtuous cycle.

The remainder of this chapter proceeds as follows. Section 2 provides an overview of the channels through which trade has been shown to affect development, distinguishing between static and dynamic effects. Section 3 reviews the key structural, policy, and geopolitical shifts that are affecting trade and globalization and links these discussions by considering the implications of recent changes for the channels – both static and dynamic – through which trade contributes to development. Concluding remarks follow.

2. How trade has fostered development in the past

Historically, trade has contributed to the development process through both static and dynamic channels. The effects of static comparative advantage – primarily linked to specialization in agriculture, natural resources, or low-skill manufacturing – have unquestionably delivered income boosts to many low-income countries. In particular, low-skill manufacturing has traditionally served as a relatively accessible first step on the path toward broader structural transformation. More consequential, however, have been the dynamic effects that generated positive spillovers to the broader economy through access to large foreign markets, technology upgrades, and incentives for institutional reforms. These effects were often catalyzed by participation in GVCs and strategic bargains – or "quid pro quo" arrangements – that enabled technology and knowledge transfers.

2.1 Static effects

The static effects of trade and globalization operate primarily through the classic channel of comparative advantage, taking a country's existing endowments and technology as a given. While important for sparking economic growth with an initial income boost, their capacity to generate sustained development is limited.

In the context of developing countries, static comparative advantage is typically considered in terms of agriculture, natural resources, and low-skilled manufacturing. Agriculture is a dominant sector in many low-income countries, several are rich in natural resources, and many have leveraged low-skilled, labor-intensive manufacturing as a launchpad for export-led growth.

Static comparative advantage in agriculture and natural resources has unquestionably delivered income gains in many low-income countries. Yet on their own – as noted by Goldberg and Reed (2023a) – these sectors have not produced meaningful development. As Joseph Stiglitz famously remarked in his 2012 Amartya Sen Lecture at the London School of Economics: "If Korea had stuck to its (static) comparative advantage, it would still be producing rice." Korea's development trajectory cannot be explained by its initial endowments; under a strict application of comparative advantage, it might have never transitioned to high-income status. Access to agricultural markets in advanced economies also remains heavily protected, limiting any straightforward development path for developing economies to achieve export-led growth and development through this sector alone. Natural resource wealth, meanwhile, has more often been associated with the infamous "resource curse" than with broad-based development or poverty reduction.

The case of low-skilled, labor-intensive manufacturing presents a more complicated picture. In many low-income countries, it did deliver early gains for sectors where they already had comparative advantage thanks to abundant low-skilled labor. This enabled relatively rapid export success that did not require major upgrading in either skills or products. As a result, these initial gains were self-financing and relatively "cheap," since they required neither foreign aid nor large upfront capital investments. Likewise, because output was sold into foreign markets, increasing production and expanding exports did not depress their terms of trade.

However, these features are not unique to manufacturing; to some extent, they also characterize agriculture and natural resources. Moreover, as Costinot and Rodríguez-Clare (2014) make clear, the static gains from comparative advantage also cannot account for the scale of income growth seen in the most successful cases of recent decades. In short, while low-skilled manufacturing clearly played a central role in many development success stories, it did so through forces beyond comparative advantage.

What, then, made trade in low-skilled manufacturing special? Why did it eventually produce development outcomes that agriculture and natural resources could not? Our argument is that the international trade in low-skilled, labor-intensive manufacturing set in motion – or accelerated – a series of critical dynamic processes.

2.2 Dynamic effects

As discussed in the introduction, dynamic effects refer to processes that trigger deeper structural changes in an economy – transformations that not only reduce distortions but also reshape a country's endowments, technologies, and institutions in ways that support long-term

development. It is these dynamic effects, we argue, that enabled low-skilled, labor-intensive manufacturing to serve not merely as a source of early income gains, but as an engine of long-run growth and development.

Three primary channels help explain how manufacturing has generated positive spillovers to the broader economy: market size, technology and skill upgrading, and institutions. First, access to large and lucrative external markets – often facilitated by trade liberalization – allowed countries to adopt modern technologies and exploit scale economies. Goldberg and Reed (2023a) demonstrate this at the macro level, showing that access to large markets supports sustained poverty reduction. A growing body of micro-level evidence supports these findings. Studies have shown that expansion into export markets enables firms to increase their scale and adopt new technologies (Aw et al., 2011; Bustos, 2011; Lileeva and Trefler, 2010).

Second, trade has promoted technology upgrading and productivity gains. This involves a few complementary channels beyond the role of the pure scale effect discussed above, including: learning by exporting and importing ((Atkin et al., 2017; Blalock and Gertler, 2004; Clerides et al., 1998); quality upgrading that catalyzed skill upgrading as exporters in developing countries targeted high-income export markets with demand for higher quality (Brambilla et al., 2012; Demir et al., 2024; Eslava et al., 2018; Verhoogen 2008); assortative matching in trade and production networks leading to broader, economy-wide skill upgrading and producing general equilibrium effects an order of magnitude larger than the direct effects on exporters (Demir et al., 2024); technology transfer (both voluntary and involuntary) via foreign direct investment (FDI) or joint ventures (Fosfuri et al., 2001; Javorcik, 2004; Jiang et al., 2018; Keller and Yeaple, 2009; Newman et al., 2015); and firm-to-firm knowledge spillovers within global value chains (Alfaro-Urena et al., 2022; Constantinescu et al., 2019; Kummritz et al., 2017; Piermartini and Rubinova, 2014; Rigo, 2021). While the dominant narrative around GVCs emphasizes hyper-specialization – fragmenting production into discrete stages across countries – there is a parallel literature, especially in sociology, that highlights how firm-level interactions enable knowledge diffusion (Gereffi et al., 2005; Strange and Humphrey, 2019). This line of research shows that GVCs are not just about efficient production, but also about transmitting know-how across firms and countries. In many development success stories, it is through these channels that trade enabled firms in initially low-income economies to move up the value chain and produce more technologically advanced products (Amendolagine et al., 2019; Taglioni and Winkler, 2016).

Third, trade has influenced development by shaping institutional environments. The GATT/WTO agreements help governments internalize the externalities they impose on each other through their unilateral trade policy choices, thus providing stability and predictability to the trade

system (Bagwell and Staiger, 2002; Staiger 2022). Complementing the multilateral framework, many developing countries signed regional trade agreements, especially since the early 1990s, which have introduced a set of enforceable rules in diverse areas such as investment, competition, intellectual property rights and the environment that act as commitment devices for enacting institutional reforms (Hofmann et al., 2017; Horn et al., 2010; Mattoo et al., 2020).

A body of literature has shown that these "deep" provisions in trade agreements help promoting trade integration and growth (Fernandes et al., 2021) and can help improve non-trade outcomes such as reduce deforestation (Abman et al., 2023, 2024), especially in developing countries where commitments to reform have higher value. In some contexts, trade-induced growth has itself prompted institutional change (Nunn and Trefler 2014; Puga and Trefler 2014). For example, trade liberalization has been linked to reductions in child labor, as documented by Abman et al. (2023) and Edmonds and Pavcnik (2005, 2006). These reductions, in turn, lead to long-term human capital accumulation as children spend more time in school.

Conversely, in cases where the initial income boost enabled by the discovery of natural resources or by low-skill manufacturing was not followed by technological, skill, and institutional upgrading, the economy faced stagnation in a "middle-income trap." A case in point is Mexico where export-led growth in low-skill manufacturing incentivized youth to drop out of school to join relatively lucrative jobs in the new export-oriented plants (Atkin 2016). Unlike the experience in East Asian countries, the positive short-run effects of exports on growth did not put Mexico on a new development trajectory; human capital stagnated, and the country remained stuck in low value activities. The case of Mexico demonstrates that export growth—or trade more broadly—is not sufficient on its own to drive the technological and skill advancements necessary for sustained growth and development. Achieving these outcomes requires deliberate, complementary investments by governments, as seen in countries like South Korea, which invested heavily in human capital. The key point is not that trade automatically generates positive dynamic effects, but rather that access to export markets and global demand can create incentives for governments to make these crucial investments. From a policymaker's perspective—especially one focused on short-term gains—there may be little motivation to invest in education or technology when there is no immediate demand for skill or technologically sophisticated output.

To illustrate how dynamics have played out in specific sectors and policy environments, the next subsection highlights three salient cases: global value chains (GVCs), so-called "quid pro quo" arrangements, and the global semiconductor industry.

2.2.1. Three Examples

GVCs

One of the most significant mechanisms for trade's dynamic effects has been the rise of GVCs, which have reshaped many low-income countries' development trajectories. From an economic perspective, GVCs allow firms in developing countries to participate in global production by specializing in discrete tasks rather than mastering the full production process. This "hyper-specialization" lowers the threshold for entry, enabling countries to export intermediate goods or perform assembly operations even without having developed full-scale manufacturing capabilities. From a sociological perspective, relational theories of production highlight an additional channel: firm-to-firm relationships within GVCs can facilitate the transfer of knowledge, operational practices, and technologies across borders. Of course, GVCs are not without their risks and limitations. For instance, countries can find themselves "stuck" in low-value-added segments of value chains, such as basic assembly or commodity processing.

Three additional observations on GVCs are worth emphasizing. First, while agricultural value chains remain important for many low-income countries, their growth potential is limited relative to manufacturing-based GVCs. Second, despite the dynamic opportunities presented by GVCs, countries cannot easily "leapfrog" from the bottom to the top of the chain. As outlined in the World Bank's 2020 *World Development Report*, GVC upgrading tends to proceed in stages, from commodity exports to limited manufacturing, then to advanced manufacturing, and finally to innovation-intensive activities. The process is sequential, and development is best understood as the cumulative transition up the ladder.

Empirical examples illustrate this progression. Countries typically move to limited manufacturing by exporting basic manufactured products (i.e., garments) using imported inputs (i.e., textiles), as in the cases of Bangladesh, Cambodia, and Vietnam. As they move up the development ladder, they transition to advanced manufacturing. A recent attempt to move from limited to advanced manufacturing is Indonesia, which is leveraging its nickel-processing capacity to develop the capabilities for electric vehicle production – a sector where nickel is a critical input (see section on industrial policy later in this chapter). Countries like the Czech Republic and Korea, meanwhile, provide examples of successful transitions from advanced manufacturing to innovation-led growth. The most pronounced growth spurts typically occur during the initial shift from commodity dependence to limited manufacturing, highlighting the developmental importance of that first rung on the GVC ladder.

Quid pro quo

While GVCs offer indirect channels for learning and upgrading, some countries have pursued more deliberate strategies – using access to their domestic markets as a bargaining tool to accelerate knowledge transfer and technological catch-up.

China represents the most prominent example of this approach. Through a set of policies often described as "quid pro quo" arrangements, China conditioned foreign firms' access to its domestic market on technology sharing or co-production with domestic firms. Bai et al. (2023), examine China's policy requiring foreign automakers to form joint ventures with Chinese firms. Their analysis shows that affiliated Chinese automakers experienced significant quality upgrades, driven in part by labor mobility and supplier linkages that facilitated knowledge spillovers. Similar dynamics are observed in China's broader strategy of "technology extraction." Minnich (2023) documents how, in the years following China's accession to the World Trade Organization in 2001, the country expanded the use of formal and informal policies that required foreign firms to transfer technology to Chinese firms in exchange for market access. These measures were particularly prevalent in strategically important sectors such as high-speed rail, aircraft manufacturing, and renewable energy technology. Where China had sufficient bargaining power, these policies contributed meaningfully to domestic technological upgrading.

However, China's experience also illustrates the limits of this strategy. In sectors where foreign firms retained control over key intellectual property – such as semiconductors – China's ability to extract technology was more constrained.

Global semiconductor sector

Semiconductors are among the most globally integrated industries, yet the ability to build a competitive domestic sector has consistently hinged on foreign technology transfer. Goldberg et al. (2024) document that – with the sole exception of the United States – no country has successfully developed a domestic semiconductor industry without substantial transfers of foreign technology, whether through joint ventures, outward foreign direct investment, or technology licensing.

Moreover, these transfers are not incidental but stem from deliberate decisions by firms about where, and with whom, to share technical knowledge. In many cases, firms opt to withhold access to frontier technologies, especially from countries perceived as strategic rivals. Unsurprisingly, the locations of three of the most successful domestic semiconductor sectors – Japan, South Korea, and Taiwan – are close U.S. allies. By contrast, there is some evidence that China, despite substantial state subsidies, has struggled to reach the technological frontier in

semiconductors because it did not have access to foreign technology. As Minnich (2023) points out, a major constraint has been China's limited market power in semiconductors, which reduced its ability to compel or attract meaningful technology transfers.

2.3 Preconditions for dynamic effects

The three examples above illustrate how trade dynamics foster knowledge transfer across borders allowing countries to move up the value chain. But if trade's dynamic effects have played such a critical role in development, it is worth asking: under what conditions are these effects most likely to occur? Three broad sets of conditions stand out: technological developments, policies, and geopolitics.

First, the fragmentation of production – central to the rise of GVCs – was made possible by technological innovations that allowed firms to disaggregate complex products into discrete components and coordinate their production across borders. A car, for instance, could now be designed in one country with its parts manufactured in others and final assembly taking place elsewhere. These transformations were enabled by dramatic reductions in trade costs – including tariff reductions but also decreased information and communication costs. The introduction of standardized shipping containers, digitized supply chain management, and global logistics networks fundamentally reshaped what was tradable and how production was organized.

Second, trade-related policies in both advanced and developing countries played a critical enabling role. Many countries embraced trade liberalization in recent decades, both unilaterally and through multilateral institutions. The expansion of the World Trade Organization to include developing economies brought more countries into a common rules-based system. The use of industrial policy was also more limited. While countries like China and Korea pursued active industrial policies, policymakers in most advanced economies refrained from aggressive intervention. Regional trade agreements often included provisions for investment protection and regulatory cooperation, further encouraging cross-border firm-to-firm relationships. Together, these policy trends created a relatively open and stable environment where GVCs and trade could flourish.

Finally, geopolitics reinforced this institutional architecture. The post-Cold War era brought a degree of geopolitical stability and predictability that proved vital for the long-term coordination and trust required by international trade and GVCs. Economic efficiency was broadly prioritized over concerns about national security or political beliefs. The United States, for example, traded extensively with countries such as China and Vietnam despite deep political

differences, and it provided direct economic and strategic support to allies like Korea and Taiwan. This geopolitical environment helped facilitate cross-border knowledge flows, technology transfers, and the expansion of productivity and quality upgrading.

Yet from the vantage point of developing countries today, each of these conditions appears to be eroding. Technological change is ongoing, but it is now concentrated in automation and digital platforms that may reduce the demand for low-skilled labor. The global policy consensus around open trade has fractured, with advanced economies increasingly turning to industrial policy and protectionism (Goldberg and Reed 2023b). And geopolitically, the return of great-power rivalry, supply chain weaponization, and the prospect of geoeconomic fragmentation have raised uncertainty and risk (Aiyar et al. 2023).

This raises a fundamental question: if the past conditions that enabled dynamic trade effects are disappearing, what does that imply for the future of development?

3. What is different today?

Before diagnosing the implications of today's changing global environment for trade-led development, it is useful to clarify the nature of the changes themselves. Over the last decade, the nature of globalization and trade started shifting in profound ways. This transformation has been driven by three interrelated forces: structural, policy, and geopolitical shifts.

The most important structural shifts have been advances in technology, including automation, digitization, and artificial intelligence (AI). While technology has long enabled and accelerated globalization, some observers believe that we may be approaching the technological limits of production fragmentation. To take just one example, the automotive industry has split car production into thousands of individual parts and components across thousands of different firms and markets – but eventually, no further fragmentation will be possible. This could slow the continued expansion of GVCs, with potentially far-reaching implications for development. At the same time, there is growing uncertainty about how emerging technologies will affect low-income countries. Increased automation poses several risks, including labor displacement and the erosion of wage-based comparative advantage. Digitization could in principle open up new opportunities, particularly in tradable services. But such outcomes are far from guaranteed, and it remains unclear whether services trade could replicate the productivity spillovers and structural transformation historically associated with manufacturing. Meanwhile, AI is poised to disrupt global production in ways that are still poorly understood. Finally, climate change poses

significant challenges for development and trade, with potential disruptions to agriculture, infrastructure, and the stability of global value chains.

In terms of policy changes, there have been significant shifts, most notably in advanced economies, with a return of industrial policy more marked since 2020. These changes reflect a shift in priorities, with greater emphasis on concerns like competitiveness of domestic labor producers, but also climate change, resilience, and national security. These industrial policy trends have been reinforced by some of the trade policy responses to climate change, such as the Carbon Border Adjustment Mechanism (CBAM) – the EU's policy that imposes carbon tariffs on imports from countries with less stringent climate policies to prevent carbon leakage –, which may further reshape global trade flows. As of early 2025, the United States have also introduced and announced a new set of tariffs targeting a large set of advanced and developing countries to achieve diverse goals from rebalancing trade to addressing illegal immigration.

In part related to these changes in policies, there is a significant geopolitical shift. Rising tensions, particularly between the US and China, alongside the growing use of economic tools to achieve geopolitical objectives, could undermine the stability of the system that previously supported globalization. Multilateral institutions such as the WTO are being weakened, trade agreements could be used more to discriminate among partners rather than integrate, and policy uncertainty has grown due to the absence of enforceable dispute mechanisms.

The broad implications are clear. Structural changes like technology and climate change pose serious challenges to the export-led growth model. To date, their effects have not been dramatic, but developing countries are in a race against time to adjust and adapt. Recent policy changes in advanced economies, by contrast, have been sudden and dramatic, with potentially far-reaching consequences for development. Looking ahead, structural changes are important, but these policy shifts – especially in advanced economies – will likely be more consequential for the future development prospects of low- and middle-income countries. Finally, changing geopolitics still offers opportunities for developing countries, particularly in “connector” countries, but they must navigate an increasingly constrained landscape shaped by the strategic interests of the United States, China, and other major powers.

