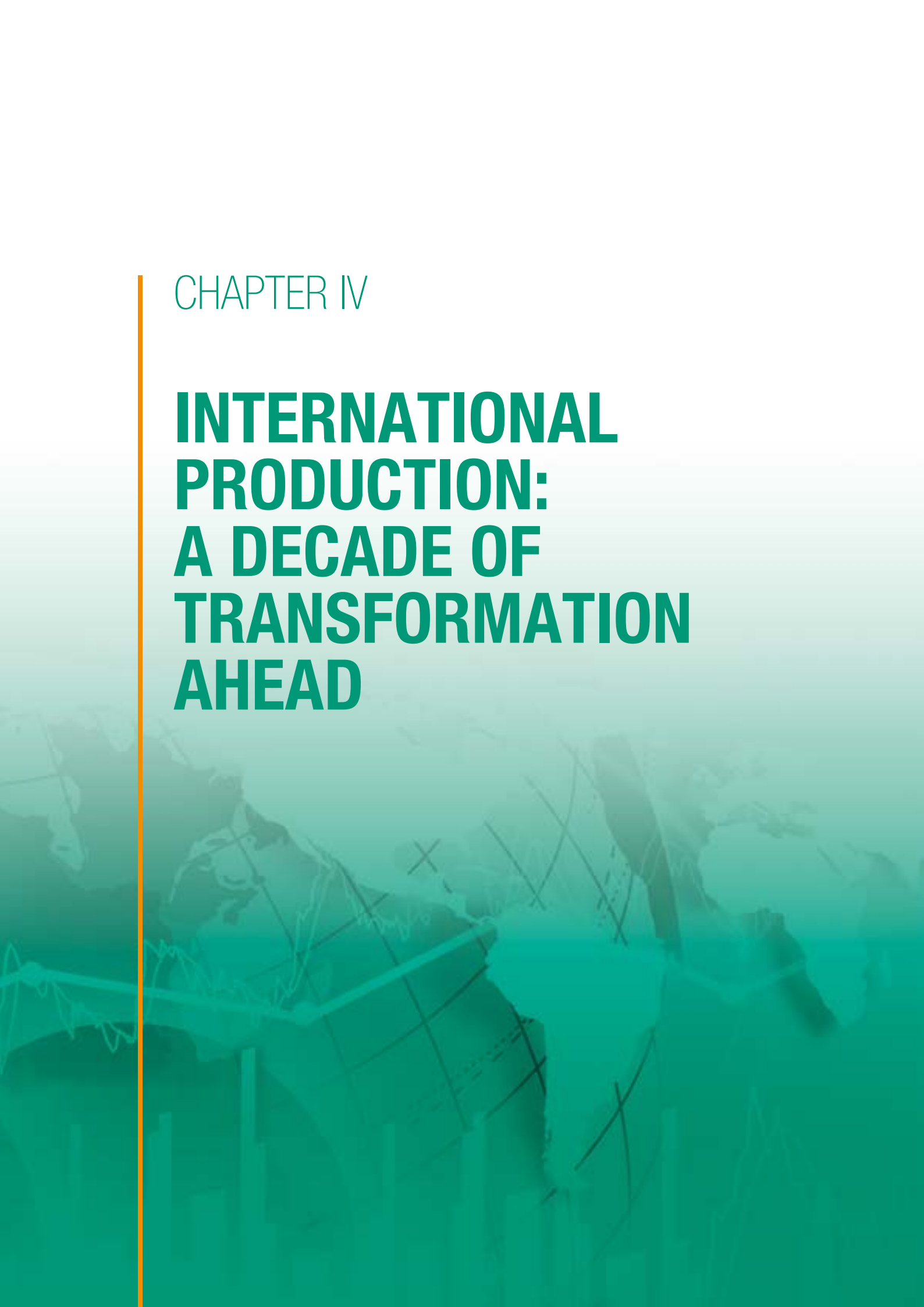
CHAPTER IV

INTERNATIONAL PRODUCTION: A DECADE OF TRANSFORMATION AHEAD



INTRODUCTION: INTERNATIONAL PRODUCTION IN A PERFECT STORM

At the start of a new decade, the global system of international production is experiencing a perfect storm, with the crisis caused by the COVID-19 pandemic arriving on top of existing challenges arising from the new industrial revolution (NIR), growing economic nationalism and the sustainability imperative.

This year's *World Investment Report (WIR)* comes in the midst of a global crisis. The coronavirus pandemic has forced governments around the world to implement strict measures to limit the spread of the virus, ranging from social distancing and closures of public spaces and offices to complete lockdowns. These measures have resulted in production stoppages and severe supply chain disruptions in most sectors, virtually complete closures of entire industries, and unprecedented demand shocks in almost all economies. The immediate impact on international production and cross-border investment has been severe, with delayed implementation of investment projects and the shelving of new projects, as well as the drying up of foreign affiliate earnings of which normally a significant share is reinvested in host countries. Longer term, the need for multinational enterprises (MNEs) to create more resilient supply chains, combined with greater pressure from governments and the public to increase national or regional autonomy in productive capacity, especially of essential (e.g. health care related) goods and services, will have a lasting effect on global production networks.

However, COVID-19 is not the only gamechanger for international production. International trade, investment and global value chains (GVCs) were already entering a period of transformation as a result of several "megatrends". These megatrends emerged and gradually increased in intensity over the course of the last decade, contributing to the slowdown of international production. The megatrends driving the transformation of international production can be grouped under three main themes:

- *Technology trends and the NIR.* The application of new technologies in the supply chains of global MNEs has far-reaching consequences for the configuration of international production networks. This has already raised important concerns for policymakers, with the realization that growth will depend on promoting investment in new sectors and that structural transformation through the build-up of the manufacturing sector is becoming more difficult.
- *Global economic governance trends.* Fragmentation in international economic policymaking and especially in trade and investment policy is reflected in a shift away from multilateral cooperation towards regional and bilateral solutions and increased protectionism. It is compounded by systemic competition between economic powers, as well as by a general shift in national economic policymaking in many countries towards more regulation and intervention.

- *Sustainable development trends.* The implementation of a broad range of sustainability measures, including climate change adaptation and mitigation measures, in the global operations of MNEs and differential speeds in the adoption and implementation of rules, regulations and practices aimed at sustainability will have important implications for international production networks. The need to channel investment to the Sustainable Development Goals (SDGs) will also affect patterns of foreign direct investment (FDI).

While the COVID-19-induced crisis is certainly a major challenge for international production on its own, it may also represent a tipping point, accelerating the effects of pre-existing megatrends. At the start of the new decade, due to the combined effect of the pandemic and existing trends reaching their boiling point, the system of international production finds itself in a "perfect storm" (figure IV.1). The decade to 2030 is likely to prove a decade of transformation.

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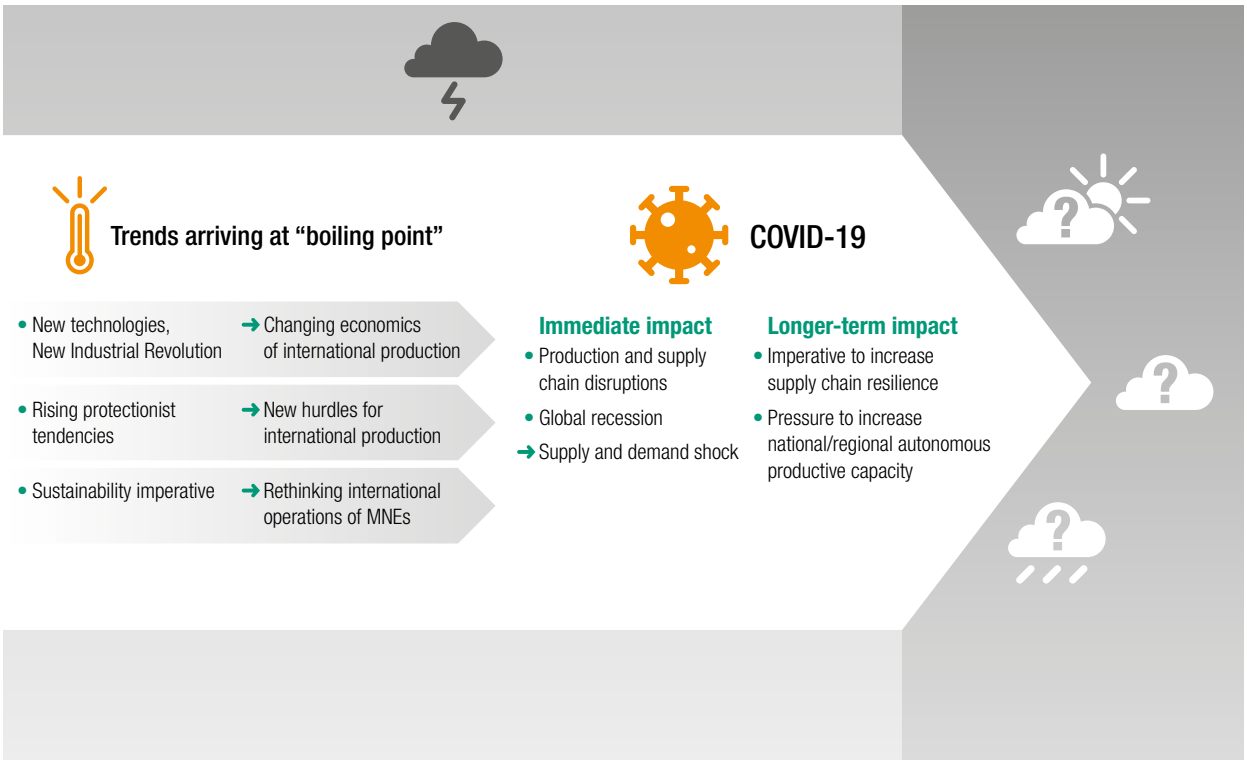
This chapter aims to assess the possible directions that the global system of international production could take over the next decade to 2030 and discusses the implications for policymakers worldwide, and especially those in developing countries. To do so, the chapter takes stock of three decades of monitoring international production through the lens of FDI and GVCs, highlights the drivers and consequences of the slowdown in the last decade, and describes possible trajectories for the next 10 years as a function of major global trends causing a "secular change" in international production, all in the context of the additional pressures that the pandemic and its aftermath will bring.

To develop the international production trajectories for the next decade, this chapter examines the likely impact of each major trend on the length and level of fragmentation

Figure IV.1. International production in a "perfect storm"



Source: UNCTAD.

in GVCs, the distribution of value added and the governance of GVCs – all dimensions that affect future patterns of cross-border investment. It looks at different impacts by industry, with a special focus on those industries that are most relevant for the growth prospects of developing and transition economies. And it discusses the policy implications of a new era of international production with regard to the role of FDI in industrial policies, national policy measures aimed at promoting and facilitating investment, and options at the international level to maintain a policy environment conducive to productive cross-border investment in sustainable development.

The structure of the chapter is as follows:

- Section A provides a succinct overview of three decades of international production, focusing on the main drivers and determinants of the first two decades of growth and the factors behind the last decade of stagnation. It argues that, even before COVID-19, the system of international production was reaching an inflection point.
- Section B paints a broad-brush picture of the international production configurations of major sectors and industries today, as a starting point for the development of possible future trajectories.
- Section C describes the megatrends that will affect international production in the decade to 2030 and their expected impact on international production configurations.
- Section D presents several possible trajectories that the system of international production could follow.
- Section E draws the conclusions for national and international investment-development policymakers.