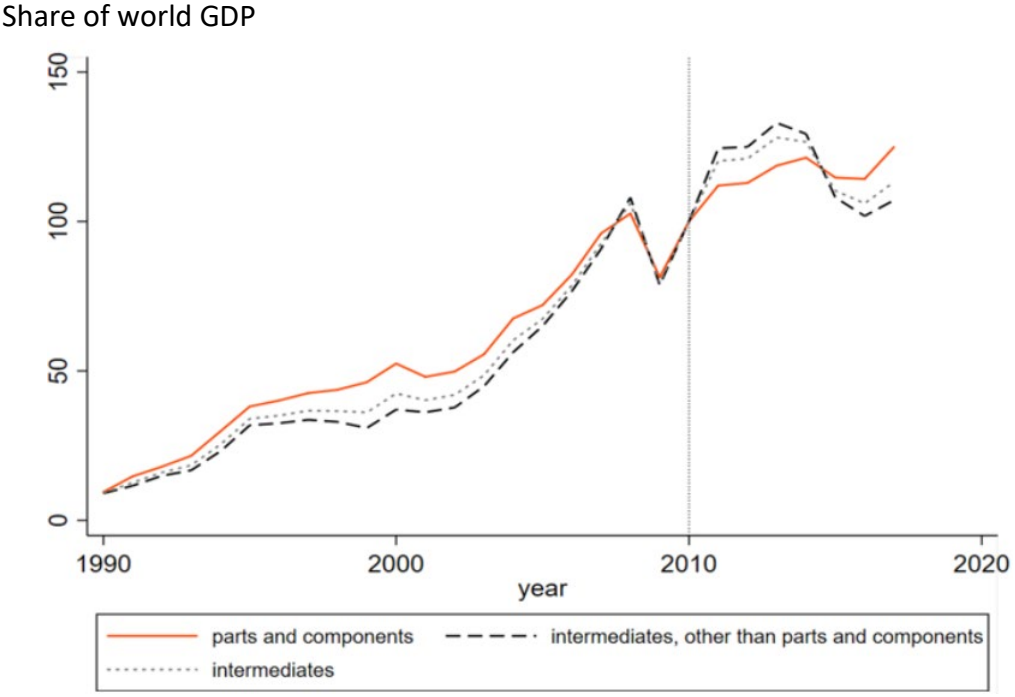
The remainder of this section considers these changes and their effects on development, starting with structural changes – then discussing policy changes and geopolitics together, given their overlapping nature.

3.1 Structural changes

In terms of their effects on trade and development, the structural changes that most frequently raise concerns among economists and policymakers are technological. The first key question is whether the global trading system has reached a fundamental technological constraint: has production fragmentation reached its limits? Since the Global Financial Crisis, the growth of international trade has slowed markedly, prompting some economists and policymakers to suggest that this deceleration reflects a secular or long-term slowdown. Yet this view is far from conclusive, and there are many compelling reasons to believe that – from a technological perspective - international fragmentation may still have a way to go.

The issue is hotly contested, with a large body of literature utilizing a range of different measures and databases. Often, different approaches produce different results. A common method for measuring GVC trade involves tracking trade in intermediate goods, or the inputs used to produce finished products. The gray dotted line in Figure 1 shows trade in intermediate goods as a share of world GDP from 1990 to 2017: intermediate goods trade collapses in 2008, recovers briefly, then continues to decline after 2013 to reach a plateau in 2017 – suggesting the possibility of a secular slowdown.

Figure 1. Exports of Parts and Components vs. Other Intermediate Goods



Source: Comtrade.

Note: Data is in base 2010 index = 100 for the period 1990-2017. This figure was previously published in Goldberg (2023) (Figure 1.9).

However, intermediate goods trade includes trade in commodities, the prices of which can fluctuate wildly across regions and over time, often for reasons unrelated to GVCs themselves. Given this, it is preferable to use trade in parts and components – a volume-based measure that excludes commodities and is often regarded as a more precise indicator of GVC activity. The red line in Figure 1 shows that trade in parts and components has followed a smoother trajectory since 2008, increasing steadily after the global financial crisis, with no clear sign of a long-term slowdown. Based on this alternative measure, there is little compelling evidence of a technologically dictated ceiling on GVC expansion.

Though production fragmentation may not have run its course yet, other technological developments associated with the increased use of robots, digital technologies, and expansion of AI tools pose new challenges for the export-led model of growth and development. We discuss those below in detail.

The second major structural change considered below is climate change. It is often assumed that rising temperatures and weather volatility will significantly alter comparative advantage for low-income countries, particularly in sectors like agriculture and tourism. Yet recent empirical evidence suggests this may not be the case across all countries and sectors. Nonetheless, the increasingly severe impacts of climate change – especially through natural disasters – are expected to generate large negative income shocks in many low-income economies by damaging infrastructure and disrupting production and trade. While many of these countries have historically not participated in GVCs, emerging research suggests that climate-related risks may lead to even greater "reshoring" or diversion away from vulnerable regions. Importantly, the effects to date have not been dramatic and are likely to be highly heterogeneous. Moreover, the interaction between climate change and emerging technologies could generate new development opportunities.

3.1.1 Technology

Today's most salient technological advances – namely automation, digitization, and AI – raise new and distinct questions for global trade. These developments have two primary implications. First, they make it increasingly feasible to reshore certain types of economic activity back to advanced economies, reducing the need to offshore production to lower-cost locations. Second, they may lead to a rise in cross-border trade in services. These two trends point in opposite directions: reshoring could reduce trade with low-income countries, while expanded services trade could increase it. In the case of AI, the technology is still in its early stages, and its implications for trade remain largely speculative. One emerging insight, however, is that AI's

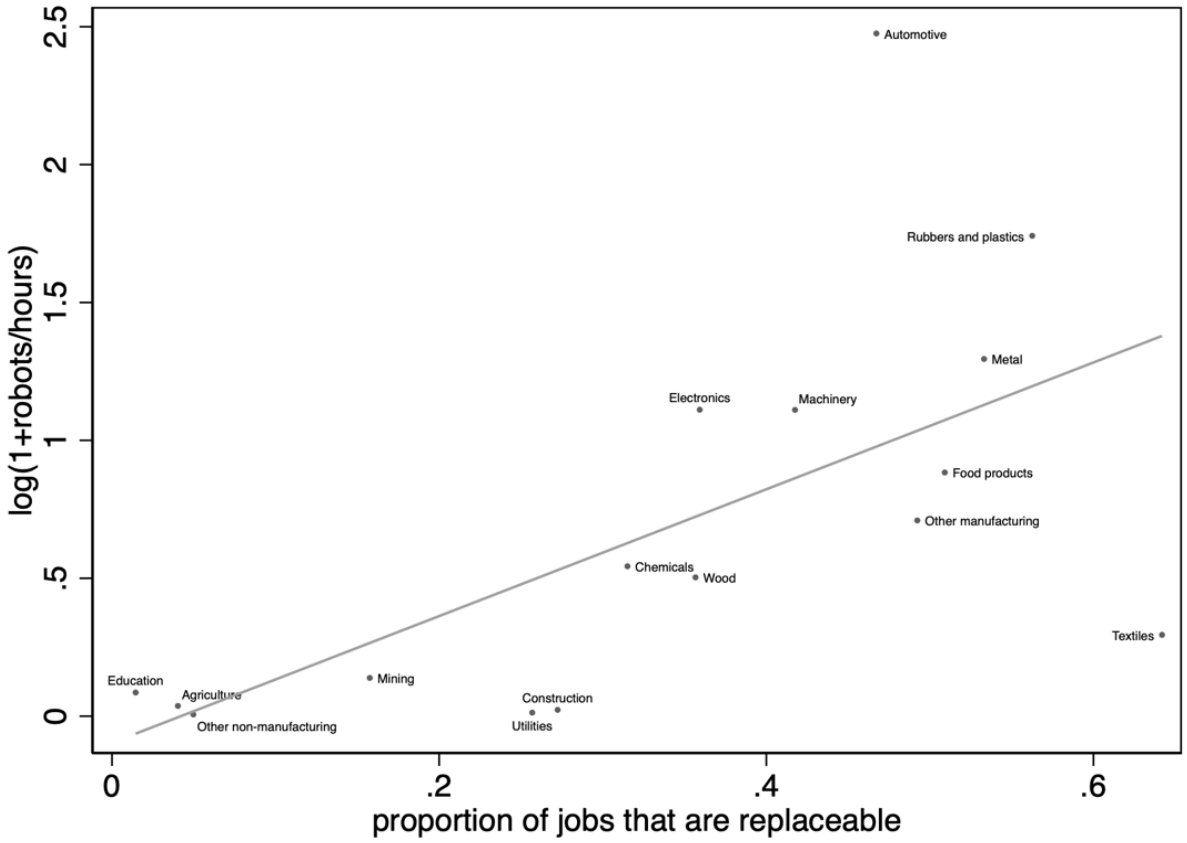
significant electricity demands may influence future patterns of comparative advantage – potentially benefiting countries with abundant clean energy resources.

Automation

Automation has long been a source of anxiety in advanced economies, but more recently, it has raised significant concerns for developing countries. The central worry is that continued advances in robotics – which have accelerated in recent years and are expected to progress further – could undermine the comparative advantage of low-income countries in low-skill manufacturing. In principle, a robot can substitute for a low-skilled worker, calling into question the viability of the export-led growth model and potentially rendering it obsolete. However, the empirical evidence to date is mixed.

Figure 2 shows that robot adoption to date has been concentrated in a small number of industries where automation is particularly feasible. The horizontal axis plots the share of jobs in each industry that are considered replaceable by robots, while the vertical axis captures the actual extent of robotization in those sectors. The points in the figure represent averages across countries and years. Two key insights emerge. First, and most reassuringly for low-income countries, robot adoption remains well below its theoretical potential. In most low-skill manufacturing sectors, robotization has yet to take hold. For example, textiles – a major low-skill export sector for many developing economies that has often served as a development springboard – has seen minimal adoption of robots, with a robotization degree of only 0.3, equating to 0.35 robots per million labor hours in this sector. This stands in stark contrast to the automobile industry, which appears at the top of the chart at a robotization value of 2.47, meaning that there are 10.81 robots per million labor hours. While the auto sector has already undergone substantial automation, this experience remains the exception rather than the rule. For low-income countries, this is good news: automation is still limited in the kinds of low-skill, labor-intensive manufacturing associated with the early stages of structural transformation. The shift from agriculture to limited manufacturing – the first rung on the GVC ladder – may still be within reach.

Figure 2: Robot Adoption and Feasibility of Automation across Sectors



Source: Artuc, Baston, and Rijkers (2023). Updated using data from EU KLEMS and IFR through 2020.

Note: Robotization (average robot density by sector averaged across countries and years) is the logarithm of 1 plus the ratio of the average stock of robots to the number of working hours (in millions) between 1993 and 2020 (or the subsample of years over this period for which robot data from the International Federation of Robotics [IFR] are available). The stock of robots is estimated using the perpetual inventory method based on the observed stock of robots in the IFR data and using a depreciation rate of 10 percent. The share of jobs that is potentially replaceable by robots is based on the task makeup of the jobs in each sector, analyzed using text mining techniques.

Yet the risks remain significant. Figure 2 also shows that many industries have a high share of potentially automatable jobs – including textiles, with 64 percent share of replaceable jobs. In other words, automation in these industries is entirely feasible, and over time it seems likely that such changes will materialize. There are already high-profile examples. The sports apparel company Adidas, for instance, garnered attention for its “Speedfactories” in Germany and the United States, which employed robotic shoe production and 3D printing. If scaled, such technologies would almost certainly reduce labor demand in footwear production, undermining opportunities for low-income countries. Yet the timeline for such transitions remains uncertain.

Notably, Adidas later relocated its Speedfactory operations to Asia – suggesting that labor costs and location-specific factors continue to shape the diffusion of automation technologies. How and when robot adoption will unfold remain uncertain, but the fact is that many sectors that are critical for developing countries have high shares of replaceable jobs.

The evidence on whether automation reduces exports from low- to high-income countries remains mixed. Recent research offers some insight into why the most feared economic consequences of automation have not yet fully materialized. Broadly speaking, automation can influence trade with low-income countries through two competing channels. The first is the labor displacement effect: as robots become cheaper and easier to adopt, the demand for low-skilled, low-wage labor from developing countries may decline. The second is the productivity and scale effect: as firms adopt automation, their output expands, potentially increasing demand for intermediate inputs – some of which may still be sourced from low-income countries. Which of these effects dominates is ultimately an empirical question, and the answer appears to vary significantly by context.

Against this background, it is not surprising that the results from a growing number of empirical studies attempting to quantify these effects are mixed. Some studies find that robotization in advanced economies is actually associated with *increased* imports from low-income countries. For example, Artuc, Bastos, and Rijkers (2023) find that automation increases intermediate input imports from low-income countries, while Stapleton and Webb (2020) report similar findings in the case of Spain. Other studies, however, document the opposite effect: Artuç, Christiaensen, and Winkler (2019) and Faber (2020) find that automation decreases exports from Mexico to the United States, while Stemmler (2019) finds that it reduces Brazil's exports of final goods. A separate strand of the literature examines whether automation leads to reshoring. Studies by Carbonero et al. (2018), De Backer et al. (2018), and Krenz et al. (2018) find that robots are associated with a reduction in offshoring. Notably, Faber et al. (2024) find that automation alone does not necessarily lead to reshoring – but it does so when combined with perceived risk. In other words, if a particular low-income country is seen as risky to trade with, firms are more likely to reshore activities previously located there.

Other evidence offers a more nuanced picture. Freund, Mulabdic, and Ruta (2022) examine the hearing aid industry, which has been an early adopter of 3D printing – a technology often assumed to eliminate the need for trade by enabling localized production. Contrary to this expectation, the authors find that the adoption of 3D printing led to an 80 percent increase in hearing aid exports, with no evidence of reshoring. The explanation lies in productivity and scale: firms that adopted 3D printing became more productive and started exporting to other countries. However, the researchers did not find evidence of increased trade with low-income

countries. The export increase occurred primarily among countries that had already adopted 3D printing – those with the capital, infrastructure, and skills to do so. The authors find similar, though smaller, effects in 35 other 3D-printing-intensive products. Their main conclusion is that automation may lead to an expansion in trade overall – but not necessarily with low-income countries. To the extent that these technologies reshape trade patterns, they are likely to benefit countries with abundant high-skilled labor, potentially shifting comparative advantage away from traditional low-wage exporters.

This evidence suggests a growing consensus that automation will alter the composition of labor demand – reducing the need for production workers, particularly in low-skill roles, while potentially increasing demand for higher-skilled and non-production workers. For developing economies, this suggests that while automation has not yet closed the door on export-led growth, the window of opportunity may be narrowing.

Digitization

What about broader technological change, specifically digitization? This includes developments like the internet, big data, blockchain, cloud computing, AI, and the rise of digital platforms. Unlike automation, which primarily affects production processes, digitization has the potential to generate more direct and transformative effects on development. For instance, Hjort and Poulsen (2019) find that the introduction of high-speed broadband internet in Africa had large positive effects on employment rates, including for less-educated workers, with little or no job displacement.

But does digitization have trade-related effects? There is growing evidence that it does, primarily by reducing logistics, search, and communication costs, accelerating trade facilitation, and enabling the rise of e-commerce and digital platforms. These developments hold particular promise for low-income countries. The 2020 *World Development Report* highlights a growing body of evidence that digitization makes it easier for firms in developing countries to participate in GVCs. For instance, Brynjolfsson, Hui, and Liu (2018) find that the introduction of machine translation on eBay boosted trade between the United States and Latin America on the platform, increasing exports by 17.5 percent. Several other studies show that digitization speeds up trade facilitation by reducing red tape and corruption at the border. Chalendard et al. (2020), Sequeira and Djankov (2014), and Sequeira (2016) also document such effects. Similarly, Fernandes, Hillberry, and Alcantara (2021) and Lee, Rocha, and Ruta (2021) find that digitizing trade facilitation boosts both imports and exports in developing countries.

The shift toward digitization is not uniformly benign. The rise of digital platforms and e-commerce has introduced new forms of market power and concentration, which can make it difficult for smaller firms to enter and compete. Moreover, realizing the full potential of digitization requires complementary policies – and in the current global climate, with rising protectionism and backlash against GVCs, such policy alignment appears unlikely.

Perhaps the most important effect of these technological developments is their potential to render a much larger share of services tradable by enabling them to be delivered remotely. Traditionally, services were considered the classic example of non-tradable goods, with limited growth potential and vulnerability to negative terms-of-trade effects – though there are notable exceptions. Fan et al. (2023), for instance, find evidence of productivity gains in India's non-tradable consumer services sectors (e.g., retail, restaurants, residential real estate). Given India's exceptionally large domestic market, however, such gains may not be generalizable – and regardless, there has been no services-led growth miracle in India to date.

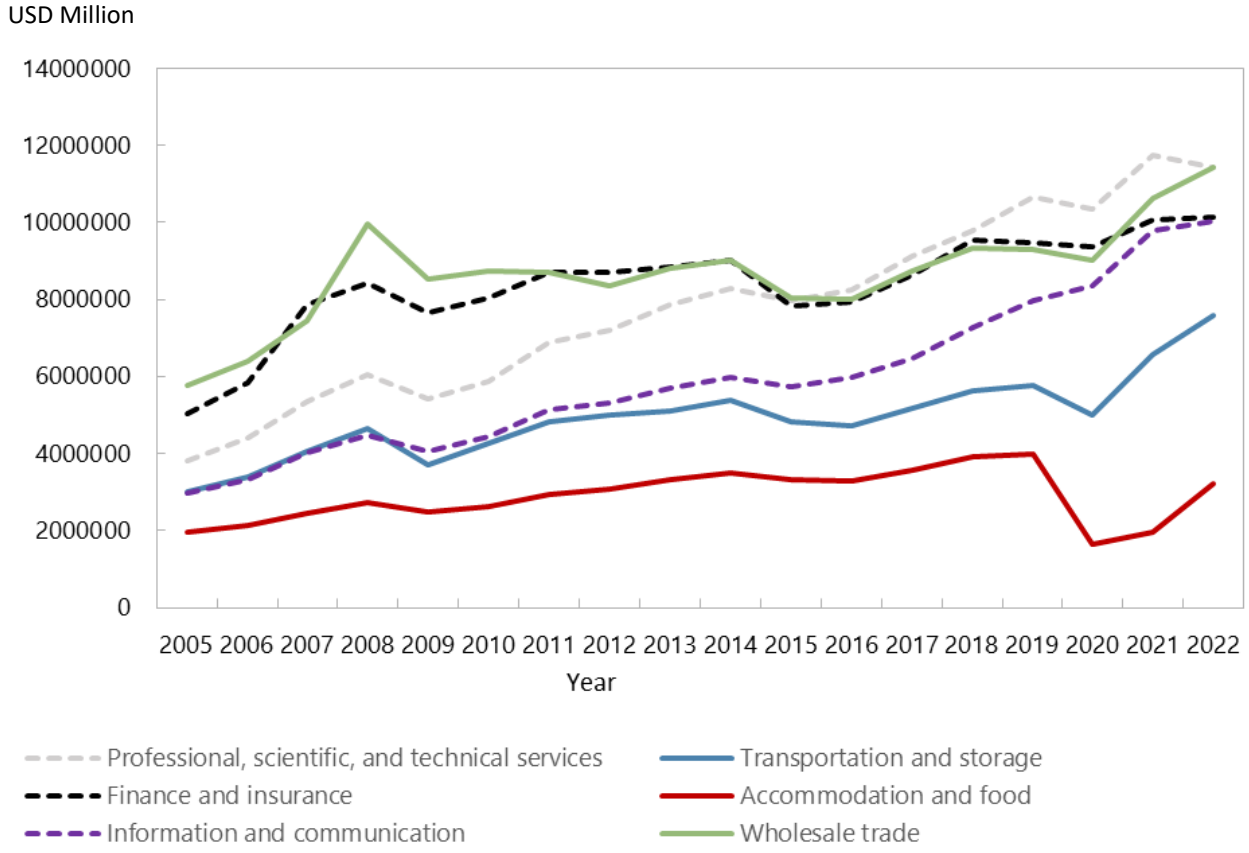
As technology expands the range of services that can, in principle, be traded across borders, a natural question emerges: Could tradable services become the new engine of growth for developing countries? At first glance, the answer is far from clear. The services sector is highly heterogeneous; some services are easily digitizable, while others are not; and even when services can be digitized, that does not guarantee they are tradable. Moreover, the key growth constraints for tradable services are not technological but regulatory. Even with strong digital capabilities, protectionist trade policies can sharply limit the export potential of tradable services.