A. THE RUN-UP: 30 YEARS OF INTERNATIONAL PRODUCTION

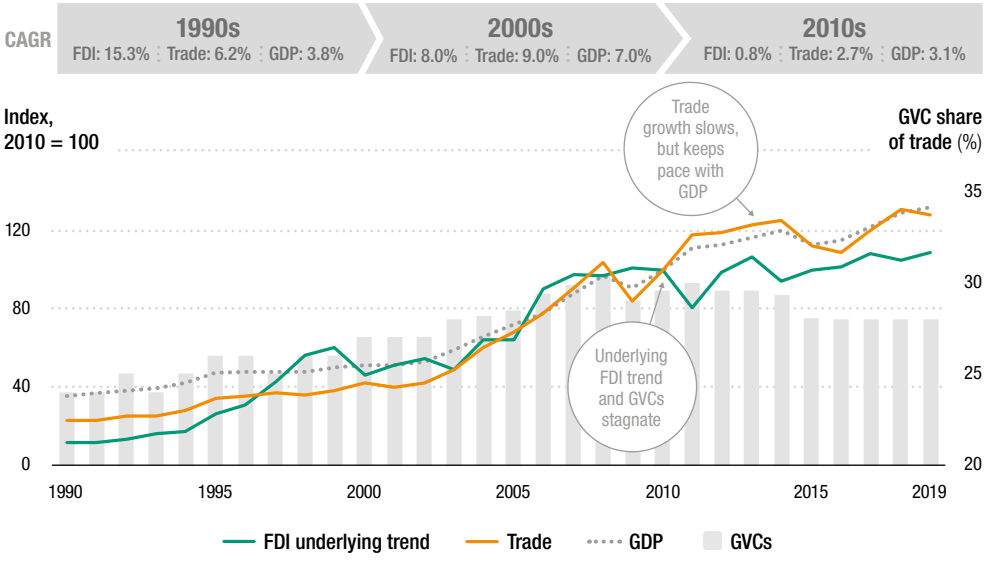
1. Two decades of growth followed by one of stagnation

The WIR has monitored FDI and the activities of MNEs for 30 years, during which international production saw two decades of rapid growth followed by one of stagnation.

Over the three decades of its existence, the *WIR* has documented trends in FDI, the activities of MNEs, and their impact on development. The first reports in the early 1990s described how the global presence of MNEs had evolved from relatively simple cross-border structures predominantly motivated by the search for natural resources and international markets only a few decades earlier to more complex international production networks built to exploit differences in labour costs and productivity. This process accelerated in the 1990s and into the 2000s, enabled by advances in technology that allowed the fine-slicing of production processes and better communication in complex cross-border supply chains, supported by the liberalization of trade and investment policies and the spread of export-oriented industrial policies, and spurred on by competition – both between firms in order to survive in globalized markets and between economies aiming to attract investment for development.

The first two decades of the report thus coincided with rapid growth in international production (figure IV.2), a 10-fold increase in the global stock of FDI and a five-fold increase

Figure IV.2. **FDI, trade, GDP and GVC trends, 1990–2019**
(FDI, trade and GDP indexed, 2010 = 100; GVCs, per cent)



Source: UNCTAD.
Note: Trade is global exports of goods and services. GVC share of trade is proxied by the share of foreign value added in exports, based on the UNCTAD-Eora GVC database (see Casella et al., 2019). The underlying FDI trend is an UNCTAD indicator capturing the long-term dynamics of FDI by netting out fluctuations driven by one-off transactions and volatile financial flows.

in global trade – much of it intra-firm trade between affiliates of the same MNE and trade within supply chains coordinated by MNEs. Early *WIR*s focused on the implications of the growth of international production, for example for employment and competition policies, and on the development impact and potential opportunities for export-led growth, linkages and domestic enterprise development.

In the 2000s, the *WIR* documented a series of fundamental shifts in the nature of international production (table IV.1). Patterns of FDI changed, with emerging markets becoming not only increasingly important recipients of FDI, but gradually also outward investors. The composition changed, with services playing an ever more important role, both through the internationalization of services industries and through the servicification of manufacturing activities. And the modalities through which MNEs expanded abroad changed, with mergers and acquisitions (M&As) playing a major role, and with corporate structures becoming highly complex.

After the global financial crisis, and especially after 2010, the growth momentum of international production stalled. This was first reflected in trade: worldwide exports of goods and services, which had grown at more than double the rate of GDP for decades, slowed down significantly relative to economic growth. The same development in investment remained obscured for some time by the expanding financial component of FDI. Nevertheless, the *WIR* observed early on that stagnation in cross-border investment in productive capacity was a key driver of the trade slowdown. Subsequent reports, exploiting new data on value added in trade, documenting investment flows net of conduits and offshore financial centres, and developing an underlying investment trend net of

Table IV.1. Evolution of international production since 1990

						CAGR (%)		
	1990	2000	2007 (pre-crisis peak)	2010	2019	1990s	2000–2007 (pre-crisis)	2008–2019 (post-crisis)
FDI inflows ($ billions)	205	1 356	1 891	1 365	1 540	20.8	4.9	0.4
FDI inward stock ($ billions)	2 196	7 377	18 634	19 751	36 470	11.6	13.5	8.4
Income on inward FDI ($ billions)	82	347	1 260	1 393	1 953	15.5	20.2	4.5
Rate of return on inward FDI (%)	3.7	4.7	7	7.1	6.7	..	..	..
Cross-border M&As value ($ billions)	98	959	1 032	347	483	25.6	1.0	-2.2
M&As to FDI ratio (%)	47.9	70.7	54.5	25.3	31.3	..	..	..
Geographical spread of inward FDI stock (number of countries that together account for 90 per cent of inward FDI stock)	23	31	37	40	40	..	..	..
Sales of foreign affiliates ($ billions)	7 136	11 859	26 394	23 392	31 288	5.2	12.4	1.8
Value added (product) of foreign affiliates ($ billions)	1 335	3 059	6 132	6 509	8 000	8.7	10.4	2.0
Total assets of foreign affiliates ($ billions)	6 202	22 761	74 504	82 588	112 111	13.9	18.4	4.5
Employment by foreign affiliates (thousands)	28 558	50 088	65 041	57 590	82 360	5.8	3.8	3.2
Memorandum								
GDP ($ billions)	23 719	33 845	47 571	66 062	87 127	3.6	5.9	2.9
Gross fixed capital formation ($ billions)	5 811	7 920	11 092	15 329	21 992	3.1	8.4	3.3
Royalties and license fee receipts ($ billions)	31	89	152	230	391	11.1	12.4	5.4

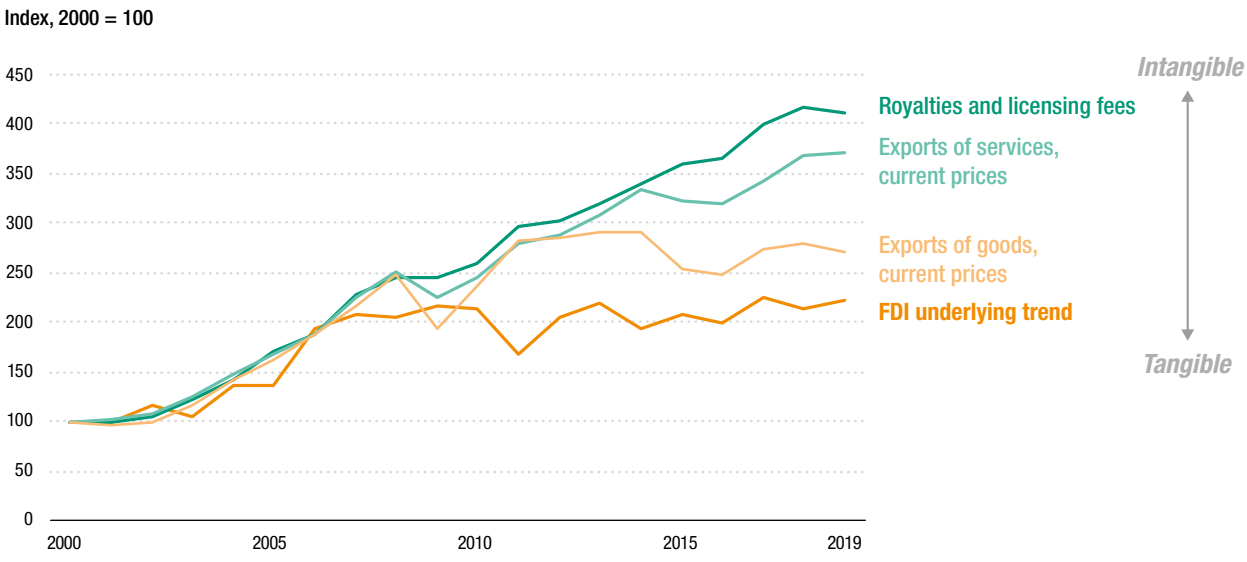
Source: UNCTAD. GDP and gross fixed capital formation data from IMF (2020).

the effects of volatile financial flows and M&As, clearly showed the relationship between the lack of growth in global (real) FDI, GVCs and trade.[1] The loss of momentum in international production did not necessarily decrease the interdependence between countries, as use of intermediate inputs, especially from China, continued to increase (Baldwin and Freeman, 2020). The geographical concentration in the production of certain critical supplies added to the exposure of international production to systemic risks – as laid bare during the COVID-19 crisis.

The causes for the investment stagnation were explored in-depth in several *WIR*s. For one, the overseas operations of MNEs became ever more intangible and less dependent on investment in physical assets (figure IV.3). Non-equity modes (NEMs) became firmly established, between arm's-length trade and FDI, as a governance mechanism in international production. NEMs allowed MNEs to access overseas markets through contracts, rather than FDI, while still exercising a significant degree of control over operations. Tech MNEs also became increasingly important. These firms can reach markets worldwide through digital channels and without the need for a significant physical presence. The number of asset-light tech MNEs in the *WIR*'s annual ranking of the 100 largest MNEs increased from four in 2010 to 15 by the end of the decade. In contrast, manufacturing investment declined. The value of greenfield cross-border investment projects in manufacturing industries was structurally lower (by 20-25 per cent) than in the previous decade, even in Asia, the only region still showing significant growth in overall FDI inflows.

Policy factors were also identified as culprits. The monitoring of national investment policy measures in the *WIR* showed a gradually increasing share of restrictive and regulatory measures, as opposed to measures aimed at liberalizing or promoting FDI. The fragmented nature of the international investment policy regime and the relatively weak impetus it gave to investment facilitation also led to several *WIR*s focusing on policy options for its reform, including through an Investment Policy Framework for Sustainable Development, an international investment agreements (IIA) Reform Package, and an Investment Facilitation Action Menu.

Figure IV.3. Indicators of international production by tangibility, 2000–2019 (Indexed, 2000 = 100)



Source: UNCTAD.

Table IV.2. The growth and slowdown of international production: key factors

1990–2010: Drivers of growth	2010s: Causes of the slowdown
Liberalization and export-led growth policies	Return of protectionism and policy uncertainty
Factor cost differentials and declining trade costs	Gradual decline in the return on FDI
Technological advances acting as enablers	Digital technologies favouring asset-light forms of international production

Source: UNCTAD.

Summarizing, analyses in various *WIR*s showed that the same factors that propelled the early growth of international production, namely policies (a wave of liberalization and export-led growth policies), economics (e.g. declining costs of trade) and technology (advances allowing the fine-slicing of production processes and coordination in complex cross-border supply chains) started pushing in the opposite direction, with a return of protectionist tendencies, a gradual decline in the return on FDI over the decade, and increasing technology-enabled asset lightness (table IV.2).

The implications for development of the slowdown in investment and international production have naturally been the key concern in the *WIR*. Foreign investment remains a key source of capital for developing countries. The least developed countries (LDCs), which confront severe structural impediments to development, are especially dependent on cross-border flows to inject capital in productive capacity and on the routes to international markets that affiliates of MNEs can provide. Their share of global FDI has remained stuck below 2 per cent, and their prospects for a step-change in investment attraction against a backdrop of global stagnation are slim. Looking beyond the group of LDCs, many other developing and transition economies still rely on FDI and participation in GVCs for industrial upgrading and growth. A survey of industrial policies adopted over the last 10 years in more than 100 countries showed that the vast majority of them aim to attract international investors in priority sectors through changes in investment laws, facilitation measures, incentives schemes and special economic zones *(WIR18* and *WIR19)*.

2. 2020: a crossroads for international production

The 2010s were the quiet before the storm. The changes in the economics of international production, the policy environment and technology trends observed in the last decade are only the beginning: the start of the new decade represents a critical inflection point in all three areas.

The rapid growth of international production until about 2010 was driven by the underlying economics, the supportive policy environment, and enabling technological developments. Changes in direction in the same three factors caused the stagnation in international production in the 2010s.

Looking ahead, the trio of technology, policy and economic considerations continues to be a helpful guide to structure the analysis of expected trends. Only the relative importance of the factors, their intensity and their detailed composition is likely to change. However, all three have arrived at critical inflection points that could fundamentally alter the configuration of international production over the next decade.

In *technology*, the spread of digital technologies in products and production over the past decade has led to a boom in trade in services, an explosion of intangibles in GVCs and a meteoric rise of digital and tech firms among the largest MNEs worldwide. But, as argued in *WIR17*, asset-light forms of international investment are just beginning to emerge and the full-scale digital transformation of the supply chains of firms that were not "born digital" (especially in manufacturing) is only at the start. Digital MNEs have grown partly in addition to, partly at the cost of, but mostly separate from traditional MNEs. And the digitalization of the supply chains of those traditional MNEs has in large part been bolted on to their existing international production configurations. Where products are designed, where parts are manufactured, and where they are assembled has, for most industries and most firms, not yet fundamentally changed.

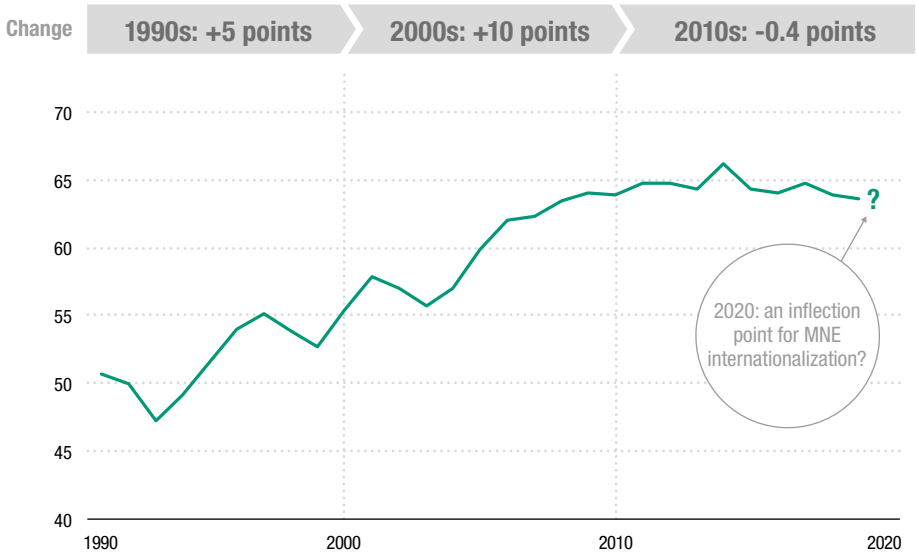
Looking at the *policy* environment and at international economic governance, the decade since the global financial crisis has seen the pendulum swing from liberal trade and investment policies toward more interventionism in national economic policies and a return of protectionism. The latter, however, really started to take effect only in the second half of the decade; in the first half, governments showed restraint and willingness to cooperate in order to restore economic stability and safeguard the recovery. While protectionist policies – tariff and non-tariff measures in trade, and restrictive measures on foreign investment – have certainly had their effect and contributed to the slowdown and stagnation of international production in after 2010, they have not yet resulted in a fundamental reconfiguration of international production networks. As trade patterns are easier to shift for firms operating international production networks, especially in nimble value chains with relatively low-capital investment in manufacturing operations, some trade diversion is evident. However, there has been no significant increase in levels of divestment, and reshoring is still only an emerging trend. A key factor to consider is that international commitments regarding interventions in national economies and restrictions on cross-border trade have so far acted as a constraint on the actions of governments; as this constraint loosens, it is likely that the impact on international production configurations will be more fundamental.

As to the *economics* of international production, reduced arbitrage opportunities on labour costs (and, perhaps, an emerging trend towards reduced arbitrage opportunities in tax) have already led to a gradual decrease in returns on foreign investment and contributed to the slowdown in international production during the last decade. However, this promises to be only the beginning of a change in the economics of international production. Sustainability concerns, especially, will affect the business case for complex international production networks and reshape global supply chains. Climate-change-induced extreme weather events are leading many MNEs to re-examine their supply chain resilience. Carbon emission targets announced by numerous governments and the associated implementation plans, including carbon border levies, promise to drastically alter MNE cost calculations about levels of technology employed in production, transportation, as well as regulatory and compliance issues. Many of these schemes imply a significant shift in the coming decade, coinciding with the last decade for the implementation of the SDGs.

The crisis caused by the pandemic has thus arrived at a time when the major driving forces of international production were all nearing critical inflection points. The pandemic has already significantly affected the production networks and supply chains of MNEs across many industries. As the outbreak began, bottlenecks in GVCs immediately emerged. The 1,000 largest global MNEs and their suppliers own more than 12,000 facilities (factories, warehouses and other operations) in the areas first hit by mobility restrictions (Hubei in China, Italy and the Republic of Korea). The longer-term policy reaction to the pandemic and the drive for greater supply chain resilience will accelerate existing trends in international production.

Over the last three decades MNEs have become ever more international, with steady increases in their shares of assets, sales and employees overseas (as measured by the Transnationality Index, or TNI) (figure IV.4). The second half of the last decade saw the TNI of UNCTAD's top 100 MNEs plateauing. There is a real possibility that a retrenchment lies ahead.

Figure IV.4. Transnationality Index of top 100 global MNEs, by decade



Source: UNCTAD.
Note: UNCTAD's Transnationality Index is the average of the ratios of foreign to total assets, sales and employment.

B. THE CONFIGURATION OF INTERNATIONAL PRODUCTION TODAY

International production networks can be described along three key dimensions: the degree of fragmentation and the length of value chains (short to long), the geographical spread of value added (concentrated to distributed), and the governance choices of MNEs that determine the prevalence of arm's-length trade, NEMs and FDI. Several archetypical configurations can be identified for the industries that account for the lion's share of global trade and investment.

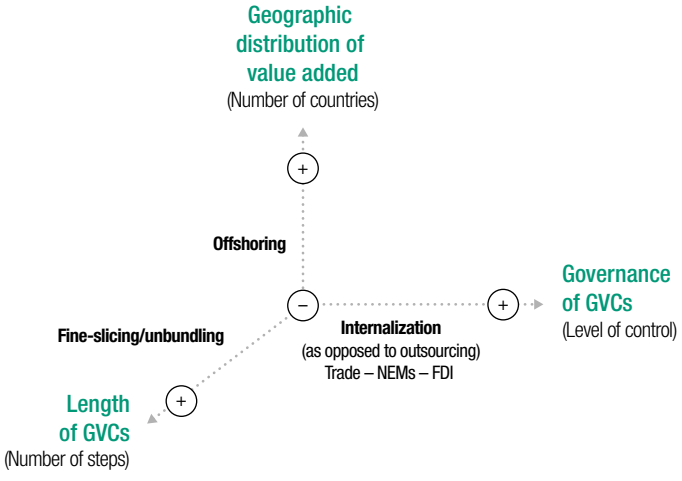
1. Key dimensions of international production

The term "international production" refers to the global production networks of MNEs that generate and coordinate GVC trade. While GVCs are often described primarily in trade terms, they are very much a function of the activities of MNEs. MNEs are the lead firms coordinating GVCs, with cross-border trade of inputs and outputs taking place between their affiliates, contractual partners and arm's-length suppliers. International production by MNEs accounts for a significant share of the global economy. Some 80 per cent of global trade is linked to the international production networks of MNEs *(WIR13)*. The combined value added generated by MNEs in their home countries and foreign affiliates amounts to about a quarter of global GDP and about a third of private sector output.

International production is not uniformly important across industries, and the configuration of international production systems varies greatly. The evolution of international production over three decades discussed in the previous section is the story of how MNEs and their networks of foreign affiliates, partners and suppliers have shaped the governance and coordination of GVCs and driven global patterns of investment in productive assets, generation of value added and trade.

International production configurations can be described along several dimensions; key dimensions are the length of value chains, the geographical spread of value added, and governance (figure IV.5). In considering the length or degree of fragmentation of value chains, the term "value chain" can be a misnomer – many production processes are "spiders" rather than "snakes", with intermediate inputs or components coming from many directions to be integrated or assembled into final products. The degree of fragmentation determines the extent to which a given value chain allows vertical

Figure IV.5. Key dimensions of international production



Source: UNCTAD.

specialization, the spatial separation of individual nodes or tasks in the process, and the exploitation of factor cost differentials across locations. Vertical specialization in value chains is a central concept in GVC analysis, and it has underpinned export-oriented development strategies promoting efficiency-seeking FDI in many countries.

The length of GVCs depends on many factors (table IV.3). A fundamental determinant is the degree of modularity of production processes in a particular industry, or the extent to which production processes can be sliced up into distinct and discrete steps. The productivity advantages that can accrue through specialization in specific tasks (economies of specialization) or through the concentration of similar and complementary tasks (economies of scale) also lead to longer value chains. Production modularity and economies of specialization and scale have led, for example, to the multi-tiered supplier structure in the automotive industry. Industries with high innovation intensity and product differentiation or customization needs tend to have shorter value chains.

Table IV.3. Key determinants of GVC length, geographical distribution and governance

Determinant	Impact	Relationship L	Relationship GD	Relationship GC
Arbitrage opportunities (labour costs, regulatory, tax)	Differences in labour costs are at the origin of efficiency-seeking investment and international production networks; other arbitrage opportunities also drive more complexity in international networks.	+	+	
Concentration of supply, demand and/or know-how and technology	Geographical dispersion of upstream and downstream segments of value chains and knowledge-intensive segments is determined by locations of demand, critical supply sources and technology/talent.		−	
Trade costs	Higher trade costs, including tariffs and costs of administrative procedures, make up a higher share of the costs of products/components that cross borders multiple times. They primarily affect the length of value chains, as well as geographical distribution of value added.	−	−	
Transportation costs	Transportation costs influence the sourcing and location decisions of firms. They will affect both the physical length of value chains and the geographical spread.	−	−	
Transaction costs (between actors in supply chains)	Transaction costs, including the difficulty of transmitting information or product specifications, quality control, and risk management, determine the degree to which lead firms resort to outsourcing, and the number of steps in value chains.	−		+
Modularity of the production process	The degree to which production can be broken up in discrete tasks is a driver (and prerequisite) for the degree of fragmentation and thus the length of value chains.	+	+	
Gains from specialization	The gains from specialization in tasks along the value chain are a key driver of fragmentation, closely linked with economies of scale at task level.	+		
Economies of scale	Economies of scale at value chain task level are equivalent to a gain from specialization and lead to more fragmentation; economies of scale in integrated production processes can have the opposite effect.	+/−	−	
Innovation/intellectual property intensity	Higher intellectual property intensity tends to lead to more closely controlled, internalized value chains, closer to home. Control through NEMs may be preferred over FDI where product/process specifications are easily codified and transmitted.	−	−	+
Degree of product differentiation/customization	The need for customization tends to lead to more decentralized value addition, i.e. higher geographical spread.	−	+	+/−

Source: UNCTAD.

Note: Columns on the right denote a positive/negative relationship between the determinants and value chain length (L), geographic distribution (GD), and governance and control (GC); for the latter, the relationship is interpreted as being towards more control through NEMs or internalization (i.e. governance through ownership).