Given these caveats, the broader question can usefully be broken down into two parts. First, do recent technological advancements (i.e., digitization) actually make services more tradable? And second, if so, do tradable services generate the same kinds of positive spillovers that low-skill manufacturing once did?

The answer to the first question appears to be an unambiguous "yes": recent decades have seen substantial growth in services trade, driven by technological advances as well as supportive trade policies. Figures 3 and 4 illustrate the expansion of global trade in services between 2005 and 2022. The figures track exports in six service sectors between 2005 and 2022, categorizing these sectors as "low-skill" versus "global innovator". Figure 3 shows annual export values while Figure 4 displays the share of each service category's exports in global trade to illustrate compositional shifts in global services trade. Professional/technical services dominate, reaching $120 million in 2021, while accommodation/food peaks at only $40 million in 2019. All sectors show growth but with different shock resilience patterns. In 2020, tourism

collapses during the COVID-19 pandemic, and this is reflected in the sharp drop from a 9 percent share to 4 percent of "accommodation and food" services (red line). However, other service categories maintained robust growth even through the pandemic. Notably, many of these tradable services are also high-skill intensive: "Information and Communication" services (green dotted line), "Professional, Scientific, and Technical" services (black dotted line), and "Finance and Insurance" services (blue dotted line) still represent 19 percent, 21 percent and 19 percent shares of global exports as of 2022. These patterns demonstrate that trade in services is growing, but also that it is becoming increasingly concentrated in high-skill sectors.

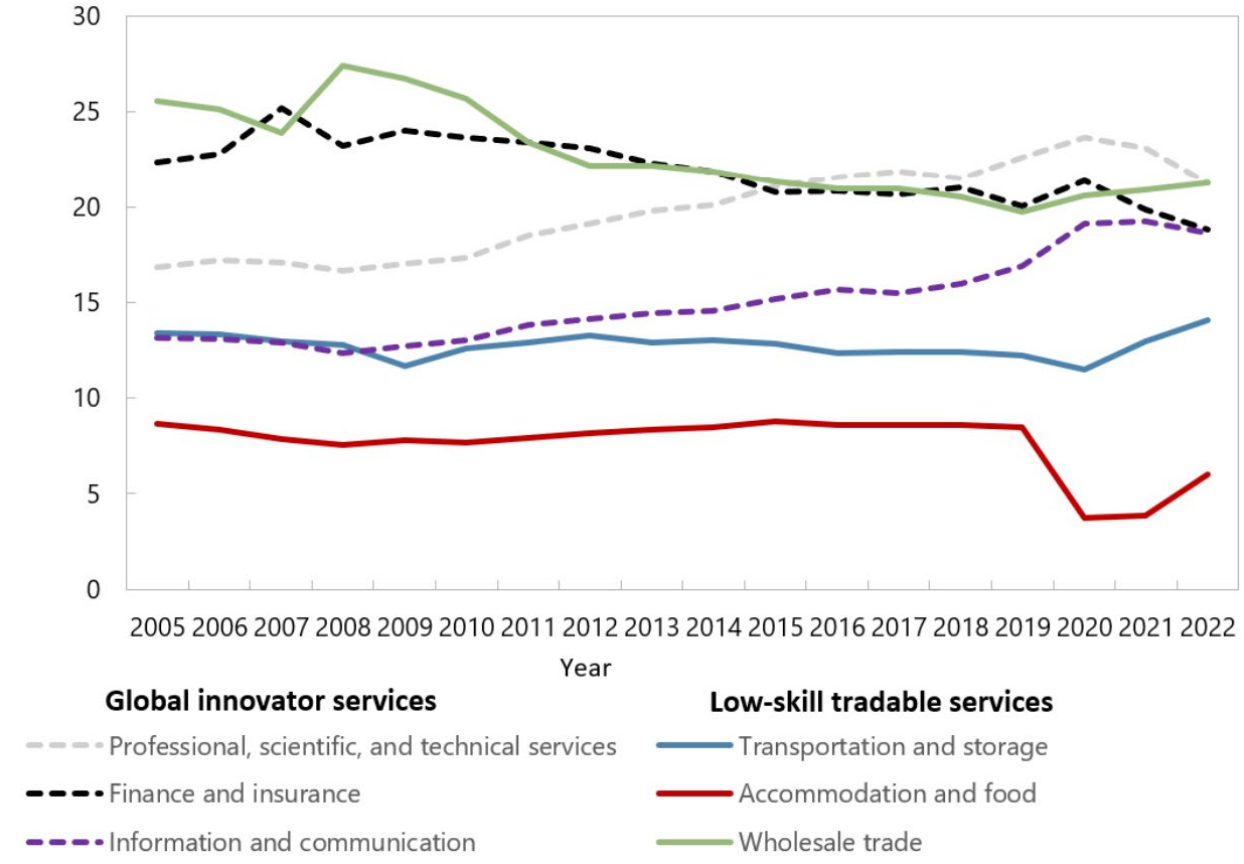
Figure 3. Growth in Global Trade in Services (Million US Dollars)



Source: WTO Trade in Services by Mode of Supply (TiSMoS).

Note: Categorization of the service subsectors is based on ISIC Rev.4 two-digit industry code, following Nayyar, Hallward-Driemeier, and Davies (2021), Table 1.3.

Figure 4. Growth in Global Trade in Services (Share of Global Exports)



Source: WTO Trade in Services by Mode of Supply (TiSMoS).

Note: Categorization of the service subsectors is based on ISIC Rev.4 two-digit industry code, following Nayyar, Hallward-Driemeier, and Davies (2021), Table 1.3.

As noted, the main constraints on the future growth of trade in services are policy-related, not technological. The sector remains highly protected in many economies. Domestic regulation remains a major constraint on trade in final services (e.g., telemedicine) and these restrictions are unlikely to be lifted in the near term (Borchert et al. 2020; Mattoo 2018). Some analysts suggest that trade in intermediate services (e.g., many business services) is less restricted than trade in final services. But this distinction is difficult to verify empirically, since data categories in the OECD's Services Trade Restrictiveness Index (STRI) are too aggregated to draw reliable inferences. Regardless, if trade in intermediate services displaces domestic labor in advanced economies, it will likely become a target of protection. Complicating matters further, automation and AI are increasingly affecting the service sectors, with many services susceptible

to replacement. Nonetheless, there remains significant room for expansion of global services trade.

As for the second question – can trade in services generate the same positive spillovers as manufacturing? – the answer is, at best, maybe. It is an open question. Some evidence suggests that not all tradable services generate positive externalities. Faber and Gaubert (2019), for example, find that tourism produces very strong, positive local effects, but these boosts are geographically limited and often come at the expense of other areas in the country – suggesting that the aggregate impact of tourism can be modest. So it is not yet clear whether trade in services can trigger the kind of virtuous cycle that manufacturing-led trade once did. That said, it is certainly possible that it could do so in the future.

In principle, it is easy to see why certain tradable services could generate positive spillovers. Business services and IT services share key features with GVC-based manufacturing: they are professional, technical, and require close collaboration between firms. Theoretically, they could serve as vehicles for sharing technology and knowledge across borders. However, these service sectors remain quite small, which raises the broader question of whether a relatively narrow segment of the economy can generate wider spillovers – can the "tail wag the dog"? It is certainly possible, particularly if these sectors catalyze changes in workplace norms and institutions. But there is no established mechanism for tradable services to replicate the widespread positive effects that manufacturing once had. Moreover, the services that are most likely to have positive spillover effects tend to be more skill-intensive than limited manufacturing. They often require advanced skills (e.g., foreign language proficiency, computer literacy, professional soft skills) that are scarce in many low-income countries. As such, participation in these services would likely require developing countries to make upfront investments to upskill the labor force.

In sum, digitization is enabling the rapid expansion of global trade in services, but it is unclear whether tradable services will become the next engine of growth for low-income countries. The scope for future growth is primarily constrained by policies (e.g., protectionism and domestic regulatory barriers) rather than technology. Yet even if demand for tradable services in advanced economies grows, the skills required are poorly aligned with low-income countries' traditional comparative advantage – unless accompanied by major investments in basic skills.

AI

AI is another emerging technology with potentially far-reaching implications for trade and development. In many respects, AI can be seen as a form of "automation on steroids": it

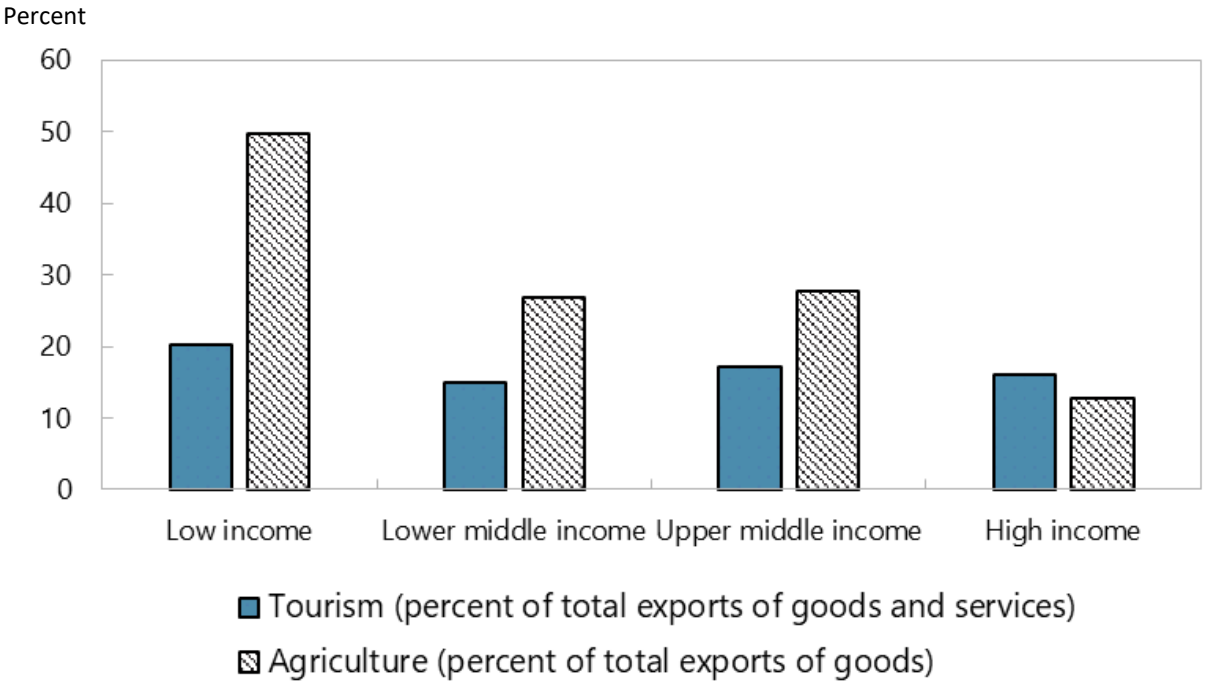
promises to have transformational and potentially highly disruptive effects on the service sectors as well as production processes. Unlike earlier waves of automation, however, which primarily threatened low-skilled, labor-intensive tasks, the current wave of AI appears – at least so far – to be most relevant for higher-skilled sectors and occupations. As such, the immediate benefits or risks of AI for low-income countries' growth strategies may be more limited. However, AI technologies are evolving rapidly, and their ultimate effects on labor markets, trade patterns, and comparative advantage remain deeply uncertain.

One facet of AI that could have structural implications for trade and development is its intense demand for electricity. AI technologies are highly energy-intensive, and it remains unclear whether these demands will decline over time, particularly given the rapid pace of adoption and scale-up. As governments and firms grapple with reconciling AI's energy requirements with global climate commitments, demand for clean electricity is likely to rise. This shift could, in principle, generate a positive income boost to countries with abundant renewable energy resources. According to the World Economic Forum (2018), several emerging and developing economies have significant potential for renewable energy development in solar (Algeria, Eritrea, Jordan, Libya, Morocco, Oman, Saudi Arabia, Yemen) and/or wind (Mongolia, Morocco, Tunisia, Yemen). However, as noted above, the presence of natural resources does not guarantee development, so the risks of a resource curse also apply with renewable energy. That said, technologies like AI may establish new sources of country heterogeneity and shift traditional patterns of comparative advantage, with resources like oil replaced by sun, wind, water, or critical minerals.

3.1.2 Climate change

Changing climate and weather patterns represent another structural change with increasingly important effects for trade and development. These effects primarily operate through the channel of static comparative advantage, since climate change affects sectors like agriculture and tourism – both of which are central to many developing economies (see Figure 5). As of 2020, tourism and agriculture represented 20 percent and 50 percent of total exports in low-income countries, respectively. In addition, the increasing frequency and severity of climate-related natural disasters may have large negative income shocks, destroy important infrastructure like ports and roads, and disrupt GVCs. If these disruptions become sufficiently persistent or widespread, they could lead to permanent relocation of production activities.

Figure 5. Country Dependence on Agriculture and Tourism, 2015-20 (Average)



Source: IMF, World Economic Outlook database; UN Comtrade; World Bank, World Development Indicators database; World Trade and Tourism Council.

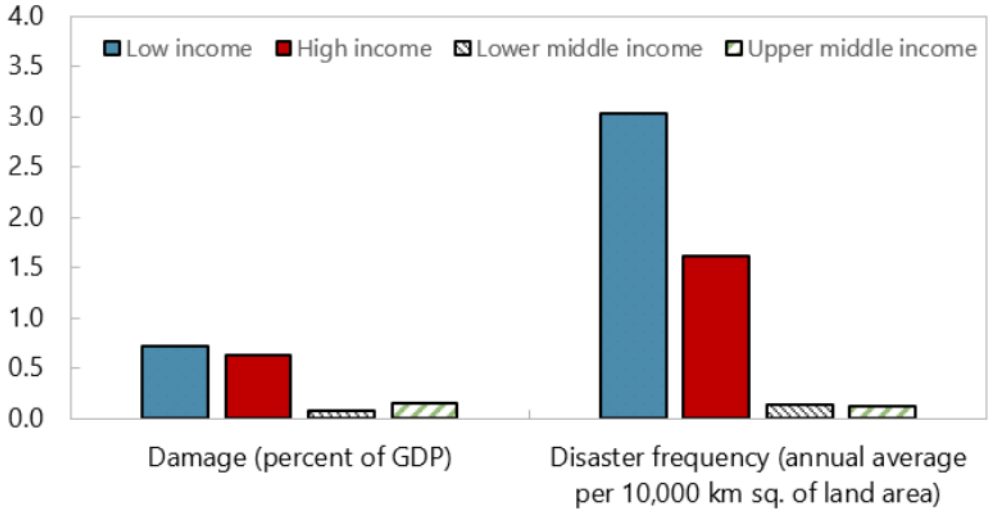
Note: Income group classification based on World Bank country classification as of 2025. This figure is extended to include the whole world and updated with more recent data based on Ivanova, Kozack, and Muñoz (2024), Figure 1.1.1.

It is often assumed that climate change will profoundly reshape patterns of comparative advantage. One of the few papers to examine this question directly is Costinot, Donaldson, and Smith (2016), and their findings are surprising. Using data from the FAO's Global Agro-Ecological Zones (GAEZ) project, they find that climate change's projected effects on agricultural productivity and yields are highly heterogeneous across countries. While the projected global welfare loss is modest (0.26 percent of world GDP), the estimated losses for some low-income countries are very large (e.g., 49 percent of GDP in the case of Malawi). This heterogeneity arises because the share of climate-sensitive crops in GDP is small globally but substantial in many developing economies. However, the study finds that these losses do not operate through international trade: while the effects of climate change lead to reallocation of production within countries, they do not lead to significant reallocation of trade flows. The authors conclude that climate change can have large welfare effects, but these operate primarily through domestic adjustment rather than shifts in trade. In other words, even in sectors like agriculture and tourism, climate change is unlikely to affect static comparative

advantage. (And as discussed earlier, even if it did, static comparative advantage is not the most consequential driver of development.)

There is, however, substantial evidence that climate-induced natural disasters will disproportionately affect low-income countries (see Figures 6 and 7). From a development perspective, this matters because natural disasters can disrupt GVCs. One might argue that this is of limited concern for countries that have not yet integrated into GVCs – as is the case for many climate-vulnerable low-income countries. Haiti, for example, experiences frequent and severe natural disasters, but plays no meaningful role in global production networks. Many economies in sub-Saharan Africa are in similar circumstances. The more serious long-term concern, however, is that climate risks reduce incentives for firms to locate GVC activity in these regions. There is no current evidence that this is already occurring, but if it does, it would represent yet another obstacle for the development trajectories of low-income countries. As discussed earlier, Faber et al. (2024) find that automation-induced reshoring is more likely when trading with countries perceived as risky; over time, climate risk may fall into this category. Not long ago, many low-income countries hoped to enter GVCs as a path to industrialization. This development strategy is becoming increasingly unlikely, partly due to climate change.

Figure 6. Average Annual Effects of Weather-Related Natural Disasters, 1980-2023

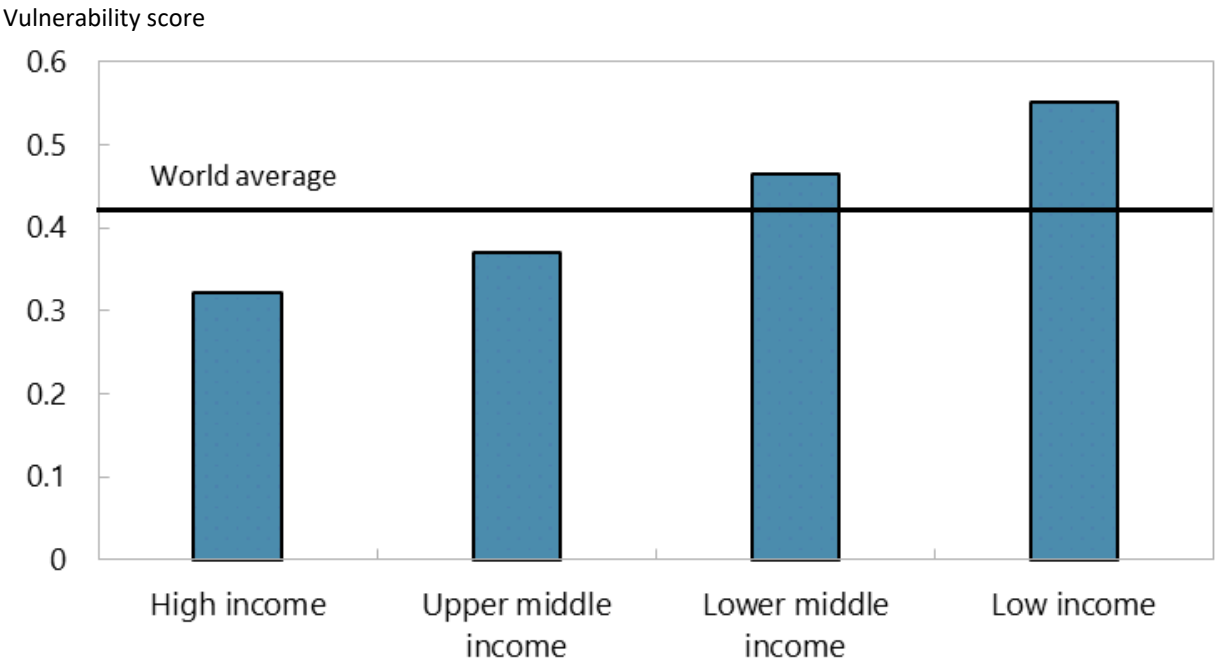


Source: Emergency Events database; IMF, World Economic Outlook database.