Longer value chains or more fragmented production processes make it possible to distribute value addition across more locations. Length is therefore connected to the second dimension, the geographical distribution of value added. However, the two are not strictly correlated. Highly fragmented production processes, such as in the textiles, electronics or automotive industries – considered typical GVC industries – often still concentrate the bulk of value added in few locations, with many labour-intensive tasks in low-cost locations capturing relatively little value. A higher degree of geographical distribution of value added often occurs in shorter value chains, with MNEs replicating production processes across locations through market-seeking investment. The length of GVCs, their geographical distribution and the interaction between the two dimensions are important elements in the analysis of GVCs (Kano et al., 2020). The "smile curve" concept of value chains addresses the two dimensions, postulating a GVC structure where high value added knowledge- and intellectual-property-intensive tasks concentrate at the extremes of the curve, and low value added manufacturing and assembly tasks in the middle (Mudambi, 2007; 2008).

The factors that determine the geographical distribution of value added include, for example, trade and transportation costs, which are an economic disincentive for the wider dispersion of value added activities. In contrast, opportunities to capitalize on labor cost differentials and tax or regulatory arbitrage can drive the geographical distribution of value added. The degree of concentration of resources required for production in an industry and the concentration of demand for its products are other factors influencing the geographical spread of activities.

The length of value chains and their geographical distribution in and by themselves do not explain the degree to which MNEs internalize value added and access overseas resources, productive capacity and markets through arm's-length trade or through FDI. That depends on the degree of control they choose to exercise over (segments of) the GVC – their GVC governance choices. Governance and coordination of GVCs can be described along a spectrum from low levels of control over external suppliers of a given value chain input to full control through internalization (i.e. carrying out a given value chain task within majority-owned foreign affiliates). Studies[2] looking at the future of trade have mostly taken a GVC perspective limited to the two dimensions of value chain fragmentation and geographic distribution. Yet the governance dimension is necessary to take into account the role of MNEs in coordinating GVCs and thus to add the investment perspective.

The governance dimension is not a binary choice between trade and FDI (Gereffi et al., 2005). Intermediate levels of control over external suppliers in international production processes can be exercised through various levers, including contracts, licenses and franchising forms. Such non-equity (or non-ownership) modes of international production (NEMs) are widely used in most industries – e.g. contract manufacturing in electronics, production under license in pharmaceuticals, international franchising in consumer goods and retail – as they allow MNEs to outsource non-core parts of the value chain, concentrate on higher value added activities, and access low-cost providers benefiting from specialization and economies of scale *(WIR11)*. Although NEMs began in the low value added manufacturing and assembly segments of the value chain, they are common across upstream and downstream segments covering services tasks such as contract research and development (R&D), back-office and customer services.

Decisions by MNEs on how to coordinate and control activities within their international production networks depend on several industry-specific factors. The relative importance of intellectual property has important implications for governance choices, with a higher propensity for the internalization of intellectual-property-intensive activities in GVCs, such as fundamental R&D or the production of active ingredients in the pharmaceuticals industry.

Table IV.4. Dimensions and indicators of international production

Dimension	Indicator	Description
Length/fragmentation of value chains	**Steps**	The number of production stages involved in a specific GVC. The index used in this chapter is equal to 1 when there is a single production stage for the end industry and increases with the number of cross-border intermediate production stages involving the same or other industries.
	Distance	The average linear distance covered in completing the international production process in a GVC, from the initial to the final stage.
Geographical distribution of value added	**Degree of concentration**	The distribution of value added in GVCs across countries. The degree is measured in this chapter by the number of countries that account for 80 per cent of global value added in gross exports of an industry, and/or by the number of countries that account for at least 0.5 per cent of global value added in gross exports of an industry.
	Contribution spread	The number of countries for which a given GVC constitutes an important part of the economy. The threshold used in this chapter is at least 5 per cent of a country's GDP being accounted for by a specific GVC.
Governance/ internalization of value chains	**Relative FDI intensity**	The ratio of the share of FDI of an industry in total FDI to the share of trade of that industry in total trade. Provides an indication of the degree to which an industry relies on internalized production (by MNEs through foreign affiliates) versus trade (both arm's-length and through NEMs of production).
	NEM intensity	The degree to which MNEs in an industry enhance control over GVCs through non-equity modes of international production. The indicator used in this chapter is a qualitative measure (scale 1-5) based on the methodology developed in *WIR11*.

Source: UNCTAD.

Governance modalities are also affected by the complexity of specifications required to produce goods and services, the extent to which such information can be transmitted efficiently (i.e. the feasibility of codifying information and applying technical standards), the capabilities of external suppliers to meet technical product requirements and the enforceability of contracts with suppliers (Benito et al., 2019; Narula et al., 2019).

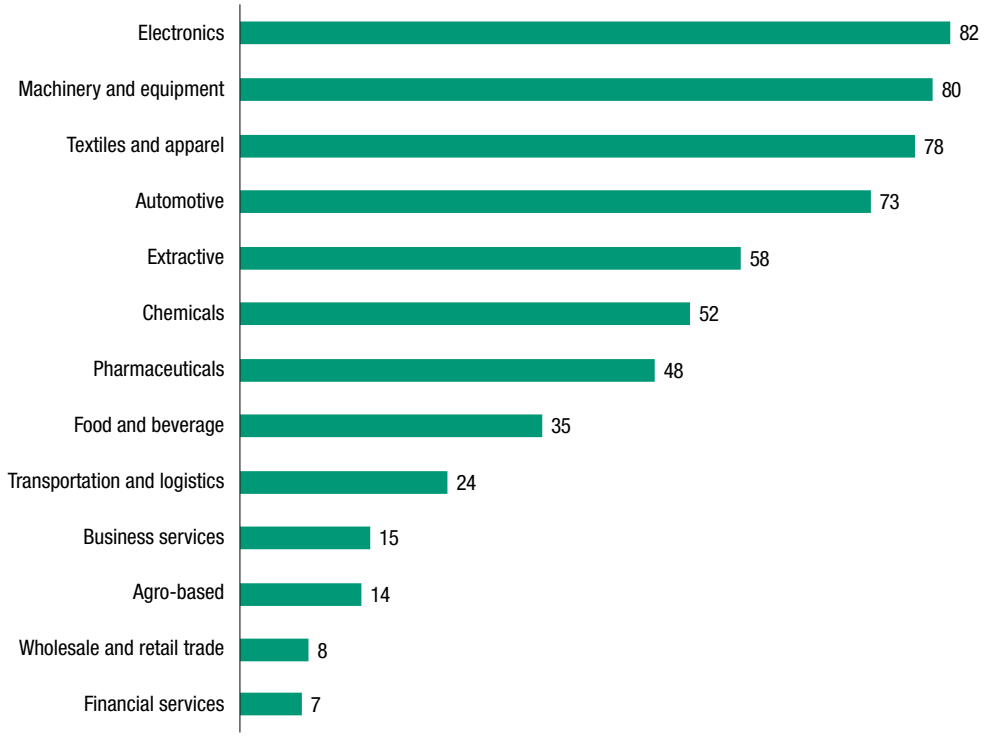
There are numerous approaches to measuring the length of value chains and the geographical distribution of value added and to describing positions on the spectrum of value chain governance options (table IV.4).

2. Industry profiles and archetypes

There is significant variation in the degree of internationalization of industries. Measured by export intensity (exports as a share of total industry output), typical GVC industries, such as electronics, automotive and machinery, rank at the top and industries that typically produce for domestic markets, such as agriculture as well as wholesale and retail, rank at the bottom (figure IV.6).

This chapter primarily takes an industry and economic activity perspective, as opposed to the product perspective of trade and GVC analysis. The industry perspective is ultimately more relevant for investment and investment policy. However, the two perspectives are intertwined: an industry combines multiple GVCs (e.g. the electronics industry produces many different products, each with variations in their value chain), and one GVC spans multiple industries (e.g. the full GVC for cars extends beyond the automotive industry to include extractive industries as well as metals and rubber products upstream and the retail

Figure IV.6. **Degree of internationalization of selected industries**
(Gross exports as a share of output, per cent)



Source: UNCTAD analysis based on Eora26 database.

industry downstream). Most activities in the primary and services sectors are commonly labeled industries (e.g. the oil and gas industry, the finance industry), while in GVC analysis they are regarded as value chain segments.

The high degree of internationalization of the typical GVC industries, as measured by gross exports, is partly driven by double counting of value added in GVCs *(WIR13)*. End products in the electronics industry crossing a border contain many components that have already crossed borders, often more than once, before being assembled. From an investment perspective, some of the industries that appear less internationalized when measured by exports may be as important as the typical GVC industries. For example, business services and chemicals are among the largest industries when measured by FDI stock. From the perspective of international production – the combination of FDI, the activities of MNEs and trade in GVCs – the industries listed in table IV.5a, which exclude the mostly domestic services sectors, can be considered a representative sample.

Table IV.5a provides data on the three dimensions of length, geographical spread and governance across industries, spanning the primary, manufacturing and services sectors, ranging from low-tech to innovation-intensive and including both capital- and labour-intensive industries. The data represent broad industry averages and, by necessity, embody a certain degree of abstraction. They are also affected by the fact that some industries are truncated value chain segments. For example, oil as a commodity traverses three industries analyzed in this report, starting from extractive industries, being processed as part of the chemicals industry, and finally reaching the consumer through the retail industry. Taking an industry perspective also presents challenges in the comparability of some indicators. For example, trade data are not fully compatible with FDI data because the former are product focused while the latter are derived primarily using an activity approach.

Table IV.5a. Key dimensions of international production

	Length/fragmentation of value chains		Geographical distribution of value added			Governance of value chains	
	Steps	Distance	Concentration		Contribution	FDI intensity	NEM intensity
Sector/industry	Number	Km	Number of countries accounting for 80% of value added in gross exports	Number of countries accounting for >0.5% of value added in gross exports	Share of countries in which contribution is >5% of GDP (%)	Share in FDI to share in trade	Prevalence of NEMs on 1-5 scale
Primary							
Agro-based	1.9	1 484	29	34	30	0.2	3
Extractive	1.5	1 402	22	37	12	2.0	2
Manufacturing							
Food and beverage	2.4	1 971	23	35	24	1.4	3
Textiles and apparel	2.6	2 278	20	31	6	0.1	5
Pharmaceuticals	1.8	2 433	21	30	4	2.2	4
Chemicals	2.4	2 911	21	37	36	0.9	2
Automotive	2.8	2 789	12	22	6	0.5	2
Machinery and equipment	2.5	2 457	16	32	37	0.4	4
Electronics	2.6	2 990	14	30	37	0.2	4
Services							
Wholesale and retail trade	1.7	1 083	16	27	55	1.1	2
Transportation and logistics	1.9	1 935	28	41	18	0.8	4
Financial services	1.7	858	18	36	84		1
Business services	1.5	1 203	16	35	82	1.3	1
Median	***1.9***	***1 971***	***18***	***34***	***30***	***0.8***	***3***

Sources: Length from Miroudot and Nordström (2015). Geographical distribution based on UNCTAD analysis using Eora26 database. Share in FDI to share in trade ratio based on UNCTAD calculations using UN-Comtrade and UNCTAD data. NEM intensity based on UNCTAD methodology developed in *WIR11*.
Note: For indicator explanations, see table IV.4.

This issue of data incomparability is more acute in specific industries. For example, trade in financial services encompasses mainly banking and insurance, but investment data for this industry are significantly broader, including finance-related inflows in regional headquarters, back-office functions and financial holdings of MNEs across several industries. These caveats notwithstanding, the indicators discussed subsequently offer important insights into key international production dimensions of different industries and are critical for constructing possible trajectories for the coming years.

The indicators on the length of value chains show the extent to which factors such as modularity, economies of scale and specialization, and innovation intensity can affect the fragmentation of international production across industries. The automotive industry displays the longest value chain length, with the highest proportion of foreign value added and a typical organization of production in a multi-tiered structure led by an original equipment manufacturer (OEM) with several layers of suppliers. The pharmaceutical industry, in comparison, has a shorter value chain, with few steps, if any, between high value added upstream activities and the production and packaging of medication close to markets.

Each industry has unique structural characteristics driving its configuration, such as resource needs, relative capital and technology intensity, and tradability of products and services. In addition, policy frameworks, including rules governing investment and trade, intellectual property rights, and soft standards on social and environmental issues, affect each industry differently. As a result, there is also significant variance in the geographical distribution of value added across selected industries. The agro-based industry, for example, is characterized by low capital and technology intensity, high tradability and facilitative policy frameworks. It is thus one of the most geographically dispersed industries across all indicators. In contrast, on account of higher technological barriers to entry and

Table IV.5b. Key dimensions of international production, memorandum items

Sector/industry	FDI		Trade		GVC intensity		Top 100 MNEs	
	Stock ($ billions)	Share of total (%)	Gross exports ($ billions)	Share of total (%)	FVA as share of exports (%)	GVC trade as share of total trade (%)	Number from industry	Average TNI (%)
Primary								
Agro-based	89	0.5	522	2.3	12	34	0	62
Extractive	1 963	9.7	1 106	4.8	7	48	6	68
Manufacturing								
Food and beverage	1 213	6.0	979	4.3	22	34	6	83
Textiles and apparel	39	0.2	730	3.2	25	40	1	78
Pharmaceuticals	1 178	5.8	585	2.5	26	34	11	67
Chemicals	1 607	8.0	2 138	9.3	31	56	13	62
Automotive	668	3.3	1 454	6.3	34	48	12	63
Machinery and equipment	460	2.3	1 416	6.2	30	48	2	62
Electronics	592	2.9	2 791	12.1	30	50	10	68
Services								
Wholesale and retail trade	2 788	13.8	1 796	7.8	10	38	6	60
Transportation and logistics	741	3.7	1 059	4.6	17	38	2	69
Financial services			445	1.9	7	34	0	11
Business services	4 119	20.4	3 596	15.6	7	34	15	63

Sources: Gross exports data from UN Comtrade. FVA as a share of exports based on UNCTAD analysis using Eora26 database. GVC-related trade proxied by proportion of exports that cross more than one border and based on UNCTAD analysis using Eora26 database; for industries without direct corresponding industry in the database, calculations are based on aggregation, disaggregation or expert assessments. Representation in top 100 MNEs from UNCTAD Top 100 MNE database (see chapter I).

Note: FVA = foreign value added. FDI stock data for finance not comparable due to accounting issues and thus removed from total FDI stock data for industry share calculations.

stringent intellectual property standards, the electronics industry has a significantly lower geographical concentration, with only 14 countries contributing to 80 per cent of value added in global exports. There are also notable differences in these industries with regard to the relative importance of each industry in national economies, which indicates the degree of opportunity for additional countries to increase their participation. The chemicals industry contributes at least 5 per cent of GDP in 36 per cent of countries in the world whereas the much more concentrated automotive industry contributes that amount in only 6 per cent of countries. The opportunity for countries to participate in chemicals GVCs is thus higher because of the pre-existing domestic production capacity.

The length and geographic spread of value chains is also a function of whether production networks are global or regional in nature. Previous analysis of value added in trade has shown that value chains are often more regional than global *(WIR13)*. In the last few years, the regional nature of value chains has intensified even further in East Asia and North America, although it has lessened in Europe (Miroudot and Nordström, 2019; Santos-Paulino et al., 2019). For some industries, a high share of regional value chains means that production stages are concentrated within a region while producing for global markets (e.g. in the electronics industry). Other industries have an equally fragmented value chain, with most production stages concentrated within a regional structure and producing mostly for the region (e.g. in the automotive industry). The result, in the latter case, is that value added is more distributed because of the replication of value chain structures.

Differences in prevalent governance modalities across industries are equally significant. The relative importance of intellectual property and capital intensity translates into much higher degrees of internalization through FDI, e.g. in the pharmaceutical industry, while economies of specialization and scale, the possibility to codify knowledge and product

specifications, and transaction costs determine the relative usage of NEMs as opposed to arm's-length trade – which is highest in textiles and apparel and common in electronics, machinery and automotive. The FDI intensity indicator shows that the textiles and apparel value chain has very low levels of FDI stock in comparison to the importance of the industry in international trade. A large part of the textiles and apparel GVC relies on outsourcing to contractors in locations with low labour costs. The industry makes extensive use of NEMs because textiles and apparel are not especially intellectual-property-intensive and rely mostly on easily transmittable product designs – notwithstanding the intra-industry differences, with the textiles segment more capital intense and concentrated, and the apparel segment more dispersed. This is in stark contrast to the pharmaceutical GVC, which has the diametrically opposite requirements of the textile and apparel industry in terms of precise quality controls, high importance of intellectual property and reliance on tacit knowledge. As a result, production networks in the pharmaceutical GVC are driven to a significantly higher degree by FDI than by trade. Broadly, as a general trend, the governance modalities are gradually skewed towards FDI rather than trade in industries that are more innovation- and technology-intensive.

The indicators of length, geographic distribution and governance choices discussed here ultimately drive the global trends of GVCs, trade and FDI that are presented in table IV.5b. However, there are myriad other factors involved, which necessitates a nuanced approach to analyzing these links. The relative positioning in GVCs of individual industries has important implications. For example, agro-based and extractive industries are more upstream; they have low foreign value added in exports despite having high levels of both trade- and GVC-related trade. Services industries, including business services, financial services and transport and logistics, serve as inputs into GVCs of other industries. Their FDI levels are inflated by overseas services activities dispersed across all industries. FDI in financial services, especially, encompasses investment in the finance functions of MNEs in all industries, not just those in banking and insurance services. FDI in retail and trade is further skewed by real estate values, a factor less relevant in other industries.

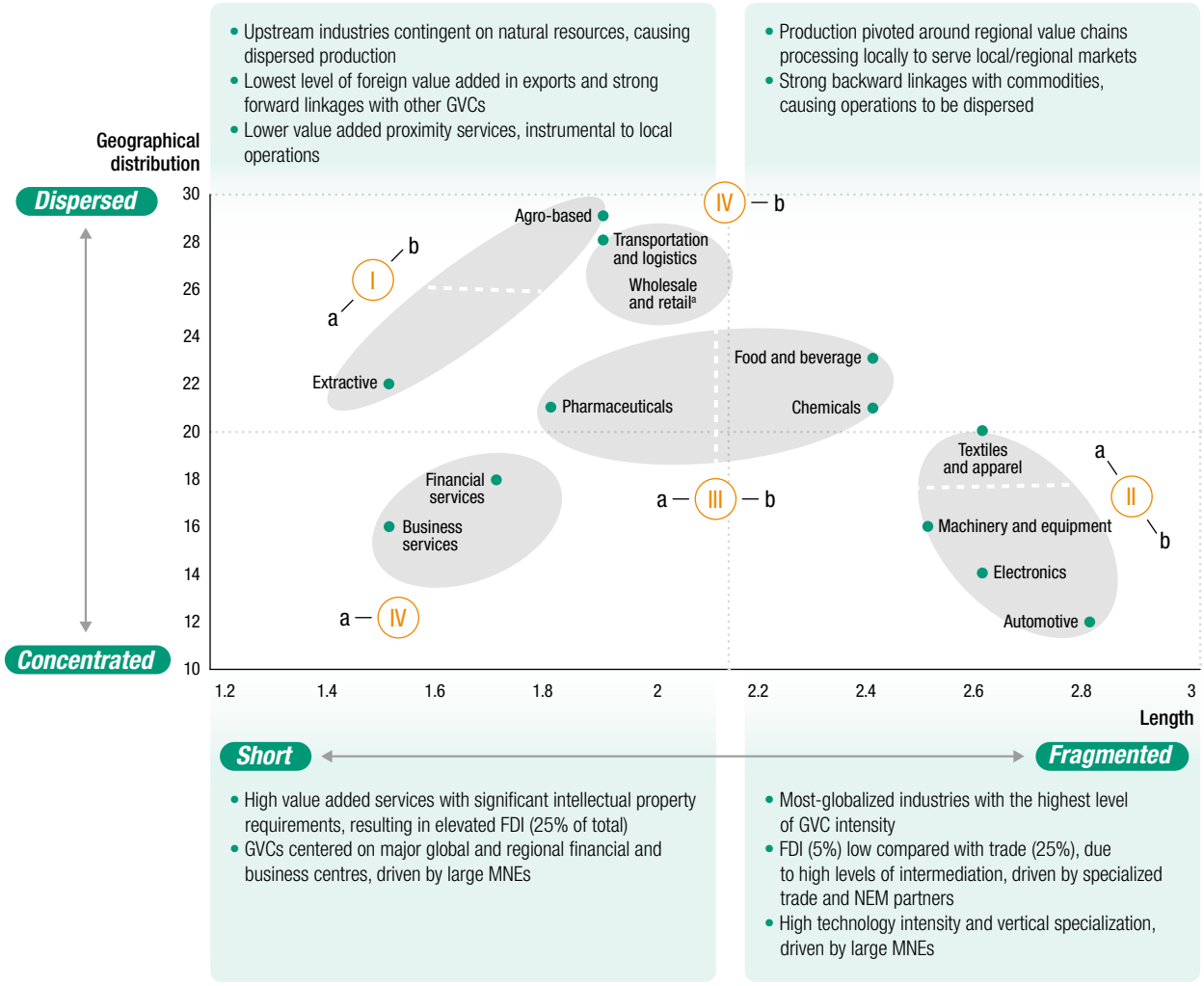
Despite the nuances and caveats discussed here, it is possible to distinguish several industry groupings based on common patterns in their configuration of international production, i.e. the length and geographic spread of value chains and governance modalities, yielding archetypical configurations (table IV.6). Archetypical international production configurations hide significant differences within industries, depending on market segments, value chain segments and individual firm strategies, but they share some common characteristics (figure IV.7).

Table IV.6. Archetypical international production configurations

Archetypes	Selected industries	Length/ fragmentation	Geographical distribution of value added	Governance (FDI intensity)
Primary industries				
Capital intensive	Extractive	Short	Concentrated	High
Less capital intensive	Agro-based	Short	Distributed	Low
GVC-intensive industries				
High-tech	Automotive, machinery and equipment, electronics	Long/fragmented	Concentrated	Low
Low-tech	Textiles and apparel	Long/fragmented	Distributed	Low
Geographically distributed industries				
Regional processing	Chemicals, food and beverage	Long/fragmented	Distributed	High
Global hub and spokes	Pharmaceuticals	Short	Distributed	High
Services industries connected to GVCs				
Lower value added	Transport and logistics, wholesale and retail	Short	Distributed	Low
Higher value added	Financial services, business services	Short	Concentrated	High

Source: UNCTAD.

Figure IV.7. Length and geographical distribution of international production and key archetypes



Source: UNCTAD.

[a] The positioning of the wholesale and retail industry relative to the dimension of "Geographical distribution" is indicative of the expected distribution of operations of international wholesalers and retailers. It does not reflect the value reported in table IV.5a, which is characterized by a more narrow scope.

I- Primary industries	II- GVC-intensive	III- Geographically distributed	IV- Services industries connected to GVCs
a: Capital intensive	a: Low-tech	a: Global hub and spokes	a: Higher value added
b: Less capital intensive	b: High-tech	b: Regional processing	b: Lower value added

C. MEGATRENDS AFFECTING INTERNATIONAL PRODUCTION

Megatrends driving the transformation of international production can be grouped under three main themes: technology trends and the NIR, global economic governance trends, and sustainable development trends. Many different developments occur in each of these areas. This section will focus on those trends that are expected to have the most significant impact on international production configurations (table IV.7).

1. Technology and the NIR

Three key technology trends of the NIR will shape international production going forward: robotics- and artificial intelligence (AI)-enabled automation, enhanced supply chain digitalization and additive manufacturing (3D printing). Each of these technologies will have distinct effects on the length, geographical distribution and governance of GVCs. Each technology, depending on industry-specific deployment, will flatten, squeeze or bend the "smile curve" of international production in its own way.

a. Key NIR technologies transforming international production

Technological changes are transforming the way goods and services are produced, paving the way to the NIR (UNCTAD, 2018a), also called the fourth industrial revolution or Industry 4.0 (Schwab, 2016). The notion of the NIR originally applies to manufacturing, but it can be extended to cover technological transformation in services.