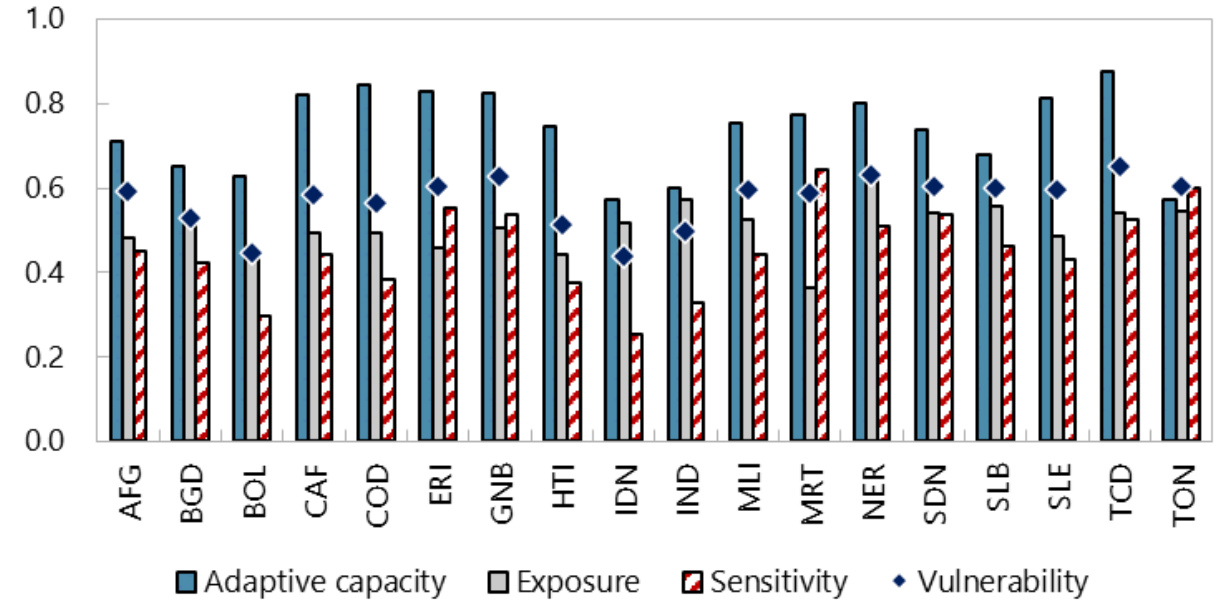
Note: Extended with more recent data based on Ivanova, Kozack, and Muñoz (2024), Figure 1.6. Weather-related natural disasters include climatological (drought, wildfire), hydrological (flood, landslide), and meteorological (storm, extreme temperature) events. A simple average taken across countries and years, with damage scaled by GDP annually and disaster frequency scaled by 2021 land area annually for each income group.

Figure 7. Vulnerability to Climate Change

7.1

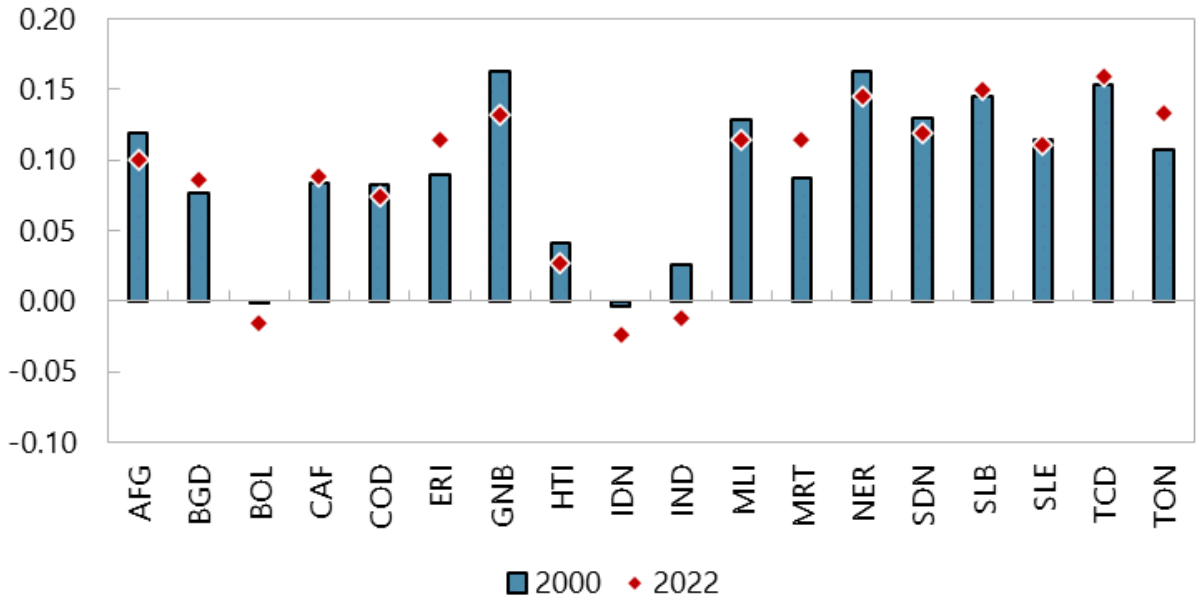


7.2



7.3

GDP adjusted vulnerability score



Source: Emergency Events Database; IMF, World Economic Outlook database; Notre Dame Global Adaptation Initiative (ND-GAIN) database; IMF Adapted ND-GAIN.

Note: Extended with more recent data based on Ivanova, Kozack, and Muñoz (2024), Figure 1.7.

(1) Country codes follow International Organization for Standardization (ISO): AFG = Islamic Rep. of Afghanistan, BGD = Bangladesh, BOL = Bolivia, CAF = Central African Rep., COD = Dem. Rep. of the Congo, ERI = The State of Eritrea, GNB = Guinea-Bissau, HTI = Haiti, IDN = Indonesia, IND = India, MLI = Mali, MRT = Mauritania, NER = Niger, SDN = Sudan, SLB = Solomon Islands, SLE = Sierra Leone, TCD = Chad, TON = Tonga, UGA = Uganda.

(2) IMF Adapted ND-GAIN assesses climate change vulnerability through three components: exposure to climate-related hazards, sensitivity to hazard impacts, and adaptive capacity to cope with impacts. Assessment covers six life-supporting sectors (food, water, health, ecosystem services, human habitat, infrastructure). Raw data scaled 0-1 using arithmetic averages. Regional averages weighted by 2022 population.

(3) To account for the correlation between ND-GAIN vulnerability scores and GDP per capita, the "GDP adjusted ND-GAIN vulnerability score" (ranging from –1 to 1) is defined as the distance of a country's measured ND-GAIN vulnerability score to the expected value for its GDP per capita, as represented by results from the regression of ND-GAIN vulnerability score and GDP per capita, for each given year. Positive values reflect lower vulnerability than expected, given a certain level of GDP per capita.

In summary

The structural changes reviewed in this section pose significant challenges for development, even if their effects to date have not been dramatic. While not all technological change is a threat – and some may bring new opportunities – the conditions that enabled past episodes of export-led growth are unlikely to persist. Automation, for example, may complicate the transition from limited to advanced manufacturing. On the other hand, digitization is likely to

reduce trade costs, facilitate participation in GVCs, and expand the tradability of services, offering a potential new frontier for development. In principle, services could substitute for manufacturing as an engine of growth, but this path requires a threshold level of human capital that many low-income countries do not yet possess – raising the need for substantial additional investments. AI may automate certain service activities, but its heavy demand for electricity could confer comparative advantage on countries with abundant renewable energy. Climate change is poised to generate increasingly severe income shocks, though its effects will vary widely across countries – and the interaction between climate vulnerability and automation may further discourage GVC participation in low-income countries over time.

3.2 Policy changes & geopolitics

What about the effects of recent policy and geopolitical shifts on trade and development? As we document below, the use of trade and industrial policies has increased worldwide, and especially in advanced economies after the COVID-19 pandemic (Evenett et al. 2025; Juhasz et al. 2025). Geopolitical shifts are more difficult to capture in the data. The international relations literature points to the end of the so-called period of "hegemonic stability" that characterized the post-World War II era and the return to "great power rivalry," especially between the US and China (Mearsheimer, 2003). Trade data show the relative resilience of trade between blocs of geopolitically aligned countries relative to countries that have less aligned political preferences, as captured by voting patterns at the UN, since the escalation of trade tensions between the US and China in 2018 (Aiyar et al., 2023; Blanga-Gubbay and Rubinova, 2023; Gopinath et al., 2025; Jakubik and Ruta, 2023). A key feature of this new era, however, is that it is difficult to clearly distinguish between policies motivated by domestic economic concerns and broader geopolitics. In sectors like electric vehicles and semiconductors, for example, US policy interventions are justified simultaneously as efforts to diversify supply chains away from geopolitically sensitive locations in the name of national security and to achieve other goals such as economic resilience and the creation of high-quality domestic jobs. Moreover, governments may use tariffs and trade policy coercively, by exploiting partners' trade dependence to achieve geopolitical goals, as first discussed in the classic work by Hirshman (1945).[1] This again suggests that the line separating policies and geopolitics may be difficult to draw in practice.

The effects of these shifts are still highly uncertain. But it seems increasingly clear that the future development prospects of low- and middle-income countries will hinge, to a significant degree, on the specific policy choices made by advanced economies, on how these policy changes will eventually impact the rules-based multilateral trading system, and on the

[1] See also the historical account of the use of trade policy during the inter-war period in Irwin (2012).

evolution of the broader context of geopolitical rivalry that appears to characterize the new era of world trade. In the rest of this section, we focus first on the return of industrial policy, including measures targeting climate change, and then devote attention to the implications of the rise of geopolitics.

It is important to note that many of these policy shifts are very recent, with several (such as the resurgence of industrial policy) taking shape only in the last few years and some (the surges in US tariffs) taking shape as this chapter is being written. As a result, any analysis at this stage is inherently speculative. With the structural changes discussed above, some empirical evidence already exists to assess their effects – but with policy changes, researchers are doing the work in real time. In the short run, some initial evidence has emerged about the effects of recent policy changes and geopolitical tensions on trade flows, particularly related to the US-China 2018-19 trade tensions, as discussed below. But evidence on the longer-term consequences for development – in the broad sense beyond just growth – does not yet exist. These effects must be assessed using first principles, informed extrapolations, and a careful reading of how the mechanisms that once supported development might be reshaped by the new global environment.

3.2.1 Industrial policy

Historically, industrial policy has been used by governments in advanced and developing economies to boost industrial capabilities and foster long-term growth (Juhász, Lane, and Rodrik, 2024; Juhász and Steinwender, 2024). During the era of hyper-globalization, however, an era shaped by multilateral trade rules and market-oriented ideologies, most advanced economies largely refrained from the heavy use of industrial policy tools. This created opportunities for many (once) developing countries – including China, Korea, Taiwan, and Vietnam – to use industrial policy tools like subsidies, state-led investment, and targeted sector promotion to promote their competitiveness in international markets.

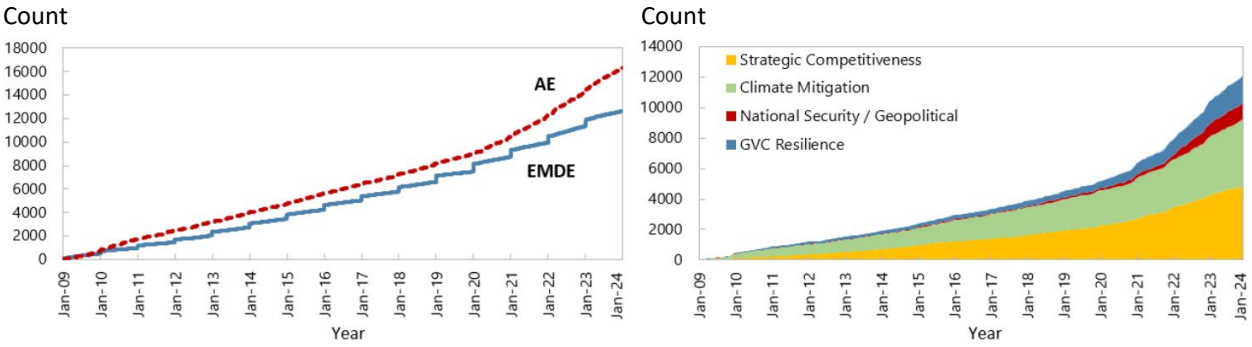
Crucially, in such countries past efforts at industrial policy often proved successful only when paired with access to foreign technology, which required cooperation with firms in advanced economies (Baldwin, 2016; Minnich 2023). Public debate tends to emphasize the role of government spending, direct or indirect (e.g. land grants, below market rates) by countries like China, Korea, and Taiwan to support their own industries. But this support alone might not have led to their industrial successes. While the primary objective of any industrial policy is to boost domestic industry, history suggests that their success is deeply tied to trade, global integration, and participation in GVCs.

A case in point is China's semiconductor industry that illustrates how industrial policy, even when backed by massive public investment, cannot on its own guarantee success (Goldberg et al. 2024). After investing enormous sums to build its domestic semiconductor industry, China is catching up but still remains behind the global frontier, underscoring the critical role of complementary factors like access to foreign technology and cross-firm collaboration. The US government has consistently imposed restrictions on Chinese firms' ability to invest in US semiconductor companies or gain access to leading-edge capabilities, many of which are critical inputs for a range of economic and military technologies.

Why were firms and governments in advanced economies so willing to share technology during the late 1980s and 1990s? Concerns over national security, economic resilience, and great power competition were far less salient during this period. This stands in stark contrast to the present moment, where industrial policy choices are increasingly framed in adversarial terms. Governments are no longer facilitating cross-border collaboration in the same way; in many cases, they are actively blocking it. While we return to this point in the next subsection, the point here is that the policy change in advanced economies has consequences for the export-led growth opportunities in developing economies.

Between 2009 and 2023, the number of industrial policies in advanced economies has increased at a pace comparable with developing economies. Since 2020, available data show an acceleration in the use of industrial policy tools which is stronger in advanced economies (see Juhasz et al, 2025, and Figure 8, LHS, which draws on data from Evenett et al. 2025). In principle, the current wave of industrial policy in advanced economies– increasingly motivated by national security and supply chain resilience concerns– might leave space for technology sharing among geopolitical allies or "friendly" countries. However, in practice, governments in the United States and Europe are often pursuing multiple objectives simultaneously. When industrial policies also seek to promote domestic employment, they may come into conflict with the interests of partner countries – particularly when cooperation would undermine job creation at home. The result is that the industrial policy environment faced by developing countries in the current time, even net of geopolitical considerations, is radically different from the period of hyper globalization.

Figure 8. New Industrial Policies 2009-2023



Source: Evenett et al. (2025)

Note: Cumulative stock of measure. For measures with multiple sectors, each sector is given equal weight.

Several recent examples illustrate these tensions between the interests of advanced economies and those of developing countries. First, in the US electric vehicle sector, tax credits for manufacturers were recently introduced to accelerate green technology adoption and reduce dependence on foreign supply chains and diversify global supply chains away from China. Yet the structure of these subsidies initially excluded key allies – such as Korea and members of the European Union – because their firms were not producing in North America, triggering disputes even among close partners.

A second example comes again from the semiconductor sector. Recent US policy has focused on reshoring the production of advanced logic chips – most of which are currently manufactured in Taiwan, a location increasingly seen as strategically exposed to China. From a supply chain resilience perspective, diversifying production away from Taiwan is a reasonable objective. But this goal could, in principle, have been achieved by expanding capacity in countries such as Korea or Vietnam. The decision to instead locate new production plants in Arizona – where labor and other production costs are high compared to global averages – reveals the authorities' goal to promote domestic production over economic efficiency.

Both the electric vehicle (EV) and semiconductor sectors are characterized by advanced technologies that exhibit significant learning externalities. As a result, industrial policies in these sectors can generate substantial positive cross-country spillovers—beyond those associated with global emissions reductions or increased resilience. In the case of EVs, Barwick et al. (2025) show that subsidies provided by China, the United States, and European countries contributed to a decline in battery production costs, driven by strong learning-by-doing effects along the EV supply chain. Because EV and battery producers are often located in different countries, these subsidies had the potential to create positive spillovers across borders, and did so in some cases.

However, the magnitude of these spillovers was diminished—and in some cases reversed—by local content requirements tied to the subsidies. China's "Whitelist" policy, which restricted EV subsidies to vehicles using domestically produced batteries, limited the benefits of learning-by-doing to Chinese firms. Similarly, the U.S. Inflation Reduction Act (IRA) included provisions favoring local content.

In the semiconductor sector, Goldberg et al. (2024) document strong cross-border learning spillovers in chip manufacturing, likely reflecting cumulative learning along a highly globalized supply chain. These spillovers resulted from deliberate actions of private firms operating in multiple countries at different stages of development, facilitated by policy environments that prioritized economic efficiency. However, as governments increasingly prioritize different objectives—such as national security or economic resilience—these channels of knowledge diffusion are being blocked. Recent export restrictions targeting China's semiconductor sector exemplify this shift, underscoring how the interests of advanced economies can constrain the positive international externalities of industrial policy.

A final example is Indonesia's aforementioned attempt to leverage its substantial nickel reserves as a tool for industrial upgrading. Nickel is a critical input in battery production, a rapidly-growing sector amid rising global electrification demand. Similar to China's earlier strategy of inducing technology transfers to develop its domestic capabilities, Indonesia has imposed export restrictions that condition access to its nickel on FDI in the country. The main firms that have invested in Indonesia under this policy framework are Chinese – which has resulted in tensions with the United States. Largely due to these tensions, Indonesia was excluded from access to the US tax credits for electric vehicle manufacturers mentioned above. In this case, Indonesia's effort to use its nickel endowment as a stepping stone into higher value-added segments of the electric vehicle supply chain appears constrained by US industrial policy goals.