Table IV.7. Megatrends shaping the future of international production

	Trends	Key elements
Technology/ New Industrial Revolution	• Advanced robotics and AI • Digitalization in the supply chain • Additive manufacturing (3D printing)	• Industrial automation, AI-enabled systems ("white collar" robots) • Platforms, cloud, IoT, blockchain • Distributed manufacturing, mass customization, commodification of production
Policy and economic governance	• More interventionism in national policies • More protectionism in trade and investment • More regional, bilateral and ad hoc economic cooperation	• Industrial policies, competition policy, fiscal policy • Tariffs and non-tariff measures, shielding of strategic/sensitive industries • Trade deals among select groups and on common-ground issues
Sustainability	• Sustainability policies and regulations • Market-driven changes in products and processes • Physical supply chain impacts	• Major green plans (and varying implementation timelines), carbon border adjustments • Increased reputational risks and demand for sustainably produced goods and services • Supply chain resilience measures, changing sources of agricultural inputs

Source: UNCTAD.

The set of technologies driving the NIR includes robotics, the internet of things (IoT), 3D printing, cloud computing and several others. These technologies can be grouped in various ways for analytical purposes, but the key feature of the NIR is the integration and interaction between technologies.

To address the impact on the future of international production, this section discusses three broad categories: digitalization, automation and 3D printing.[3] This classification leverages the two major forces driving the NIR: the use of digital technologies in production processes (digitalization) on the one hand, and the employment of machines to replace physical labour (automation) on the other. While in the NIR digitalization and automation work synergistically to disrupt traditional patterns of production, their impact on international production may differ, and even push in opposite directions (van Tulder et al., 2018). 3D printing is an example of synergy between digitalization and automation that has specific implications for international production. NIR technologies are heterogeneous in terms of technological scope, adoption across industries and technical and market maturity (table IV.8).

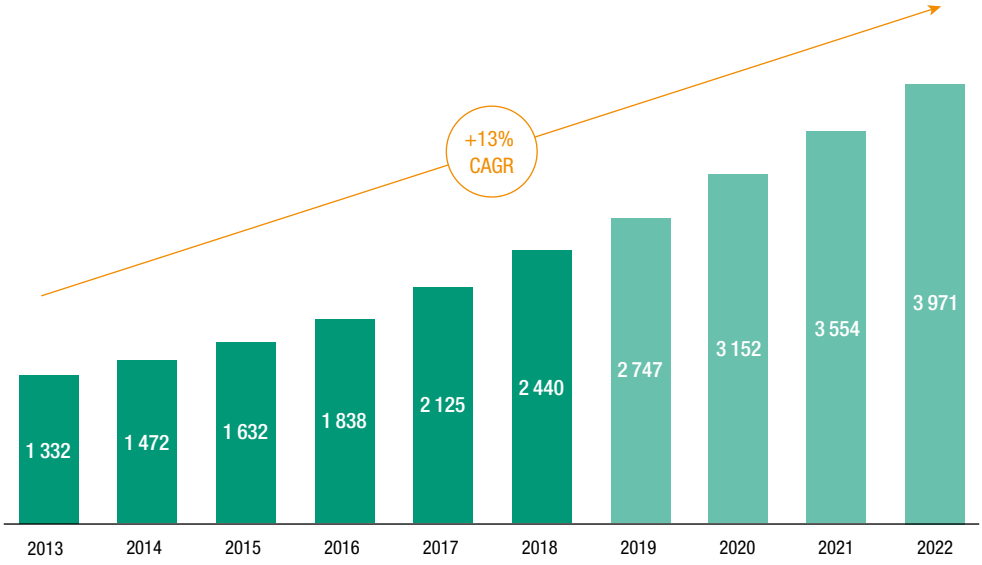
Digitalization covers the frontier of internet-based technologies: the Internet of Things (IoT), the cloud, augmented and virtual reality (AR and VR), and platform-based technologies, including e-commerce, fintech and blockchain (UNCTAD, 2019a). Big Data analytics are also instrumental in and enabled by digitalization. Although widely applied to all industries, these technologies are intrinsically linked with services; they actually provide intangible services. When employed in manufacturing, they boost the service component of manufacturing, a process known as servicification of manufacturing. All together digital technologies are a prominent component of the NIR. However, the individual technologies stand at different stages of development and business penetration. Whereas the IoT is already widely adopted – its deployment in the automotive industry is expected to reach a value up to $750 billion annually by 2025 – blockchain applications are still limited.

Table IV.8. High-level classification of NIR technologies

	Industry focus	Prospects
Digitalization: • IoT • Cloud • Artificial reality and virtual reality • Platforms (blockchain, e-commerce, fintech) • Big Data analytics	Applied to **all industries**	The combined market of the IoT (IoT and analytics revenues) **more than doubling in five years,** from $240 billion in 2017 to $520 billion in 2021.
	Focus on **data** and **intangible services;** servicification of manufacturing	
Automation: • Advanced industrial robotics • AI-enabled robotics	Mainly **manufacturing and low-value services**	Stock of **industrial robots tripling in 10 years,** from 1.3 million in 2013 to 4.0 million in 2022.
	Application to higher-value services at the early stage, with potential for future growth	Stock of professional service robots **nearly quadrupling in four years,** from 270,000 units in 2018 to 1 million units in 2022 (mainly logistical and medical robots).
3D printing	**Niche manufacturing** products (rubber and plastics products, specific components)	The market size of **additive manufacturing growing 10 times in 10 years** from $5 billion in 2015 to $50 billion in 2025, up to over $350 billion in 2035 (CAGR 2015-2035: > 20%).
	Application to mainstream industries (food, pharmaceuticals, textiles, electronics) very limited, with potential for future growth	

Source: Figures on IoT from Bain & Company (2018); on industrial and service robots from the International Federation of Robotics (2019a; b); on additive manufacturing from The Boston Consulting Group (2017).

Figure IV.8. **Operational stock of industrial robots, 2013–2018 and 2019–2022 forecast** (Thousands of units and compound annual growth rate)



Source: International Federation of Robotics.

The total spending for blockchain applications in Europe in 2018 was estimated at only $400 million, with an expected increase in 2022 of up to $3.5 billion.

Automation relies on the use of advanced robots, the new generation of industrial machines. Application of robotics to manufacturing, including some low value added services such as transportation and logistics, is very different from its application to services (Baldwin, 2019). Advanced industrial robots employed in manufacturing essentially require mechanical and computing power; within the framework of the NIR, this basic setting may be augmented by digital technologies to make operations as connected as possible. The penetration of advanced industrial robots is already very large in some industries – such as automotive or electronics – and it is expected to grow further quickly (figure IV.8). The application of robotics to medium- and high-value services instead involves the use of AI-enabled and intelligent robots. The replacement of human labour with intelligent robots in services is still at a very early stage but growing quickly. The stock of professional services robots – mainly logistical and medical robots – is expected to grow from 270,000 units in 2018 to a million units in 2022 (International Federation of Robotics, 2019b). Over the next 10 years, there will be further progress towards "white collar" robots but, overall, services will be less exposed to automation than manufacturing will.

3D printing is the technology to manufacture a solid object from a digital design. It works by adding layers of material to construct an object ("additive manufacturing"). There is a significant variety of 3D printers, from low-cost, open-source printers for private or small-scale production to high-end, patented machines for industrial-scale printing. Currently, 3D printing is used to produce a limited set of products, including some rubber and plastic products, non-metallic mineral products and components. The nature of the industrial process, particularly the type of input material, represents a constraint on application. Natural materials such as solid wood, cork, leather, natural textiles, paper and tobacco products are largely unsuitable as filament for 3D printing. Also, in some industries such as food products, pharmaceuticals, electronics and textiles, although there are no technological constraints, the use of 3D printing is currently still limited due to considerations of economic feasibility.

b. How technologies reshape international production configurations

The three technology trends each affect international production configurations in specific ways (table IV.9). They do so through the determinants of the length, geographical distribution and governance of value chains (see table IV.3).

(i) Digitalization and international production

The application of digital technologies results in more integrated production processes, a reduction in governance and transaction costs, more effective coordination of complex value chains and improved bottom-up access to GVCs for small and medium enterprise (SME) suppliers. For example, IoT-enabled connected machines enable better capacity planning and assessment of the usage and functionality of products. It provides large amounts of real-time data ("Big Data") from smart products to inform and optimize the production process. Big Data analytics, enhanced by cloud storage and computing, can leverage external sources of information. The development of powerful AI-based predictive techniques enables better planning and management of dispersed operations, reducing uncertainty and risks.

E-commerce platforms and online marketplaces make market transactions easier and more transparent. On the supply side, companies purchase material inputs and services more efficiently. More suppliers can access GVCs, including small suppliers and suppliers from geographically peripheral areas. Downstream, the commercialization of products can reach remote markets without a physical presence. Extended disintermediation reduces transaction costs and value leakage along the value chain *(WIR17)*. Digital payments and fintech favor smoother and safer cross-border transactions and financing.

Digital technologies are also instrumental in the rise of the service content of manufacturing. On the one hand, the IoT and Big Data can increase the service content used in the manufacturing of the final product (embodied services). On the other, new services are added to the final product, generally with a major digital component (embedded services). Both these effects greatly increase the share of services in trade and GVCs.

The impact of advanced ICT is not confined to the coordination of physical machines and operations in manufacturing processes but also involves human tasks and services.

Table IV.9. Technology trends and determinants of international production

	Impact on determinants of GVC length, geographic distribution and governance
Digitalization in the supply chain	• Lower governance and transaction costs in dealing with external partners in supply chains supports *modularity* • Improved coordination and control of dispersed supply chains reduces *transaction costs and risks* • Increased importance of customer data and product customization s*hifts value to the end of the chain*
Advanced robotics and AI	• Cheaper industrial and AI-driven robots reduce the need to exploit *arbitrage opportunities on labour costs* for both manufacturing and services • High capital costs of robots increase *economies of scale and concentration* • Higher *IP intensity* in the production process favours internalization
Additive manufacturing (3D printing)	• End-to-end (indivisible) production process reduces *modularity* • Replication in multiple locations allows *geographic dispersion*, proximity to market and high degrees of product *customization* • Reduced *IP intensity* of production, *concentration of IP value* in design

Source: UNCTAD.

Advances in teleconferencing, as well as in virtual and augmented reality, make teleworking an increasingly viable option, accelerating the physical separation between service labour and service activities (Baldwin, 2019). Cloud storage and computing make it possible to carry out complex, data-intensive tasks from standard personal computers, while improvements in translation software largely overcome language barriers.

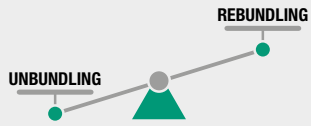
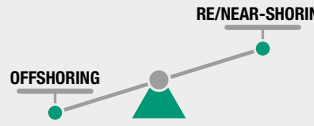
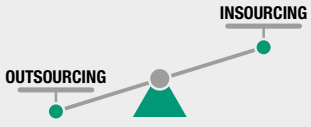
Unbundling, offshoring and servicification lead to a bigger role for external providers, operating either at arm's length or under a NEM arrangement (table IV.10). Lower transaction costs increasingly shift the balance towards outsourcing in MNEs' decisions to "make or buy" (Elia et al., 2019).

Digitally enhanced GVCs strengthen the role of large digital MNEs – the major global platform providers – in providing the enabling infrastructure *(WIR17)*. Digitally enhanced international production networks tend to concentrate more value in a few developed economies, particularly in the United States, and exhibit a distinctly "asset-light" international footprint (Bolwijn et al., 2018; Casella and Formenti, 2018).