These examples underscore the extent to which the return of industrial policy in advanced economies complicates the development strategies available to many low- and middle-income countries. The pathways that once enabled industrial upgrading are far less accessible today. In principle, industrial policy in advanced economies need not be inconsistent with development opportunities. Industrial policies aimed at "friendshoring" production could in theory recreate some of the cooperative dynamics seen among the Western bloc during the Cold War, when geopolitical alignment facilitated technology transfer and market access for lower-income countries. Positive cross-border spillovers due to learning-by-doing and sharing of technology could – in principle – make industrial policies pursued by advanced countries beneficial to developing economies. But when industrial policy is focused primarily on promoting domestic

production, it is less likely to generate growth opportunities through trade for developing economies.

While the emphasis here has been on the potential impact of the return of industrial policy in advanced economies, at the same time, industrial policies pursued by large emerging markets, such as China, pose additional challenges for other countries, especially smaller developing economies. Rotunno and Ruta (2024) document that Chinese subsidies boosted exports to developing countries more than exports to advanced economies, especially in sectors like electrical machineries and automotive. In addition, these measures lower exports from third countries, as they reduce imports to China (import-substitution effect) and exports to third countries in competing sectors (export-competition effect), which further limit the prospect of export-led growth for developing countries. Barwick et al. (2025) show how China's industrial policy in the shipbuilding sector crowded out exports of initially more efficient producers, such as Japan and South Korea. In contrast to the policies currently pursued by advanced economies, several of which could in principle be justified by the presence of market failures and externalities, many industrial policies pursued by emerging markets target traditional sectors (such a shipbuilding), in which such externalities are absent leading to inefficiencies and negative spillovers to other economies.

3.2.2 Policy responses to climate change

As noted above, climate change will have important structural effects on the future of trade and development – but global policy responses to climate change are also highly consequential. As shown in Figure 8 (RHS), climate mitigation is the second most prominent motive for industrial policy. Of course, policy responses to climate change may go beyond industrial policy, as they might not be targeted to specific sectors or products. The crucial point for this discussion, however, is that policies to support the climate transition may generate new opportunities for some low- and middle-income countries but also constrain traditional export-led development strategies.

The green agenda's potential for developing countries

On one hand, the green agenda reinforces the more general view of development introduced at the start of this chapter: that it is not limited to economic growth alone but can accommodate goals like expanding access to clean air and water and ensuring long-term environmental sustainability. Moreover, these goals are critically important for the low- and middle-income countries that are most vulnerable to the adverse effects of climate change, where rising

temperatures and extreme weather events threaten livelihoods, food security, and basic human welfare.

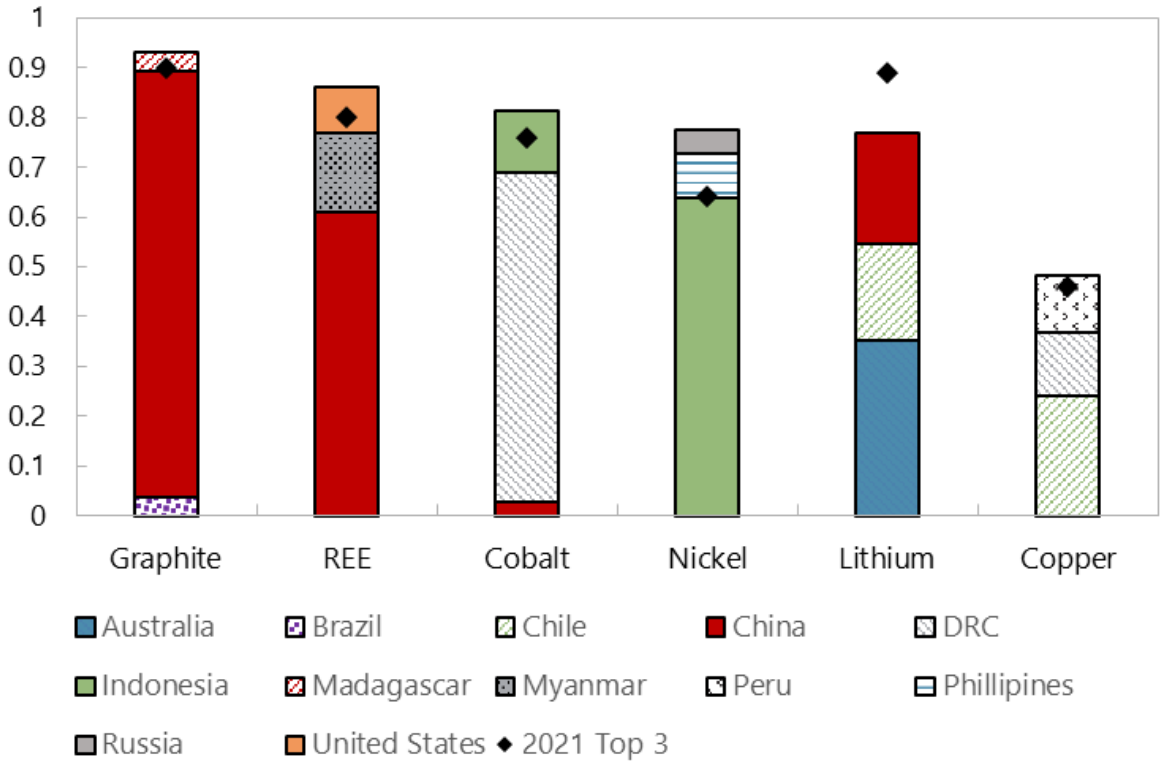
At the same time, the climate transition that new industrial policies are promoting can reshape patterns of comparative advantage in ways that may generate benefits and costs for select groups of developing countries. Consider the potential benefits first. Rising global demand for climate-relevant inputs, especially critical minerals used in renewable energy, has increased the strategic value of certain natural resources. Indeed, critical minerals may come to assume the role once played by oil – and many of these critical minerals are located in developing countries. As with oil, the risk of a "natural resource curse" should not be overlooked. But the surge in global demand for critical minerals may offer certain developing countries a historically unique development opportunity.

Many of the countries with high concentrations of critical mineral reserves are located in sub-Saharan Africa – a region that, as noted above, has historically remained on the margins of global trade and production networks (IMF 2024). The Democratic Republic of Congo (DRC), for instance, accounts for more than 70 percent of global cobalt mining output and holds approximately half of the world's known reserves, making it central to any future strategy for electric vehicle batteries and other low-carbon technologies. Similarly, over 60 percent of the world's manganese – an essential input for steel production and battery technology – is produced in South Africa, Gabon, and Ghana. In Zimbabwe, the DRC, and Mali, there are substantial unexplored deposits of lithium, which are critical for batteries and other energy storage systems. A wide range of other critical mineral reserves have also been identified in Guinea, Mozambique, South Africa, and Zambia. According to recent IMF estimates, sub-Saharan Africa could capture more than 10 percent of the future cumulative global revenues generated from critical minerals, potentially increasing the region's GDP by 12 percent or more by 2050 through mineral sales alone.

Several developing countries from other regions also stand to benefit from the rising demand for critical minerals. Figure 9 shows the share of the top three producing countries in the mining of key critical minerals as of 2022. The figure makes clear that China currently dominates production of several rare earth elements and graphite, with 61 percent and 85 percent share of the global total, respectively – which both play an essential role in many high-tech, energy, and defense applications. However, the figure also shows that several other developing countries also possess substantial reserves, including Indonesia, the Philippines, Peru, and others.

Figure 9. Share of Top Three Producing Countries in Mining of Selected Minerals, 2022

Percent



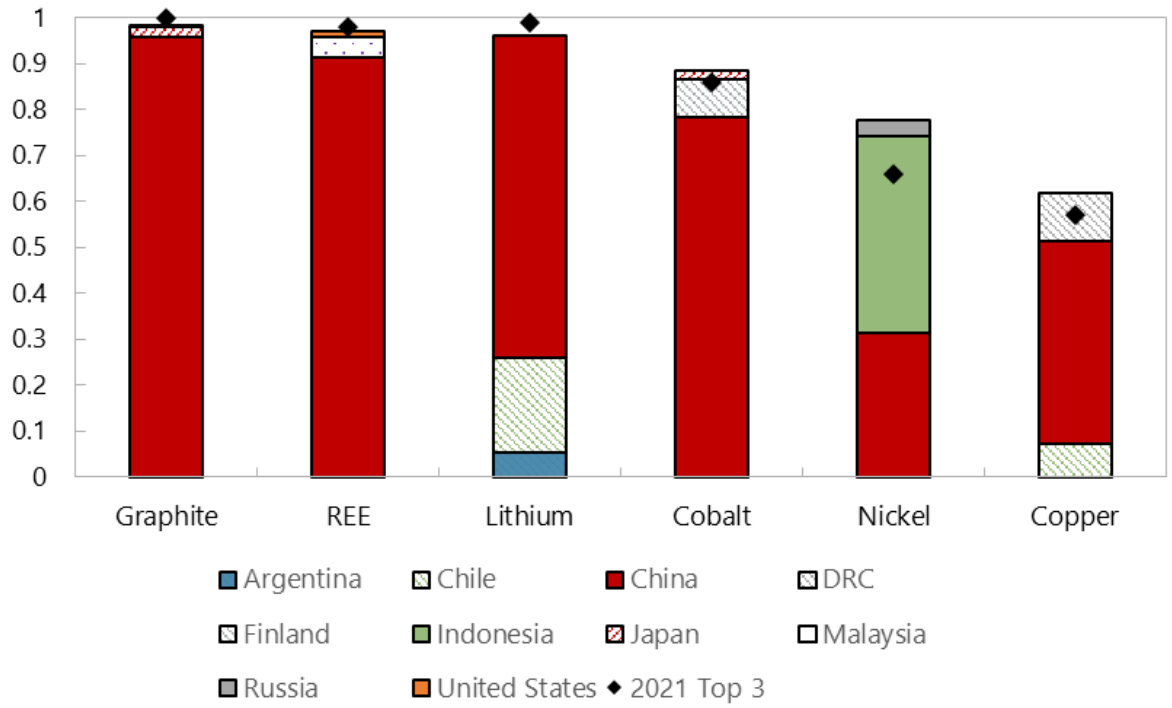
Source: IEA.

Note: Market share for top three producers in each mineral. "2021 Top 3" sums up the shares of the top three mining countries in IEA's 2021 dataset to demonstrate how market concentration has changed.

Of course, mining and extraction are just part of the value chain, and a substantial share of the economic benefits – and strategic importance – of natural resources lies in the downstream capacity to process them. In the case of critical minerals, China has established a dominant position in global processing for several, as illustrated by Figure 10. For example: 96 percent for graphite, 91 percent for rare earth elements, 78 percent for cobalt, and 70 percent for lithium as of 2024. While many developing countries have rich endowments of the raw materials needed to power the climate transition, this concentration in processing capabilities is what most observers refer to when discussing geopolitical competition over critical mineral supply chains (Leruth et al. 2022).

Figure 10. Share of Top Three Producing Countries in Processing of Selected Minerals, 2022

Percent



Source: IEA.

Note: Market share for top three producers in each mineral. "2021 Top 3" sums up the shares of the top three mining countries in IEA's 2021 dataset to demonstrate how market concentration has changed.

The green agenda's costs and risks for developing countries

On the other hand, the green transition could impose substantial economic costs on many other developing countries, particularly those whose current comparative advantage is tied to carbon-intensive sectors or fossil fuel endowments. This is especially relevant for countries with abundant coal reserves like India and South Africa, where coal continues to play a central role in powering industry and the broader energy mix.

Moreover, depending on their design and implementation, climate-related trade policies risk further narrowing the already constrained set of pathways available to countries pursuing export-led development. Initiatives like "climate clubs," which seek to coordinate carbon pricing and align trade policy with climate commitments among participating countries, exemplify this tension. More concretely, the European Union's Carbon Border Adjustment Mechanism (CBAM) – which seeks to equalize carbon costs between domestic producers and foreign exporters – is scheduled to enter into force in 2026. While justified as a tool to prevent

carbon leakage and preserve the integrity of domestic climate commitments, CBAM could negatively impact exporters from countries with less stringent environmental regulations.

In an attempt to quantify the risk of the potential effect of CBAM on developing countries' exports, the World Bank has developed a CBAM Exposure Index, constructed on the basis of the EU's current implementation plan (Maliszewska et al. 2023).[2] Based on this index, the most exposed countries include several developing economies. Specifically, the most exposed country is Zimbabwe (most exposed product: iron and steel), followed by Mozambique (aluminum), Egypt (fertilizer), Cameroon (aluminum), South Africa (iron and steel), India (iron and steel), Kazakhstan (aluminum), and Ukraine and Belarus (cement). For these and other exposed countries, CBAM would narrow their set of accessible export markets.

Several international organizations have provided proposals on carbon pricing aiming at reconciling the tension between the need to tax carbon emissions as a tool for climate change mitigation and the trade spillover effects of such measures which may be especially harsh on developing countries (IMF et al., 2024). For example, the IMF's proposal for a differentiated carbon pricing floor links minimum carbon prices to income levels to account for the stark global carbon asymmetries—for instance, low-income countries account for just 4 percent of total emissions (Parry, Black, and Roaf 2021). Critics of this approach, however, have noted that low-income countries tend to produce more carbon-intensive products than they consume, while the reverse is true for high-income countries (Clausing and Wolfram 2023). This points to the difficulties in designing carbon pricing schemes to minimize negative spillovers, while achieving fairness and effectiveness in climate action.

3.2.3 Geopolitics

In this last subsection, we turn to the geopolitical shifts and their potential impact on the prospect of development through trade. In general terms, geopolitical shifts are changes in the global balance of power that affect policy frameworks and governance structures, and thus influence trade patterns and investment decisions. As discussed earlier, the era where the United States provided what international relations scholars call "hegemonic stability" may have shifted to a period of "great power rivalry", especially between the US and China (Mearsheimer, 2003). The surge in bilateral tariffs between these two countries in 2018 and 2019 is widely seen as a moment where geopolitical tensions had a direct impact on trade relations (Wolff, 2023). We first discuss the literature on that episode and then look more

[2] The CBAM Exposure Index is constructed by multiplying a country's share of exports to the EU (for CBAM-covered products) by the embodied carbon payment per dollar of exports, which is determined by the country's carbon emissions intensity and an assumed carbon price of $100 per ton CO2.

broadly at evidence of geoeconomic fragmentation and how the rise of geopolitics is impacting the world trading system.

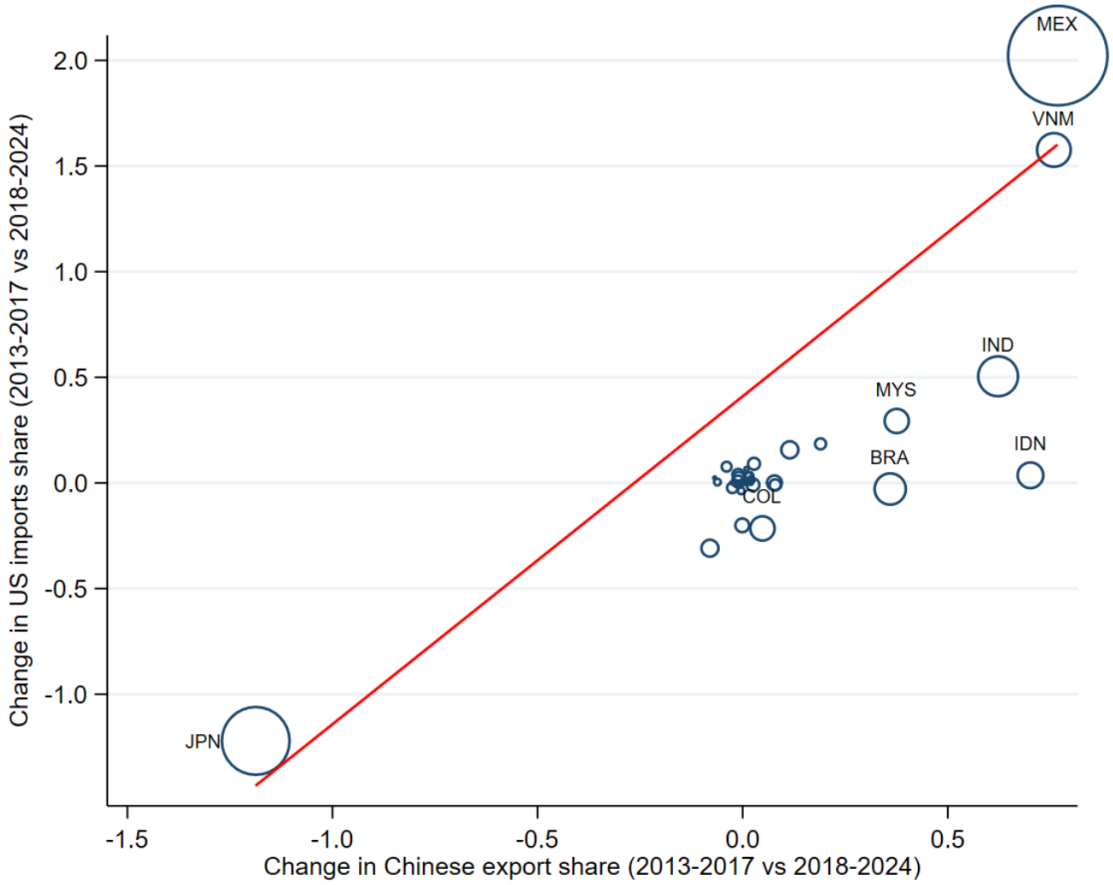
US-China 2018-19 trade tensions

One of the most visible manifestations of recent geopolitical shifts has been the escalation of trade tensions between the United States and China – most notably the imposition of bilateral tariffs beginning in 2018, but also a growing set of US export controls targeting advanced technologies, particularly in the semiconductor sector (Bown, 2019; 2020a, 2020b; Goldberg and Reed 2023b). These actions mark a significant departure from the previous era of economic engagement and have introduced new forms of uncertainty into global trade relationships.

What are the short-run effects of US-China trade tensions on global trade flows? Somewhat surprisingly, a growing body of empirical research suggests that several developing countries have actually benefited in terms of export performance. While the increased tensions have generated considerable anxiety across developing countries, several "bystander" countries have been able to help fill the gap left by China's declining exports to the United States, in part relying on growing engagement in supply chains with China, thus acting as "connector" countries between the two rivals.

A first study by Fajgelbaum et al. (2024) finds that the US-China tariffs led to a net *increase* in global exports of the targeted products, with almost all bystander countries increasing their exports – not just to the United States, but globally. Several recent studies also show how GVCs helped developing countries benefit from these trends. Direct US-China trade has declined, but China also exports indirectly by supplying intermediate inputs to third countries that then export finished goods to the United States. Freund et al. (2024) show that following the imposition of US tariffs on China in 2018 and 2019, third countries like Vietnam, Malaysia, and Mexico all increased their exports of affected products to the United States – while also increasing their imports of intermediate inputs from China. Alfaro and Chor (2024) report a similar pattern. Figure 11 illustrates this dynamic, showing robust associations between China's increased exports to connector countries and those countries' increased exports to the United States before and after the periods from 2013-17 and 2018-24 (Gopinath et al. 2025). These associations suggest that a 1 percent increase in a country's share in US imports between the earlier and later periods is associated with a 1.6 percent higher share of Chinese exports to that country.