Digitalization not only affects the length, geographic distribution and governance of the value chain, but also reshapes its value added configuration (figure IV.9). Digital technologies, such as the IoT and Big Data, emphasize the importance of intangibles in the value chain, particularly R&D and innovation on the upstream side and market data and intelligence downstream, shifting value added towards the extremes of the smile curve (Garay-Rondero et al., 2019). The concurrent commodification of lower value added services and the servicification of manufacturing contribute to flatten the central part of the curve.

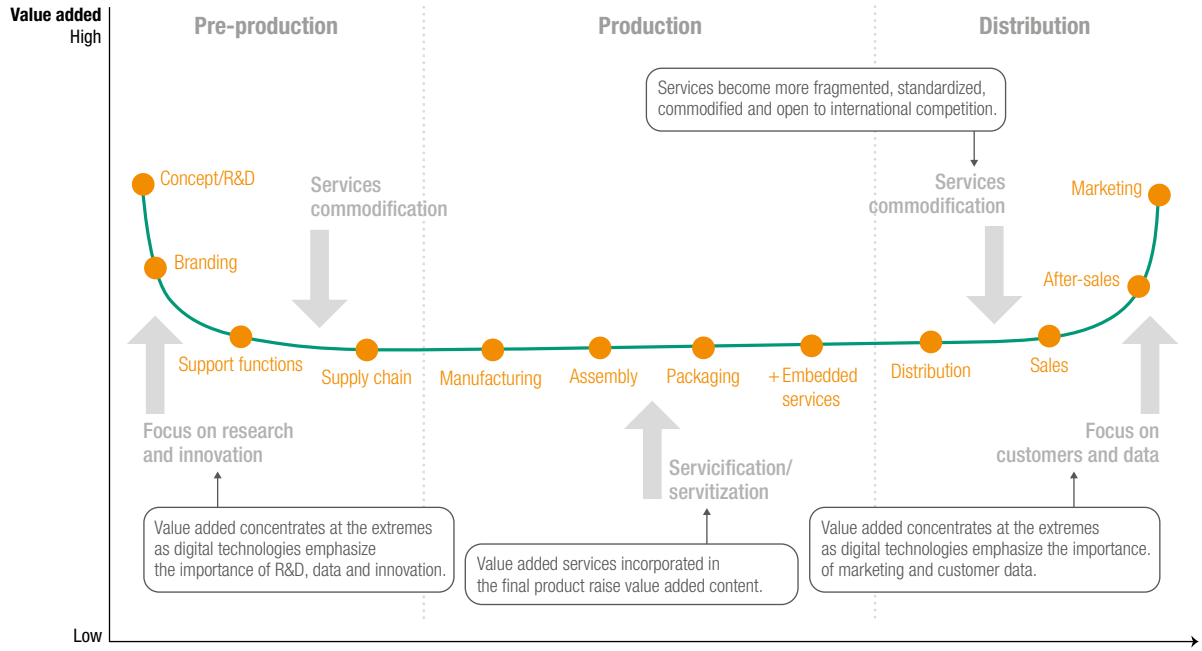
The resulting model is highly polarized between a niche of high value added knowledge- and data-intensive services, typically internalized and retained onshore by the lead MNE, and many fragmented, offshored and outsourced low value added activities. This configuration has critical development implications. Although digitalization can work as a vehicle for inclusiveness, for example by allowing broader access to GVCs for developing-country suppliers, it also tends to exacerbate the value added gap between countries at different stages in the GVC development ladder, making upgrading and catching-up more challenging (*WIR13;* UNCTAD, 2019a).

Table IV.10. Digitalization in the supply chain: international production impact

Binary trends	Description	Impact on key indicators
	• Digital technologies favour servicification and introduce new mechanisms for coordination and control in fragmented supply chains	FDI (=) GVC trade (=) Trade in goods (=) Trade in services (+)
	• New digital technologies favour faster, more effective and safer (e.g. through blockchain) remote communication, coordination and control	
	• Services increasingly outsourced to NEMs and third-party providers; role of third parties in production also increases due to servicification	

Source: UNCTAD.

Figure IV.9. Impact of digitalization on value added



Source: UNCTAD.
Note: Servicification is intended as carrying out manufacturing as a service, in a contract manufacturing relationship. Servitization is intended as the incorporation of embedded services in products.

(ii) Automation and international production

MNEs, mainly from developed economies, have offshored many production processes over the last 30 years to exploit differences in labour costs. Labour cost arbitrage has been one of the major forces, if not the major force, shaping modern patterns of international production and GVCs.

The increasing availability of cheaper industrial robots has the potential to revert this trend. It will reduce, potentially dramatically, the competitive advantage of low-cost manufacturing hubs in developing countries. This effect, coupled with the increase in the cost of labour in emerging markets and rising geopolitical risks, may trigger a wave of reshoring of manufacturing activities (table IV.11).

Several considerations put the reshoring trend in some perspective. First, automation is not going to affect all manufacturing industries equally. The use of industrial robots is still confined to few industries, such as automotive and electronics. For these industries, the two key dimensions of technical feasibility and economic feasibility point toward increasing adoption of robots (UNCTAD, 2017). In other industries, such as textiles and apparel, robots are not yet taking hold because the employment of human labour is still economically more convenient than robotization and the technical feasibility of robots handling soft materials is only just emerging. By 2030, it is expected that more advanced, efficient and productive robots will improve the technical and economic feasibility of robotization across the board. Still, the employment of robots, and related to that, the opportunities for reshoring will remain highly heterogeneous across industries and activities.

Second, the link between automation and reshoring mainly builds on the expectation that as labour costs become less important as a share of total costs, MNEs will automatically reshore production in search of the technologies and skills needed to support robotization.

Table IV.11. Automation in the supply chain: international production impact

Binary trends	Description	Impact on key indicators
UNBUNDLING – REBUNDLING	• Advanced industrial robots can perform complex integrated sequential tasks, generally leading to a rebundling of previously separated steps	FDI (–) GVC trade (–) Trade in goods (–) Trade in services (=)
OFFSHORING – RE/NEAR-SHORING	• Robots reduce the need for MNEs to exploit arbitrage opportunities based on labour costs, leading to reshoring of manufacturing operations from developing to developed and higher-income emerging economies	
OUTSOURCING – INSOURCING	• High capital investment requirements and reshoring are likely to reduce the role of smaller third-party suppliers in favour of more direct governance by MNEs	

Source: UNCTAD.

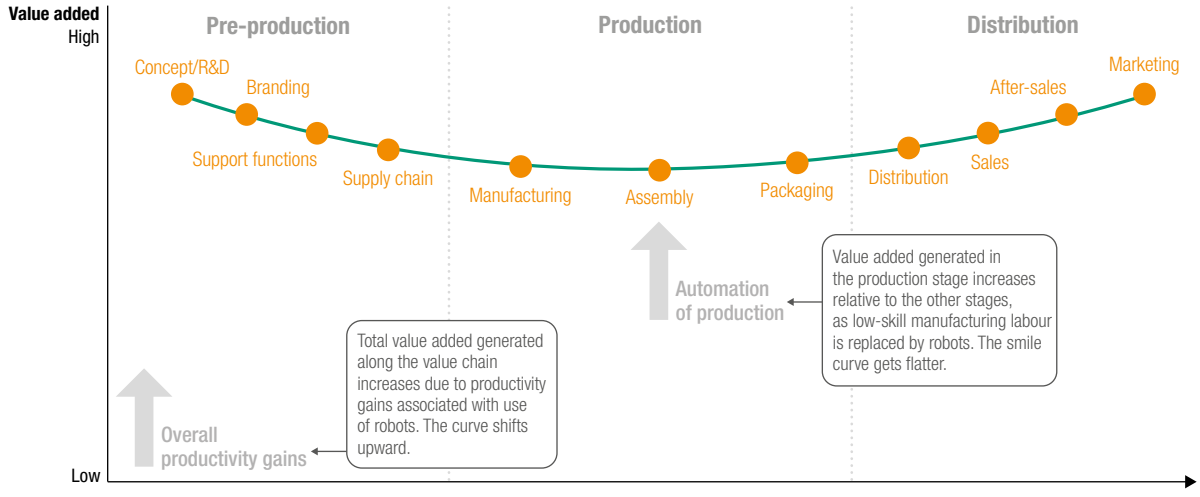
This is not the only possible scenario. Several large manufacturing hubs, for example India, Brazil and Mexico, in addition to China, already have a significant stock of industrial robots (Hallward-Driemeier and Nayyar, 2017). MNEs with local production in these countries may decide to stay, to benefit from the available skills base and to minimize disruptions.

These arguments explain why, to date, technologically driven reshoring has been quite limited (De Backer et al., 2016). Over the next 10 years it seems likely that the trend towards reshoring will intensify, but it will not affect all industries and countries equally.

The impact on development of reshoring is not as clear-cut as it appears. Productivity gains generated by automation in developed economies can increase the demand for intermediate inputs, many of which would continue to be sourced from less developed countries (Antràs, 2019).

Reshoring is by far the most relevant effect of automation on international production and GVCs. But automation will have an impact on the length and governance of GVCs as well

Figure IV.10. Impact of automation on value added



Source: UNCTAD.

(Artuc et al., 2018). Advanced industrial robotics make it possible to perform complex sequences of tasks, generally leading to a rebundling of steps. In terms of governance, while robots become relatively cheaper, they still require significant capital investment. Capital investment, together with reshoring, is likely to reduce the role of smaller third-party suppliers in favour of more direct governance by MNEs (Narula, 2019). Stronger MNE control driven by reshoring, however, does not generally translate into more FDI as it would instead involve a stronger presence in home countries.

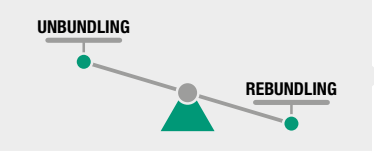
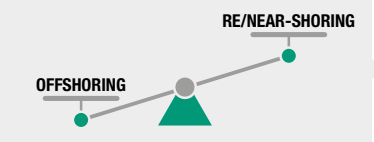
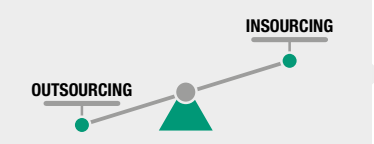
In addition to the reshoring and rebundling of activities, automation affects the distribution of value added across the value chain (figure IV.10). Value added in the manufacturing stage increases as robots replace low-skill manufacturing labour; the smile curve gets flatter. Furthermore, the productivity gains associated with the use of robots shift the entire curve upward.

(iii) 3D printing and international production

3D printing is potentially one of the most revolutionizing technologies for global value chains (Laplume et al., 2016; Buonafede et al., 2018). The main limit to the disruptive power of 3D printing is its technical and economic feasibility; unlike digitalization and automation, which are expected to affect all industries to some degree, 3D printing in 2030 is likely to be still confined to selected industries or niche segments within industries. Where applicable, it has the potential to reshape GVCs, changing their geographic span and distribution (Laplume et al., 2016; Rehnberg and Ponte, 2018). GVC-intensive industries organized in long, vertically disintegrated value chains for which additive manufacturing would imply the rebundling of many steps, such as footwear, may undergo dramatic changes. For other industries, like pharmaceuticals, which already rely on shorter and more distributed production networks, the transition will be smoother but still significant.