Figure 11. Emergence of "Connector" Countries



Source: Trade Data Monitor. Gopinath et al. (2025).

Note: Extended with more recent data based on Gopinath et al. (2025), Figure 4(a). Sample includes only non-aligned countries based on ideal point distance (IPD) from United Nations General Assembly (UNGA) voting patterns. This figure plots changes in U.S. import shares against changes in Chinese export shares, comparing 2018-24 versus 2013-17 periods. Weighted regression (using pre-period U.S. imports as weights) with robust standard errors produces a slope of 1.552, statistically significant at $p < 0.001$ ($n = 57$ countries).

Such patterns should not be taken to imply that the US-China trade tensions had benign or positive effects on development prospects through trade for a wide range of low and middle-income countries. Likewise, they should not be taken as evidence that trade and globalization no longer matter. Critically, the countries that benefitted the most from the US-China tariffs in 2018-19 were already well-integrated into the global trading system. For the most part, these are not low-income countries in less-integrated regions like sub-Saharan Africa or South Asia. They are largely middle-income countries that have long embraced liberalization, globalization, deep trade agreements, and global value chains.

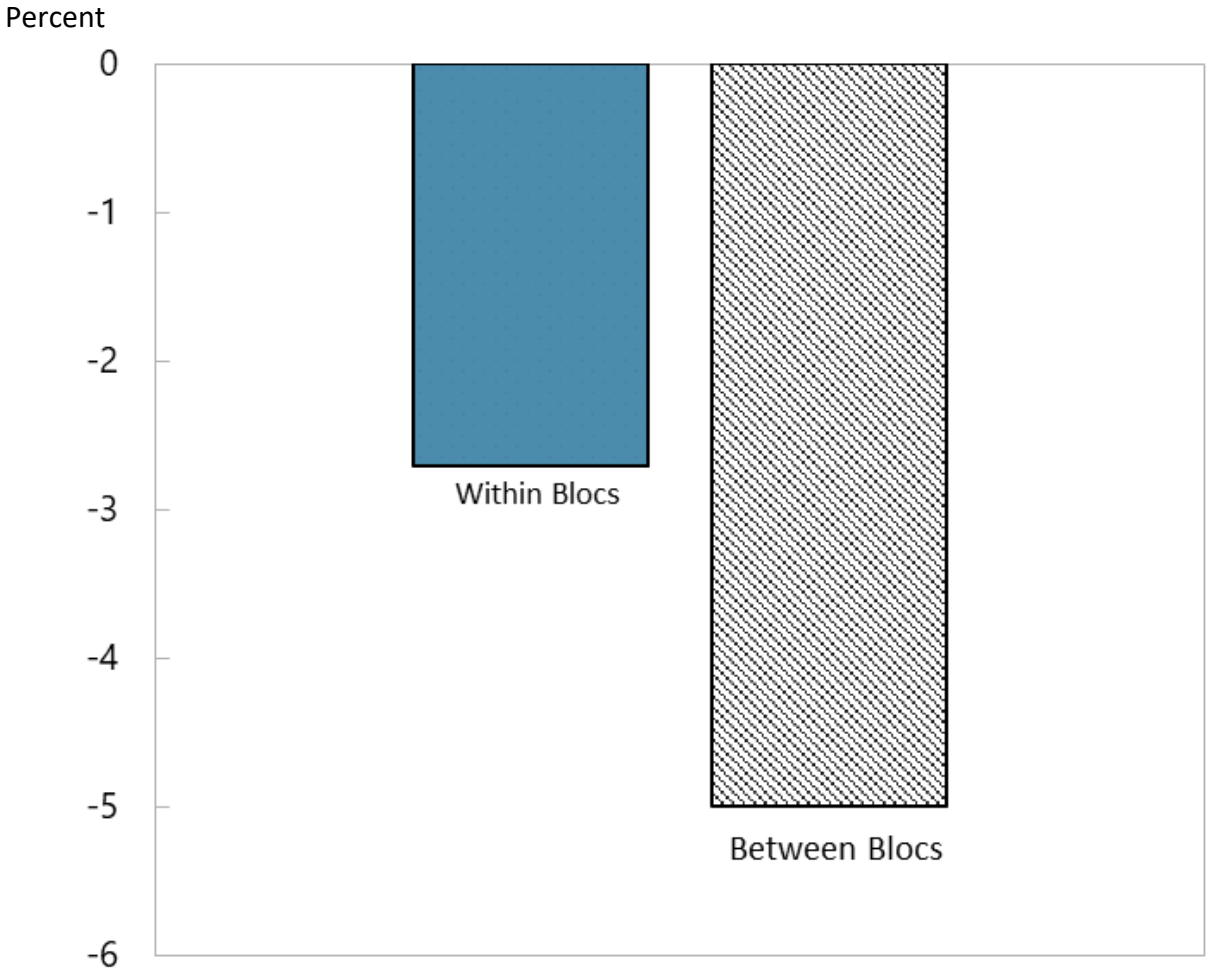
A further concern is that, even accounting for the positive trade effects of the US-China 2018-19 tariffs on some developing countries, the long-run implications for development more generally are considerably less clear. Analyzing these long-run effects is inherently more speculative, but we discuss them below under the more general question of how geopolitical tensions will affect developing economies.

Geopolitical fragmentation

Geopolitical fragmentation is likely to affect developing countries more directly in the future. The 2018-19 escalation in trade tensions between the United States and China has prompted frequent comparisons to the Cold War, motivating new research aimed at uncovering new underlying signs of increasing fragmentation. Recent studies by Blanga-Gubbay and Rubinova (2023), Gopinath et al. (2025), Jakubik and Ruta (2023) show that, even as aggregate trade levels remain relatively stable, trade flows are reorienting along geopolitical lines. Between 2017 and 2023, amid escalating trade frictions, China's share in US imports fell by 8 percentage points; over the same period, the US share in China's exports declined by 4 percentage points. Likewise, direct trade between Russia and Western economies declined sharply after Russia's 2022 invasion of Ukraine.

Figure 12 illustrates analysis by Gopinath et al. (2025) that groups countries into three blocs: a US-leaning bloc, a China-leaning bloc, and a bloc of non-aligned countries. The figure shows that, after the Ukraine invasion, the average weighted quarter-on-quarter trade growth between US-leaning countries and China-leaning countries was 5 percentage points lower than the average quarterly weighted trade growth between 2017 and early 2022. During the same period, quarterly growth in trade within blocs dropped by only 2.7 percentage points. While other factors certainly could have played a role in such shifts, the data strongly suggests that Russia's invasion of Ukraine was the key trigger: Gopinath et al. (2025) plots the dramatic change in the semi-elasticity of trade between blocs before and after the invasion – trends not markedly different from the levels of fragmentation that unfolded during the initial years of the Cold War.

Figure 12. Change in Trade Growth Post War



Source: Trade Data Monitor. Gopinath et al. (2025).

Note: Based on Gopinath et al. (2025), Figure 1(b), and extended with more recent data, this figure plots average trade growth during 2022Q2-2024Q4 minus average trade growth during 2017Q1-2022Q1 within and between blocs. Bloc classification defines a Western bloc centered around the U.S. and Europe and an Eastern bloc centered around China and Russia. Bilateral quarterly growth rates computed as log differences in bilateral trade, aggregated using bilateral nominal trade as weights.

While the literature so far has been focusing on the possibility that geopolitical tensions would primarily impact the trade relationship between the United States and China, and bystanders would be indirectly affected through trade reallocation, the shift in US trade policy in early 2025 questions this approach. On April 2, 2025, the US administration announced tariff surges from an average rate for the world of below 3 percent in January, with a 10 percent baseline tariff for all countries and significantly higher rates for specific trading partners, including developing countries such as Vietnam (46 percent), Cambodia (49 percent), Lesotho (50 percent) and Madagascar (47 percent). Of course, while the situation evolves with new announcements and bilateral deals being signed by the US administration with a number of trading partners, it is

clear that the shift in trade policy targets multiple countries to achieve distinct goals (boosting domestic manufacturing production, rebalancing trade relations, addressing national security concerns). This new environment presents distinct challenges for developing countries beyond the possible rise of a bipolar order.

The assessment of the impact of the latest US tariffs has mostly relied on simulations based on multi-country, multi-sector, quantitative trade models (Baqaee and Malmberg, 2025; Conteduca et al., 2025; IMF, 2025; Rotunno and Ruta, 2025; WTO, 2025). All models point to a significant contraction in world trade, and especially in the US, the extent of which depends among other things on the assumed retaliation by trading partners. As different countries would face different tariff rates, trade would reallocate. But differently from the 2018-19 tariffs on China, the impact on potential connector countries may be mitigated as several of these countries may now face higher tariffs to access the US market. Finally, as China still faces significantly higher tariffs in the US—the tariff on China was at 13 percent in January 2025, went up to 64 percent after April 2 and then was reduced to 42 percent after the US-China trade deal—Chinese exports will be diverted to other regions, namely Europe and East Asia.

A related literature, also relying on quantitative trade models, has attempted to quantify the cost for the world economy of more severe geopolitical fragmentation scenarios. The quantification of fragmentation costs reveals substantial heterogeneity across scenarios and affected economies. Analysis of multiple modeling exercises shows that trade fragmentation imposes costs ranging from 0.2 percent of global GDP under limited fragmentation with low adjustment costs to 7 percent under severe fragmentation scenarios with high adjustment costs (Aiyar et al., 2023; Aiyar, Presbitero and Ruta, 2023). When technological spillovers are explicitly incorporated, the welfare losses become substantially larger, with Cerdeiro et al. (2021) finding long-run losses on the order of 5 percent of world GDP, while Goes and Bekkers (2022) estimate welfare losses of up to 12 percent in some countries under full-decoupling scenarios which account for technological decoupling. The distributional consequences exhibit marked asymmetries, as emerging market and developing economies face disproportionate exposure through reduced access to knowledge spillovers, constrained technology transfer, and diminished integration in global value chains (Aiyar et al., 2023).

A different approach to quantify the effect of geopolitical fragmentation is proposed by Fernández-Villaverde et al. (2024). They develop a dynamic hierarchical factor model using 16 indicators across trade, financial, mobility, and political dimensions to measure geopolitical fragmentation as a latent variable, then they use structural VARs and local projections to assess macroeconomic effects of fragmentation. The results show that fragmentation has increased to unprecedented levels since 2008, with a one-standard-deviation shock reducing global GDP by

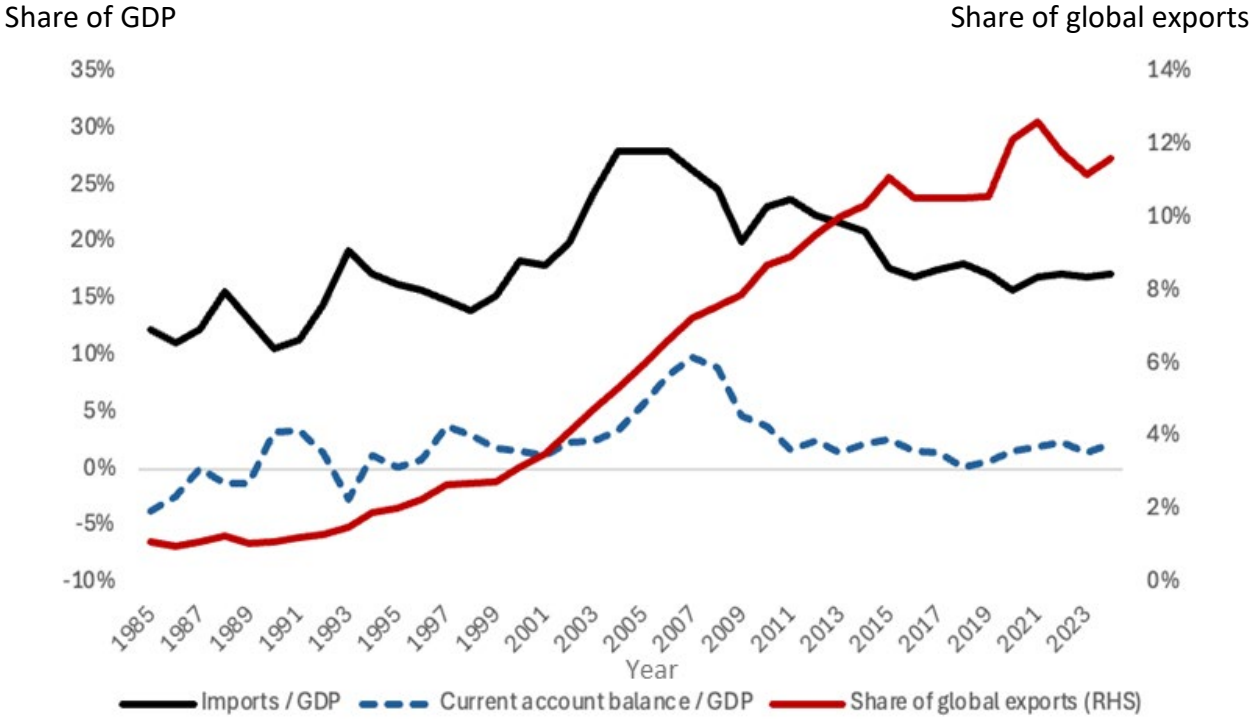
0.4 percent and disproportionately harming emerging economies, because they rely heavily on international trade, investment, and technology transfer for their catch-up growth, making them more vulnerable when these global linkages are disrupted compared to advanced economies that have greater diversification and alternative options.

While it is difficult to predict how geopolitical tensions will affect developing economies, with exact predictions contingent on the policies that will eventually be implemented, one can draw on first principles to assess the longer-term impact of a fractured world economy on development. In our earlier discussion on mechanisms linking trade to development, we emphasized the role of market size and cross-border technology/knowledge transfer. Both mechanisms are under strain in the current environment.

Access to large and lucrative markets has historically been a critical channel through which low-income countries have moved up the value chain. Now, such access appears highly uncertain and less likely in the future. The evidence on the US-China 2018-19 trade war suggests that the reallocation of global trade flows largely favored developing economies already well-positioned within GVCs, rather than opening new doors for countries on the margins. More broadly, given current sentiments around trade and globalization in advanced economies, it is unlikely that large markets like the United States and Europe will open their markets to a surge of low-cost imports from low-income countries (Colantone et al. 2022; Goldberg and Reed 2023b). The surge in tariffs announced by the US administration on April 2, 2025 is a direct confirmation of this broader shift in sentiment.

One possibility is that China could take the place of the United States or Europe as the next large export destination for developing countries. In principle, China's size, economic growth, and integration in global trade suggest that this is a possibility. However, to date, there is little evidence that China is playing this role. In recent decades, Chinese exports to the rest of the world have continued to grow, but imports into China have steadily declined. Figure 13 illustrates this trend. The red line, representing China's share in global manufacturing exports, increases dramatically from 1 percent in 1985 to 12 percent in 2024. The black line, by contrast – representing China's imports as a share of GDP – peaked at 28 percent in 2004 before declining to less than 17 percent in 2024. China's widening trade surpluses reflect domestic macroeconomic imbalances that have resulted in persistently high domestic savings and low consumption (IMF, 2025). Despite China remaining a dominant force in global trade, there is so far little indication that it is becoming a major destination for imports from low-income countries.

Figure 13. China's Global Competitiveness and Trade, 1985-2024



Source: Calculations based on the World Bank's World Development Indicators.

Note: China's share of global exports is plotted on the alternative, right-side Y axis. Imports and exports include both goods and services. This figure is inspired by a similar figure in Arvind Subramanian's 2024 Project Syndicate article titled "The Paradox of China's Globalization."

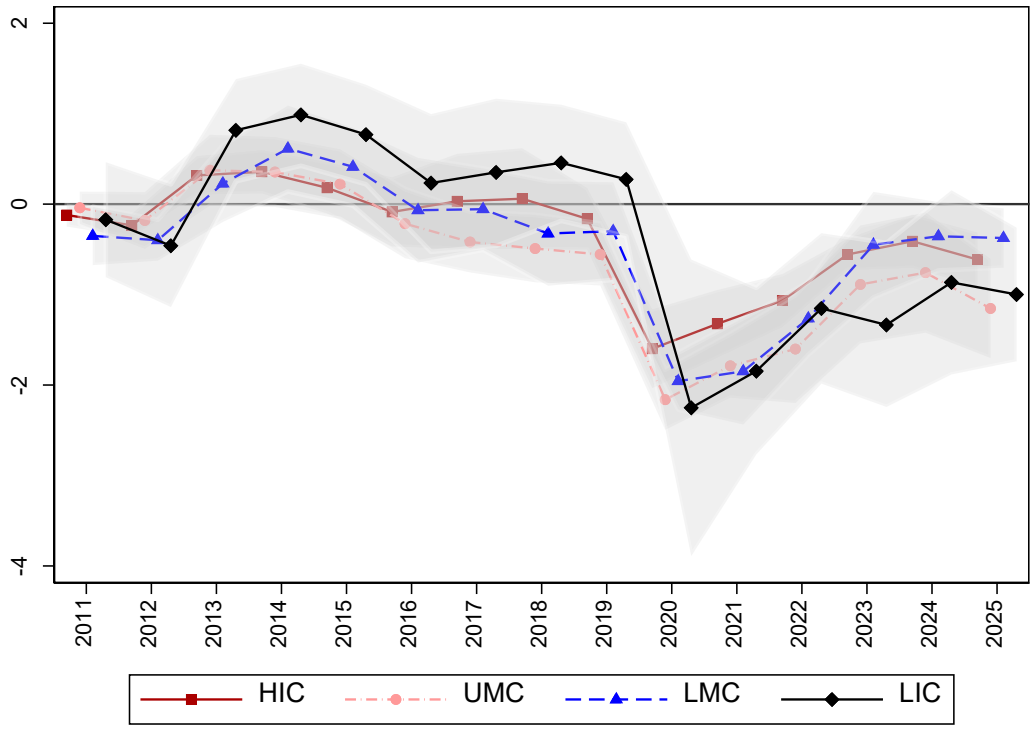
Regarding the role of technology sharing or transfer, we noted earlier that China often required technology transfers or joint ventures with Chinese firms as a "quid pro quo" condition for foreign investment, while also working to embed domestic firms within GVCs – strategies that facilitated rapid technological catch-up. Yet in the current geopolitical climate, and amid the recent resurgence of industrial policies in advanced economies (see previous section), this mechanism also appears increasingly unlikely for today's developing countries.

There are a number of reasons behind the limited future prospects of technology and knowledge transfers as a driver for development. It is partly because, as discussed before, most low-income countries today lack the size and leverage that allowed China to compel or incentivize foreign firms to share technology in the past. It is also because, when concerns like national security drive policy, the incentives to share technology or knowledge diminish significantly, especially towards countries that are considered as non-allies (Aiyar et al., 2024; Goldberg and Reed 2023b). Finally, trade policy uncertainty can significantly impede developing countries' trade integration and reduce foreign direct investment flows, as the sunk costs associated with export market entry and foreign intermediate input sourcing create option

values of waiting that discourage irreversible investments when future trade policies remain uncertain (Handley and Limão, 2015, 2017, 2022).

These effects are already visible in the data. Recent World Bank research finds that countries become more inward-looking during periods of elevated geopolitical risks. Specifically, the results suggest that such events reduce international trade by about 20–30 percent, corresponding to a global tariff equivalent increase of up to 11 percent (Mulabdic and Yotov, 2025). FDI to emerging markets and developing economies has declined sharply and persistently, falling from 731 billion USD in 2019 to 434.5 billion USD in 2023 (World Bank, 2025). Even after controlling for time-invariant country and sector characteristics, Figure 14 shows that the gap between low-income and high-income countries may be widening as the number of FDI projects to the former declined more sharply in the aftermath of COVID-19 and has remained consistently lower since then. This trend raises the risk that low- -income countries could find themselves "stuck" in low-value segments of global production, without access to the technologies and capital that earlier cohorts of developing countries were able to acquire through trade and GVC integration.

Figure 14. The Gap in FDI to Low-Income Countries May Have Widened



Source: Orbis Crossborder Investment.

Note: Updated with more recent and extended data based on Ruta and Sztajerowska (2025). The figure shows the evolution of flows in cross-border greenfield investment projects in manufacturing over time, using coefficients

from a Poisson regression at the host-country-sector level. Results are expressed relative to 2010, controlling for time-invariant characteristics of each host-country-sector.

In sum, growth and development are unlikely to proceed at the pace observed during the era of hyper-globalization. As a result, developing countries may find it difficult to replicate the rapid catch-up trajectories or growth miracles that characterized countries like Korea or China during that period. A more fragmented global economy can still support growth, but it will likely be slower and contingent on the major powers maintaining support for their allies within their respective blocs. The most significant risk may be political rather than economic: peace and stability can no longer be taken for granted. Escalating geopolitical tensions and proxy conflicts have created deep uncertainty, and regardless of one's views on the drivers of growth, sustained conflict and uncertainty are not conducive to long-run investments in the technology and institutions that spur development. These developments point to a more difficult, and far less predictable, environment for development going forward.

Weakening of multilateral trade system

As argued above, institutions are another key channel through which trade has historically supported development. While often underappreciated and difficult to measure, the multilateral trade system has played an important role in supporting the development of low- and middle-income countries over the past several decades.

The WTO's institutional framework provides both an anchor and critical protection for developing countries to engage in international trade. The multilateral trading system's core function lies in facilitating efficient international policy cooperation by enabling governments to escape from a terms-of-trade-driven prisoner's dilemma (Bagwell and Staiger, 1999, 2002) and in providing a commitment device that helps governments overcome domestic time-consistency problems by binding future policy choices (Brou and Ruta, 2013; Maggi and Rodriguez-Clare, 1998, 2007; Staiger and Tabellini, 1987). Both functions are crucial for developing countries. The WTO's non-discrimination principles, particularly the Most Favored Nation clause, serve as essential safeguards for smaller economies by preventing large countries from exploiting bilateral power asymmetries to secure preferential terms of trade (Bagwell and Staiger, 2005). Developing countries also particularly benefit from the commitment value of the WTO as it shields their reform efforts from domestic protectionist pressures that might otherwise prove overwhelming given weaker institutional capacity (Maggi, 2014). Finally, the dispute settlement understanding provides an additional layer of protection through rules-based adjudication, thereby offering smaller economies institutionalized recourse against practices by advanced economies that would otherwise remain unchallenged due to asymmetric bargaining power (Bown, 2004; Busch and Reinhardt, 2003).

The recent surge in protectionism discussed in previous sections poses a fundamental threat to the rules-based multilateral trading system, with particularly severe implications for developing countries. This pattern reflects what Mattoo and Staiger (2020) characterize as a systematic transition from rules-based to power-based tariff negotiations, whereby the declining hegemon exploits asymmetric trade relationships to extract concessions beyond the constraints imposed by multilateral disciplines. Such transitions can be particularly detrimental for developing economies: under a power-based regime, developing countries would forfeit the protective mechanisms inherent in Most Favored Nation treatment, which ensures that any exporter gains derived from lower tariffs will be shared as well by third-country exporters, thereby diluting the capacity of powerful nations to exploit asymmetric bargaining positions (Bagwell and Staiger, 1999; Mattoo and Staiger, 2020). The dynamic analysis presented by Carvalho et al. (2025) shows that once a rules-based system is dismantled, the world can switch back to a rules-based regime only if it returns to a hegemonic state, suggesting that the current institutional erosion may prove irreversible absent the emergence of a new global hegemon, thereby exposing developing countries to discriminatory trade policies from dominant powers for potentially extended periods.

A related question that economic research has begun to address is how the multilateral trade system will be impacted by the rise of geopolitics and whether it can adapt to it. Geopolitics manifests in two distinct but interconnected dimensions: first, as a quest for dominance whereby rival powers seek relative rather than absolute gains, with each country caring not only about its own economic success but also about undermining its rival's achievements (Mearsheimer, 2003); and second, as concerns about economic dependence, where countries pursue anti-coercion policies to reduce their reliance on strategic inputs controlled by potential adversaries (Hirschman, 1945). Using a standard model of trade cooperation (Bagwell and Staiger, 1999 and 2002), Mattoo et al. (2025) show that the dominance aspect leaves the set of internationally efficient tariffs unchanged but alters the equilibrium bargaining outcomes, requiring non-reciprocal tariff adjustments that conflict with the WTO's core principle of reciprocal and mutually advantageous negotiations. Meanwhile, Clayton et al. (2025) show that dependence concerns drive countries toward uncoordinated economic security policies that create a "fragmentation doom loop," where each nation's attempt to insulate itself from foreign influence leads to globally inefficient outcomes as countries over-fragment their economies despite continued gains from cooperation. These challenges suggest that the multilateral trading system requires institutional adaptation, including greater flexibility in WTO rules to accommodate geopolitical realities—potentially through conditional exemptions from most-favored-nation treatment for geopolitical rivals that allow for orderly adjustments to the new geopolitical reality while minimizing disruption to third parties (Mattoo et al., 2025). The

alternative is that geopolitical rivals will increasingly negotiate bilateral deals outside the multilateral framework, such as the so-called US-China Phase 1 Agreement, which could have discriminatory trade effects that are especially significant for bystander developing countries that lack retaliatory capacity (Ruta, 2023).

This erosion of the multilateral trading system threatens to curtail the integration opportunities that have been crucial for developing economies' growth in the past thirty years as discussed in the previous sections, a setback that is especially damaging given the need for faster development and stronger international cooperation to confront the mounting global challenges of climate change, health security, and other transnational risks.

4. Conclusion

This chapter takes stock of the dramatic shifts unfolding in the nature of trade and globalization to address a set of increasingly urgent questions for low- and middle-income countries: In this new era, can trade still support growth and development? Is the export-led growth model still viable? If not, what strategies might still offer sustainable pathways for development amid the new global order?

Addressing such questions requires understanding the static and dynamic mechanisms through which trade and globalization previously contributed to development – defined in this chapter as a multidimensional transformation beyond mere growth. While static comparative advantage can produce positive income effects to jumpstart the growth process, we argue that trade's dynamic effects are more critical for long-run economic development. Historically, developing countries' access to large foreign markets, transfers of technology and knowledge, and incentives for institutional reform channeled these dynamic effects in ways that enabled low-skilled, labor-intensive manufacturing to serve as an engine of long-run growth and development.

While trade and globalization will still play a role in the future of development, the surrounding conditions have changed dramatically. These shifts have been driven by structural factors, policy changes, and evolving geopolitical dynamics. Structural factors – namely emerging technologies like automation and AI and the increasingly adverse environmental effects of climate change –are likely to affect developing countries primarily through the mechanism of static comparative advantage. These static effects pose significant challenges for developing countries, but their effects have been so far fairly limited and heterogeneous. Indeed, some technological changes (such as digitization of services) and facets of climate change (such as

renewable energy demand) may offer growth opportunities for many low- and middle-income countries.

Ongoing policy changes and geopolitical shifts, by contrast, may trigger dynamic effects across a range of factors important for economic growth and development. The intensification of US-China trade tensions, the resurgence of industrial policy, the fragmentation of the multilateral trade system, and policies responding to climate change have broad and potentially far-reaching implications for the future of trade and development. The effects of these shifts on low- and middle-income countries are still highly uncertain, particularly in the long-run. But it seems increasingly clear that the outlook will largely hinge on how larger economies, particularly the United States and China, choose to navigate this evolving landscape.

This chapter does not aim to provide policy prescriptions. However, the unfolding trends clearly imply that the processes which, in earlier decades, worked in favor of developing countries can no longer be taken as given. It appears increasingly unlikely that trade and globalization will offer the same pathways for rapid growth and development that they did in the past. Given the degree of uncertainty involved, it is difficult to offer concrete recommendations for how governments in developing countries should navigate this new era. That said, it seems clear that countries will need to carefully devise new strategies that align with the realities of this changed environment.

In our view, the most binding constraints are increasingly political and geopolitical in nature, rather than structural or technological. This means that, in principle, developing countries could still find growth opportunities – but the optimal strategies have changed. Regional partnerships may prove crucial, complementing to a greater extent the multilateral cooperation that played a central role in earlier periods. At a minimum, countries will need to choose their “friends” wisely; it will be critical to determine which partnerships can serve as reliable foundations for growth. However, developing countries may find themselves caught in a strategic game between major powers whose interests are increasingly domestic.

In the absence of meaningful policy or geopolitical reversals in advanced economies, the development prospects of low- and middle-income countries may also increasingly rely on their domestic markets and policies. As Goldberg and Reed (2023a) argue, redistributive policies aimed at creating a broad-based middle class will likely become more important as engines of domestic demand. Likewise, investments in human capital will take on even greater significance – particularly if tradable services emerge as a new engine of growth.

References (Aug 4, 2025)

Abman, R., Lundberg, C., McLaren, J., Ruta, M., 2023. Child labor standards in regional trade agreements: Theory and evidence. NBER Working Paper 30978.

Abman, R., Lundberg, C., Ruta, M., 2024. The effectiveness of environmental provisions in regional trade agreements. Journal of the European Economic Association 22, 1670–1715.

Aiyar, S., Chen, J., Ebeke, C.H., Garcia-Saltos, R., Gudmundsson, T., Ilyina, A., Kangur, A., Kunaratskul, T., Rodriguez, S.L., Mi, 2023. Geoeconomic fragmentation and the future of multilateralism. IMF Staff Discussion Notes 2023/001. International Monetary Fund, Washington, DC.

Aiyar, S., Presbitero, A., Ruta, M. (Eds.), 2023. Geoeconomic fragmentation: The economic risks from a fractured world economy. CEPR Press, Paris & London.

Aiyar, S., Malacrino, D., Presbitero, A.F., 2024. Investing in friends: The role of geopolitical alignment in FDI flows. European Journal of Political Economy, 83, 102508.

Alfaro, L., Chor, D., 2023. Global supply chains: The looming “great reallocation”. NBER Working Paper No. 31661, National Bureau of Economic Research.

Alfaro-Urena, A., Manelici, I., Vasquez, J.P., 2022. The effects of joining multinational supply chains: New evidence from firm-to-firm linkages. The Quarterly Journal of Economics, 137(3), 1495–1552.

Amendolagine, V., Presbitero, A.F., Rabellotti, R., Sanfilippo, M., Seric, A., 2019. FDI, global value chains, and local sourcing in developing countries. IMF Economic Review, 67(4), 772–801.

Artuc, E., Christiaensen, L., Winkler, H., 2019. Does automation in rich countries hurt developing ones? Evidence from the U.S. and Mexico. Policy Research Working Paper No. 8741. World Bank, Washington, DC.

Artuc, E., Bastos, P., Rijkers, B., 2023. Robots, tasks, and trade. Journal of International Economics, 145.

Atkin, D., 2016. Endogenous skill acquisition and export manufacturing in Mexico. American Economic Review, 106(8), 2046–2085.

Atkin, D., Khandelwal, A.K., Osman, A., 2017. Exporting and firm performance: Evidence from a randomized experiment. The Quarterly Journal of Economics, 132(2), 551–615.

Atkin, D., Khandelwal, A., 2020. How distortions alter the impacts of international trade in developing countries. Annual Review of Economics, 12(1), 213–238.

Atkin, D., Donaldson, D., 2022. Chapter 1 - The role of trade in economic development, in: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics, Volume 5. Elsevier, 1–59.

Aw, B.Y., Roberts, M.J., Xu, D.Y., 2011. R&D investment, exporting, and productivity dynamics. American Economic Review, 101(4), 1312–1344.

Bagwell, K., Staiger, R.W., 1999. An economic theory of GATT. American Economic Review 89, 215–248.

Bagwell, K., Staiger, R.W., 2002. The Economics of the World Trading System. MIT Press, Cambridge, MA.

Bagwell, K., Staiger, R.W., 2005. Multilateral trade negotiations, bilateral opportunism and the rules of GATT/WTO. Journal of International Economics 67, 268–294.

Bai, J., Barwick, P.J., Cao, S., Li, S., 2020. Quid pro quo, knowledge spillover, and industrial quality upgrading: Evidence from the Chinese auto industry. NBER Working Paper No. 27644, National Bureau of Economic Research.

Balassa, B., 1971. Trade policies in developing countries. American Economic Review, 61(2), 178–187.

Balassa, B., 1988. The lessons of East Asian development: An overview. Economic Development and Cultural Change 36, S273–S290.

Baldwin, R., 2016. The great convergence: Information technology and the new globalization. Harvard University Press, Cambridge, MA.

Baqaee, D., Malmberg, H., 2025. Long-run effects of trade wars. NBER Working Paper 33702.

Barwick, P., Kalouptsidi, M., Zahur, N., 2025. Industrial policy implementation: Empirical evidence from China's shipbuilding industry. Review of Economic Studies, rdaf011.

Barwick, P., Kwon, H., Li, S., Zahur, N., 2025. Drive down the cost: Learning by doing and government policy in the global EV battery industry. Working paper.

Blalock, G., Gertler, P.J., 2004. Learning from exporting revisited in a less developed setting. Journal of Development Economics, 75(2), 397–416.

Blanga-Gubbay, M., Rubínová, S., 2023. Is the global economy fragmenting? WTO Staff Working Paper No. ERSD-2023-10. World Trade Organization, Economic Research and Statistics Division, Geneva.

Borchert, I., Magdeleine, J., Marchetti, J.A., Mattoo, A., 2020. The evolution of services trade policy since the Great Recession. Policy Research Working Paper No. 9265. World Bank, Washington, DC.

Bown, C.P., 2004. On the economic success of GATT/WTO dispute settlement. Review of Economics and Statistics 86, 811–823.

Bown, C.P., 2019. US-China trade war tariffs: An up-to-date chart. Peterson Institute for International Economics Chart.

Bown, C.P., 2020a. Export controls: America's other national security threat. Peterson Institute for International Economics Working Paper WP20-8.

Bown, C.P., 2020b. How the United States marched the semiconductor industry into its trade war with China. Peterson Institute for International Economics Working Paper WP20-16.

Brambilla, I., Lederman, D., Porto, G., 2012. Exports, export destinations, and skills. American Economic Review 102, 3406–3438.

Brou, D., Ruta, M., 2013. A commitment theory of subsidy agreements. The B.E. Journal of Economic Analysis & Policy 13, 239–270.

Brynjolfsson, E., Hui, X., Liu, M., 2018. Does machine translation affect international trade? Evidence from a large digital platform. NBER Working Paper No. 24917, National Bureau of Economic Research.

Busch, M.L., Reinhardt, E., 2003. Developing countries and General Agreement on Tariffs and Trade/World Trade Organization dispute settlement. Journal of World Trade 37, 719–735.

Bustos, P., 2011. Trade liberalization, exports, and technology upgrading: Evidence on the impact of MERCOSUR on Argentinian firms. American Economic Review, 101(1), 304–340.

Carbonero, F., Ernst, E., Weber, E., 2018. Robots worldwide: The impact of automation on employment and trade. ILO Working Papers, International Labour Organization.

Carvalho, C., Monte, D., Ornelas, E., 2025. Equilibrium trade regimes: Power- vs. rules-based. Unpublished manuscript.

Cerdeiro, D.A., Eugster, J., Mano, R.C., Muir, D., Peiris, S.J., 2021. Sizing up the effects of technological decoupling. IMF Working Paper No. 2021/69.

Chalendard, C., Duhaut, A., Fernandes, A.M., Raballand, G., Rijkers, B., Mattoo, A., 2020. Does better information curb customs fraud? Policy Research Working Paper No. 9254. World Bank, Washington, DC.

Chenery, H.B., 1960. Patterns of industrial growth. American Economic Review, 50, 624–654.

Chenery, H.B., Syrquin, M., 1975. Patterns of development: 1950–1970. Oxford University Press, London.

Clausing, K.A., Wolfram, C., 2023. Carbon border adjustments, climate clubs, and subsidy races when climate policies vary. Journal of Economic Perspectives, 37(3), 137–162.

Clayton, C., Maggiori, M., Schreger, J., 2025. A theory of economic coercion and fragmentation. Working paper.

Clerides, S.K., Lach, S., Tybout, J.R., 1998. Is learning-by-exporting important? Micro-dynamic evidence from Colombia, Mexico and Morocco. The Quarterly Journal of Economics, 113(3), 903–947.

Colantone, I., Ottaviano, G.I.P., Stanig, P., 2022. The backlash of globalization, in: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics, Vol. 5. Elsevier, Amsterdam, pp. 405–477.

Constantinescu, C., Mattoo, A., Ruta, M., 2019. Does vertical specialisation increase productivity? The World Economy, 42(8), 2385–2402.

Conteduca, F.P., Mancini, M., Romanini, G., Borin, A.E., Giglioli, S., Attinasi, M.G., Boeckelmann, L., Meunier, B., 2025. Fragmentation and the future of GVCs. Bank of Italy Occasional Papers.

Costinot, A., Rodríguez-Clare, A., 2014. Trade Theory with Numbers: Quantifying the Consequences of Globalization, in: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics, Volume 4. Elsevier, Amsterdam, 197–261.

Costinot, A., Donaldson, D., Smith, C., 2016. Evolving comparative advantage and the impact of climate change in agricultural markets: Evidence from 1.7 million fields around the world. Journal of Political Economy, 124(1), 205–248.

De Backer, K., DeStefano, T., Menon, C., Suh, J.R., 2018. Industrial robotics and the global organisation of production. OECD Science, Technology and Industry Working Papers 2018/03, OECD Publishing.

De Loecker, J., Goldberg, P.K., Khandelwal, A.K., Pavcnik, N., 2016. Prices, markups, and trade reform. Econometrica, 84(2), 445–510.

Demir, B., Fieler, C., Xu, D.Y., Yang, K.K., 2024. O-ring production networks. Journal of Political Economy 132, 200–247.

Duarte, M., Restuccia, D., 2010. The role of the structural transformation in aggregate productivity. Quarterly Journal of Economics, 125(1), 129–173.

Edmonds, E.V., Pavcnik, N., 2005. The effect of trade liberalization on child labor. Journal of International Economics, 65(2), 401–419.

Edmonds, E.V., Pavcnik, N., 2006. International trade and child labor: Cross-country evidence. Journal of International Economics, 68(1), 115–140.

Eslava, M., Fieler, C., Xu, D.Y., 2018. Trade, quality upgrading, and input linkages: A theory with evidence from Colombia. American Economic Review 108, 109–146.

Evenett, S., Jakubik, A., Martín, F., Ruta, M., 2024. The return of industrial policy in data. The World Economy, 47, 2762–2788.

Evenett, S., Jakubik, A., Kim, J., Martín, F., Pienknagura, S., Ruta, M., 2025. Industrial policy since the great financial crisis. IMF Working Paper, forthcoming.

Faber, B., Gaubert, C., 2019. Tourism and economic development: Evidence from Mexico's coastline. American Economic Review, 109(6), 2245–2293.

Faber, M., 2020. Robots and reshoring: Evidence from Mexican labor markets. Journal of International Economics, 127.

Faber, M., Kilic, K., Kozliakov, G., Marin, D., 2024. Global value chains in a world of uncertainty and automation. CEPR Discussion Paper 19615.

Fajgelbaum, P., Goldberg, P., Kennedy, P., Khandelwal, A., Taglioni, D., 2024. The US-China trade war and global reallocations. American Economic Review: Insights, 6(2), 295–312.

Fan, T., Peters, M., Zilibotti, F., 2023. Growing like India—the unequal effects of service-led growth. Econometrica, 91(4), 1457–1494.

Fernandes, A.M., Hillberry, R., Mendoza Alcántara, A., 2021. Trade effects of customs reform: Evidence from Albania. The World Bank Economic Review, 35(1), 34–57.

Fernandes, A.M., Rocha, N., Ruta, M., 2021. The Economics of Deep Trade Agreements. CEPR Press, London.

Fernández-Villaverde, J., Mineyama, T., Song, D., 2024. Are we fragmented yet? Measuring geopolitical fragmentation and its causal effect. NBER Working Paper 32638.

Fontagné, L., Rocha, N., Ruta, M., Santoni, G., 2023. The economic impact of deepening trade agreements. World Bank Economic Review 37, 366–388.

Fosfuri, A., Motta, M., Rønde, T., 2001. Foreign direct investment and spillovers through workers' mobility. Journal of International Economics, 53(1), 205–222.

Freund, C., Mulabdic, A., Ruta, M., 2022. Is 3D printing a threat to global trade? The trade effects you didn't hear about. Journal of International Economics, 138.

Freund, C., Mattoo, A., Mulabdic, A., Ruta, M., 2024. Is US trade policy reshaping global supply chains? Journal of International Economics, 152.

Gereffi, G., Humphrey, J., Sturgeon, T., 2005. The governance of global value chains. Review of International Political Economy, 12(1), 78–104.

Góes, C., Bekkers, E., 2022. The impact of geopolitical conflicts on trade, growth, and innovation. WTO Staff Working Paper No. ERSD-2022-9.

Goldberg, P.K., Reed, T., 2023a. Presidential address: Demand-side constraints in development. The role of market size, trade, and (in)equality. Econometrica 91, 1915–1950.

Goldberg, P.K., Reed, T., 2023b. Is the global economy deglobalizing? If so, why? And what is next? Brookings Papers on Economic Activity, 54(1), 347–423.

Goldberg, P.K., with Larson, G., 2023. The unequal effects of globalization. The MIT Press, Cambridge, MA.

Goldberg, P.K., Juhász, R., Lane, N.J., Lo Forte, G., Thurk, J., 2024. Industrial policy in the global semiconductor sector. NBER Working Paper No. 32651, National Bureau of Economic Research.

Gopinath, G., Gourinchas, P.-O., Presbitero, A.F., Topalova, P., 2025. Changing global linkages: A new Cold War? Journal of International Economics, 153.

Handley, K., Limão, N., 2015. Trade and investment under policy uncertainty: Theory and firm evidence. American Economic Journal: Economic Policy 7, 189–222.

Handley, K., Limão, N., 2017. Policy uncertainty, trade, and welfare: Theory and evidence for China and the United States. American Economic Review 107, 2731–2783.

Handley, K., Limão, N., 2022. Trade policy uncertainty. Annual Review of Economics 14, 363–395.

Harrison, A.E., 1994. Productivity, imperfect competition and trade reform: Theory and evidence. Journal of International Economics, 36(1–2), 53–73.

Harrison, A., Martin, W., Nataraj, S., 2003. Globalization's impact on compliance with labor standards. Brookings Trade Forum, 45–96.

Hausmann, R., Pritchett, L., Rodrik, D., 2005. Growth accelerations. Journal of Economic Growth, 10(4), 303–329.

Herrendorf, B., Rogerson, R., Valentinyi, Á., 2014. Growth and structural transformation, in: Aghion, P., Durlauf, S.N. (Eds.), Handbook of Economic Growth, Vol. 2B. Elsevier, Amsterdam, pp. 855–941.

Hirschman, A.O., 1945. National Power and the Structure of Foreign Trade. University of California Press, Berkeley.

Hjort, J., Poulsen, J., 2019. The arrival of fast internet and employment in Africa. American Economic Review, 109(3), 1032–1079.

Hofmann, C., Osnago, A., Ruta, M., 2017. Horizontal depth: A new database on the content of preferential trade agreements. World Bank Policy Research Working Paper 7981.

Horn, H., Mavroidis, P.C., Sapir, A., 2010. Beyond the WTO? An anatomy of EU and US preferential trade agreements. The World Economy 33, 1565–1588.

International Monetary Fund, 2024. Harnessing Sub-Saharan Africa's critical mineral wealth. April 2024.

International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations Conference on Trade and Development, World Bank, World Trade Organization, 2024. Working together for better climate action: Carbon pricing, policy spillovers, and global climate goals. World Trade Organization, Geneva.

International Monetary Fund, 2025. World Economic Outlook. April 2025.

Irwin, D.A., 2019. Does trade reform promote economic growth? A review of recent evidence. NBER Working Paper 25927.

Irwin, D.A., 2022. The trade reform wave of 1985-1995. NBER Working Paper 29973.

Ivanova, A., Kozack, J.A., Muñoz, S. (eds), 2024. Climate change challenges and opportunities in Latin America and the Caribbean. International Monetary Fund, Washington, DC.

Jakubik, A., Ruta, M., 2023. Trading with friends in uncertain times. IMF Working Paper No. 2023/124. International Monetary Fund, Washington, DC.

Javorcik, B.S., 2004. Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. American Economic Review, 94(3), 605–627.

Jiang, K., Keller, W., Qiu, L.D., Ridley, W., 2018. International joint ventures and internal vs external technology transfer: Evidence from China. Journal of International Economics, 142, 263–294.

Juhász, R., Lane, N., Rodrik, D., 2024. The new economics of industrial policy. Annual Review of Economics, 16, 213–242.

Juhász, R., Steinwender, C., 2024. Industrial policy and the Great Divergence. Annual Review of Economics, 16, 27–54.

Juhász, R., Lane, N.J., Oehlsen, E., Perez, V.C., 2025. Measuring industrial policy: A text-based approach. NBER Working Paper No. 33895.

Keller, W., Yeaple, S.R., 2009. Multinational enterprises, international trade, and productivity growth: Firm-level evidence from the United States. Review of Economics and Statistics, 91(4), 821–831.

Krenz, A., Prettner, K., Strulik, H., 2021. Robots, reshoring, and the lot of low-skilled workers. European Economic Review, 136.

Krishna, P., Mitra, D., 1998. Trade liberalization, market discipline and productivity growth: New evidence from India. Journal of Development Economics, 56(2), 447–462.

Kummritz, V., Taglioni, D., Winkler, D., 2017. Economic upgrading and social upgrading in global value chains. Policy Research Working Paper No. 8081. World Bank.

Kuznets, S., 1957. Quantitative aspects of the economic growth of nations: II. Industrial distribution of national product and labor force. Economic Development and Cultural Change, 5(4), 1–111.

Kuznets, S., 1973. Modern economic growth: Findings and reflections. American Economic Review, 63(3), 247–258.

Lee, W., Rocha Gaffurri, N.P., Ruta, M., 2021. Trade facilitation provisions in preferential trade agreements: Impact on Peru's exporters. Policy Research Working Paper No. 9674. World Bank, Washington, DC.

Leruth, L., Mazarei, A., Régibeau, P., Renneboog, L., 2022. Green energy depends on critical minerals: Who controls the supply chains? Peterson Institute for International Economics Working Paper 22-12.

Levinsohn, J., 1993. Testing the imports-as-market-discipline hypothesis. Journal of International Economics, 35(1–2), 1–22.

Lewis, W.A., 1954. Economic development with unlimited supplies of labor. The Manchester School, 22(2), 139–191.

Lileeva, A., Trefler, D., 2010. Improved access to foreign markets raises plant-level productivity... for some plants. The Quarterly Journal of Economics, 125(3), 1051–1099.

Luo, T., 2018. Which countries could gain the most from renewable energy? World Economic Forum.

Lu, Y., Yu, L., 2015. Trade liberalization and markup dispersion: Evidence from China's WTO accession. American Economic Journal: Applied Economics, 7(4), 221–253.

Maggi, G., 2014. International trade agreements, in: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics, Vol. 4. Elsevier, Amsterdam, pp. 317–390.

Maggi, G., Rodríguez-Clare, A., 1998. The value of trade agreements in the presence of political pressures. Journal of Political Economy 106, 574–601.

Maggi, G., Rodríguez-Clare, A., 2007. A political-economy theory of trade agreements. American Economic Review 97, 1374–1406.

Maliszewska, M., Fischer, C., Jung, E., Chepeliev, M., 2025. Carbon Border Adjustment Mechanism (CBAM) Exposure Indices: Methodological Note. World Bank Prosperity Notes Series.

Mattoo, A., 2018. Services globalization in an age of insecurity: Rethinking trade cooperation. Policy Research Working Paper No. 8579. World Bank, Washington, DC.

Mattoo, A., Staiger, R.W., 2020. Trade wars: What do they mean? Why are they happening now? What are the costs? Economic Policy 35, 561–584.

Mattoo, A., Rocha, N., Ruta, M. (Eds.), 2020. Handbook of Deep Trade Agreements. World Bank, Washington, DC.

Mattoo, A., Mulabdic, A., Ruta, M., 2022. Trade creation and trade diversion in deep agreements. Canadian Journal of Economics 55, 1598–1637.

Mattoo, A., Ruta, M., Staiger, R.W., 2025. Geopolitics and the world trading system. NBER Working Paper 33089.

McMillan, M., Rodrik, D., Verduzco-Gallo, Í., 2014. Globalization, structural change, and productivity growth, with an update on Africa. World Development, 63, 11–32.

Mearsheimer, J.J., 2003. The Tragedy of Great Power Politics. W. W. Norton & Company, New York.

Minnich, J.D., 2023. Re-Innovation Nation: The Strategic and Political Logic of Technology Transfer Policy in Rising China. PhD thesis. Massachusetts Institute of Technology.

Mulabdic, A., Yotov, Y., 2025. The trade cost of geopolitical risks, in: Baldwin, R., Ruta, M. (Eds.), The state of globalisation. CEPR Press, Paris & London.

Murphy, K.M., Shleifer, A., Vishny, R., 1989. Income distribution, market size, and industrialization. The Quarterly Journal of Economics 104, 537–564.

Nayyar, G., Hallward-Driemeier, M., Davies, E., 2021. At your service? The promise of services-led development. World Bank, Washington, DC.

Newman, C., Rand, J., Talbot, T., Tarp, F., 2015. Technology transfers, foreign investment and productivity spillovers. European Economic Review, 76, 168–187.

Nunn, N., Trefler, D., 2014. Domestic institutions as a source of comparative advantage, in: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics, Vol. 4. Elsevier, Amsterdam, pp. 263–315.

Ossa, R., 2015. Why trade matters after all. Journal of International Economics. 97(2), 266–277.

Parry, I., Black, S., Roaf, J., 2021. Proposal for an international carbon price floor among large emitters. IMF Staff Climate Notes 2021/001. Washington, DC: International Monetary Fund.

Piermartini, R., Rubinova, S., 2014. Knowledge spillovers through international supply chains. WTO Staff Working Paper No. ERSD-2014-11.

Puga, D., Trefler, D., 2014. International trade and institutional change: Medieval Venice's response to globalization. Quarterly Journal of Economics 129, 753–821.

Rigo, D., 2021. Global value chains and technology transfer: New evidence from developing countries. Review of World Economics, 157(2), 271–294.

Rodrik, D., 2016. Premature deindustrialization. Journal of Economic Growth, 21(1), 1–33.

Rotunno, L., Ruta, M., 2024. Trade spillovers of domestic subsidies. IMF Working Paper No. 2024/041.

Rotunno, L., Ruta, M., 2025. Trade partners' responses to US tariffs. IMF Working Papers 2025/147.

Ruta, M., 2023. The rise of discriminatory regionalism. Finance and Development 60, 22–25.

Ruta, M., Sztajerowska, M., 2025. Shifting advantages: Do subsidies shape cross-border investment? IMF Working Papers 2025/080.

Sachs, J.D., Warner, A., 1995. Economic reform and the process of global integration. Brookings Papers on Economic Activity, 1995(1), 1–118.

Sequeira, S., Djankov, S., 2014. Corruption and firm behavior: Evidence from African ports. Journal of International Economics, 94(2), 277–294.

Sequeira, S., 2016. Corruption, trade costs, and gains from tariff liberalization: Evidence from Southern Africa. American Economic Review, 106(10), 3029–3063.

Staiger, R.W., Tabellini, G., 1987. Discretionary trade policy and excessive protection. American Economic Review 77, 823–837.

Staiger, R.W., 2022. A World Trading System for the Twenty-First Century. MIT Press, Cambridge, MA.

Stapleton, K., Webb, M., 2020. Automation, trade and multinational activity: Micro evidence from Spain. CSAE Working Paper Series 2020-16, Centre for the Study of African Economies, University of Oxford.

Stemmler, H., 2019. Does automation lead to de-industrialization in emerging economies? Evidence from Brazil. University of Göttingen Working Papers in Economics 382, University of Göttingen, Department of Economics.

Stiglitz, J.E., 1996. Some lessons from the East Asian miracle. The World Bank Research Observer 11, 151–177.

Strange, R., Humphrey, J., 2019. What lies between market and hierarchy? Insights from internalization theory and global value chain theory. Journal of International Business Studies, 50(8), 1401–1414.

Subramanian, A., 2024. The paradox of China's globalization. Project Syndicate.

Taglioni, D., Winkler, D., 2016. Making global value chains work for development. World Bank Publications, Washington, DC.

Verhoogen, E.A., 2008. Trade, quality upgrading, and wage inequality in the Mexican manufacturing sector. Quarterly Journal of Economics 123, 489–530.

Wolff, A.W., 2023. Discarding a utopian vision for a world divided: The effect of geopolitical rivalry on the world trading system. Peterson Institute for International Economics Working Paper.

World Bank, 1993. The East Asian miracle: Economic growth and public policy. Oxford University Press, New York.

World Bank, 2020. World Development Report 2020: Trading for development in the age of global value chains. World Bank Group, Washington, DC.

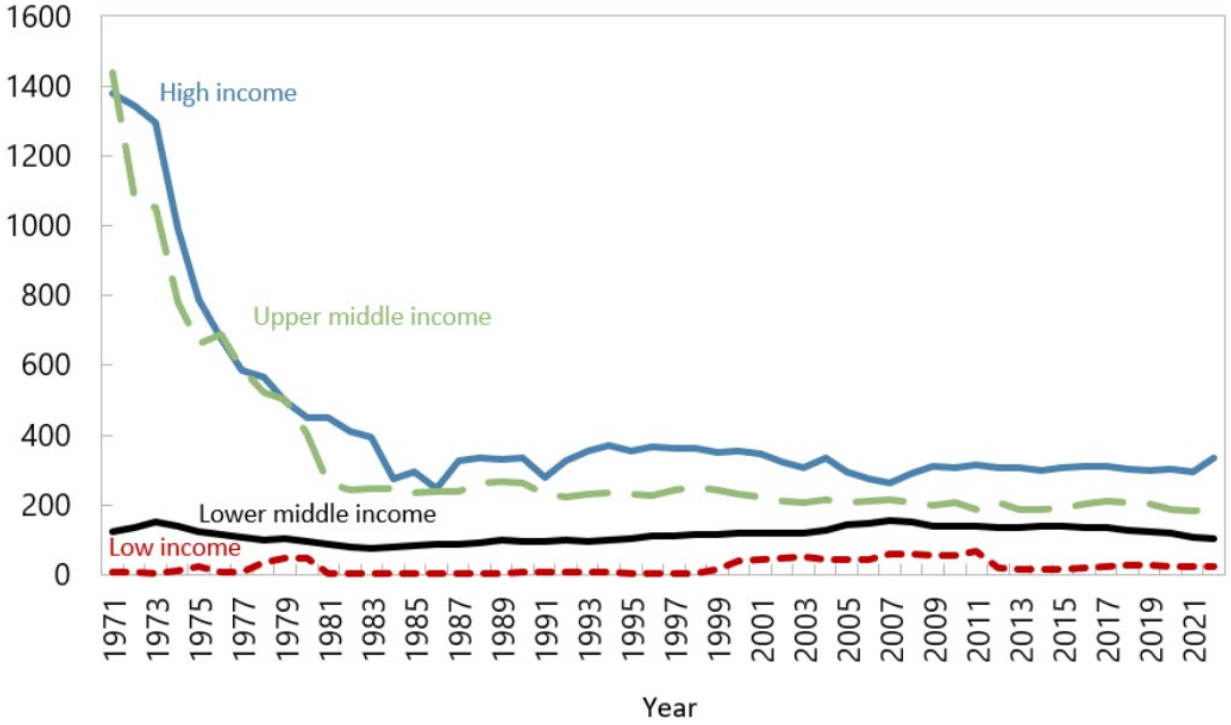
World Bank, 2025. Foreign Direct Investment in Retreat: Policies to Turn the Tide. World Bank, Washington, DC.

World Trade Organization, 2025. Trade forecasts. April 2025.

Appendix

Figure A.1. Average Energy Dependency Ratio

Energy dependency ratio



Source: IEA, IMF, World Economic Outlook database.

Note: Country grouping based on World Bank classification (2025). Energy Dependency Ratio = (Energy Imports – Energy Exports) / Final Consumption × 100.