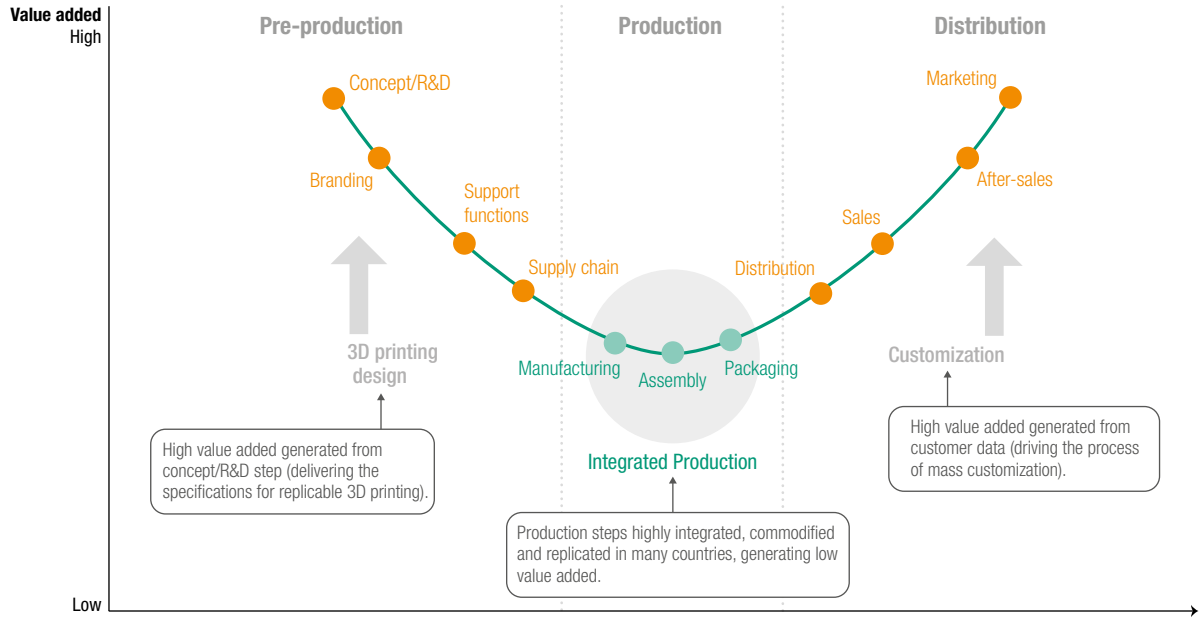
Overall 3D printing points to a configuration of international production characterized by small-scale, localized production. This takes place through the simultaneous effects of rebundling and offshoring (table IV.12). The convergence of rebundling and offshoring marks a paradigm shift in international production, which historically has been based on the dichotomy between unbundling and offshoring on the one hand and rebundling and reshoring on the other.

Table IV.12. 3D printing in the supply chain: international production impact

Binary trends	Description	Impact on key indicators
	• 3D printing technologies imply inseparability, resulting in a rebundling of manufacturing stages	FDI (−) GVC trade (−) Trade in goods (−) Trade in services (+)
	• 3D printers enable distributed manufacturing with significantly increased geographic dispersion of activities (but not necessarily value added)	
	• Actual operations of distributed manufacturing sites and supporting services can be outsourced	

Source: UNCTAD.

Figure IV.11. Impact of 3D printing on value added



Source: UNCTAD.

Rebundling follows mainly from a technology constraint. 3D printing implies technological inseparability. The concept of additive manufacturing requires performing all manufacturing steps from the raw material to the end-product in one step. The impact on the length of value chains depends on the printed product – whether it is the final good or some intermediate input into a longer value chain. In both instances, 3D printing leads to a shortening of the value chain (Buonafede et al., 2018). In this context, rebundling does not involve only manufacturing stages but also parts of lower value added services, such as the stages related to the supply chain, distribution and sales.

Offshoring is the second main aspect of the 3D printing transformation of GVCs because the printers enable distributed manufacturing with a significant increase in geographic dispersion. The distributed production model originates from the disruption of two key pillars of recent patterns of international production: labour cost arbitrage and economies of scale.

3D printing is a special instance of automation. Similar to robotics, it reduces the labour component in production. By freeing international production decisions from labour cost considerations (efficiency-seeking), it favours internationalization strategies based on proximity to market (market-seeking). The transition from efficiency-seeking and vertically specialized to distributed market-seeking value chains is also favoured by relatively limited capital cost differentials across countries (Laplume et al., 2016). Overall, the weight of factor cost differentials in internationalization decisions becomes smaller.

3D printing enables the shift from mass production and economies of scale to *mass-customization*. In 3D printing, value added stems from the design/programming phase – delivering the specifications for replicable 3D printing – and the customer-related activities, addressing the clients' needs (figure IV.11). The manufacturing step tends to be a highly commodified, low value added activity replicated in many countries. Relatively low-cost standard 3D printers make the creation of small batches economically feasible, lowering the minimum requirements for efficient technical scales. At the same time, 3D printing makes it possible to produce a significant variety of product at no additional marginal cost – a technological breakthrough compared to traditional manufacturing. The focus and source of value switches then from economies of scale to economies of scope.

The 3D printing model is compatible with a governance structure characterized by outsourcing and dispersed, bottom-up governance. While 3D printing technology is generally data- and intellectual-property-intensive, potentially resulting in strong MNE control at the extremes of the smile curve, the central bulk of the supply chain – the actual operation of the 3D printers and the services directly instrumental to production – are liable to be locally outsourced in a distributed production setting. Household 3D printing and local 3D printing shops are examples of this trend.

Distributed manufacturing is probably the most interesting outcome of 3D printing but certainly not the only feasible one. 3D printing can also lead to rebundling and reshoring. For example, the production of hearing aids – a segment where the adoption of 3D printing is ubiquitous – has become concentrated in a few high-income countries (Switzerland, Singapore and Denmark) and some emerging hubs (China and Mexico) (Freund et al., 2018). The choice to concentrate as opposed to distribute depends on several factors. In the case of hearing aids, major drivers include the availability of skilled labour, the high cost of specialized 3D printers, the possibility of remote customization and the ability to make small volumes and minimize the impact of trade costs.

2. Policy, sustainability and COVID-19

The pace and extent of adoption of the key technologies that will reshape international production will depend in large part on the policy environment for trade and investment, which is trending towards more interventionism, rising protectionism and a shift away from multilateral to regional and bilateral policy frameworks. They will also depend on sustainability concerns affecting the economics of international production, including differences in approach between countries and regions on emission targets and environment, social and governance (ESG) standards, market-driven changes in products and processes, and supply chain resilience measures.

a. Policy and economic governance trends

There has been a tangible shift in the last few years from a laissez faire economic approach in many economies to an increasingly interventionist role for the State. The rate of adoption of both formal industrial policies and individual policy measures aimed at stimulating industrial sectors has accelerated markedly. Over the past decade, at least 110 countries have issued industrial policy statements or explicit policy frameworks for industrial development. Governments are using targeted industrial policies not only for economic development and job creation, but also to respond to myriad contemporary challenges, such as regional development and poverty reduction, participating in the technology revolution or in GVCs, and achieving sustainability goals *(WIR18, WIR19)*.

Industrial policies have become commonplace among not only developing but also developed countries. Policies to push productivity growth in sectors key to industrial development – manufacturing first and foremost, but also adjunct services and supporting infrastructure – are widely considered indispensable to generate economic growth and jobs. Developing countries are often motivated by concerns of premature deindustrialization. In contrast, developed countries are adopting measures aimed at rebuilding their manufacturing base (incentives, subsidies, public investment in advanced manufacturing to increase internal production capacity) and at strategic positioning in advanced technology areas. Special economic zones (SEZs), an industrial policy tool that relies on the attraction of FDI, continue to proliferate and diversify around the world (Narula and Zhan, 2019).

There are now more than 5,400 SEZs across nearly 150 economies, up from 4,000 in 2015, and hundreds more are in the planning stage. They are both a response to and a cause of increasing competition for FDI between countries and regions *(WIR19)*.

Moreover, industrial policies are increasingly targeting industries considered strategic not only for job creation and long-term economic growth and development prospects, but also for (broadly interpreted) national security reasons. The strategic importance of the pharmaceutical and medical equipment industries, for example, with their reliance on cutting-edge research and innovation, could see progressively more countries enacting policies to develop national productive capacity.

Interventionist policies are increasingly aimed at promoting value addition in targeted sectors of international production. Modern industrial policies often support concentration and clustering of know-how and technology in capital- and innovation-intensive industries, so as to competitively integrate modular value chains to enhance value capture. For example, in recent years there has been explosive growth in high-tech SEZs *(WIR19)*. Some countries actively target transfer of technology and upgrading of domestic manufacturing capacity through trade and investment facilitation programmes. In the European Union (EU), a $7 billion plan was launched in 2017 to produce electric vehicle (EV) batteries jointly by German and French firms on the model of Airbus, including through $1.5 billion of public subsidies targeting this strategically important industry. This approach to capturing a share of the international production pie, especially in strategically important and technology-intensive industries, will tend to support a trend towards a few large clusters where technology and know-how for the most valuable GVCs are concentrated. The trend is not exclusive to developed regions. Some clusters already exist in Asia, e.g. electronic components, batteries, semiconductors and display panels in China and the Republic of Korea, and IT services in India. Developed economies and emerging markets are thus no longer catching up, but instead are simultaneously vying for global leadership in high-tech and strategic GVCs.

The increase in interventionism in national policies has gone hand in hand with more protectionism in trade and investment around the world. Trade tensions are already reshaping the international production landscape. An increasing number of countries are taking a more critical stance towards foreign investment.

New investment restrictions or regulations in the last few years often reflect concerns about national security and foreign ownership of high-tech firms, strategic assets, land or natural resources. Several countries have heightened scrutiny of foreign takeovers or are considering new investment screening procedures. National security arguments are now widely used to safeguard national interests, core technologies and know-how, which are considered paramount for national competitiveness. In the coming years, intellectual property in certain industries, such as financial services, telecommunication, electronics, bio-tech and even agriculture, is likely be guarded ever more rigorously, potentially resulting in new investment restrictions. The recent adoption by the EU of the Directive on Cross-Border Mobility, which expands the screening of takeovers, is part of a broader trend. Some countries have also tightened investment regulations and introduced temporary measures to prevent foreign takeovers during the COVID-19 crisis (see chapter III).

A policy trend likely to accelerate in the coming years is the intensification of regional, bilateral and ad hoc economic integration efforts at the cost of broader multilateral cooperation. In recent years, multilateral rule-making on trade and trade-related issues has been elusive (table IV.13).

Table IV.13. Evolution of the policy environment for international production

Year	Key events	Evolution
2008	**Global Financial Crisis** • First G20 Leaders' Summit, in the United States, reaffirms commitments to an open multilateral regime • Negotiation of comprehensive Trans-Pacific Partnership (TPP) starts between 12 countries including the United States, Mexico, Canada, Japan and other Asia-Pacific nations • *Number of SEZs established worldwide reaches 3,500 in 135 economies*	After the crisis, G20 countries signaled willingness to keep the international trading system open…
2009	• Signings of international investment agreeements reach their highest annual number in the two decades between 2000 and 2019	
2010	• *54 countries introduce 116 changes to their investment policies, including 33 restrictive measures – the largest number in a decade*	… however, the need to intervene in national economies increased at the same time and…
2012	• ASEAN initiates the Regional Comprehensive Economic Partnership (RCEP) negotiations with Australia, China, Japan, New Zealand, the Republic of Korea and India	
2013	• At WTO Bali Ministerial Conference, Trade Facilitation Agreement negotiation concludes, and negotiations on Trade in Services Agreement (TiSA) launch • The EU and the United States start negotiation of the Transatlantic Trade and Investment Partnership (TTIP)	
2015	• **UN launches the Sustainable Development Goals – 2030 Development Agenda**	
2016	• The United Kingdom votes to leave the EU • The G20 agrees on the Guiding Principles for Global Investment Policymaking • Negotiations of the TTIP, Environmental Goods Agreement and TiSA are suspended	...gradually support for multilateral approaches in rulemaking diminished, resulting in more plurilateral and regional initiatives…
2017	• The United States withdraws from the TPP, starts renegotiating the North America Free Trade Agreement and launches domestic tax reform to encourage MNEs to invest at home • China and the United States conduct a "100-day trade talk" to reduce the United States' trade deficit with China • At 11th WTO Ministerial Conference, some members agree to advance discussions on e-commerce, investment facilitation and micro, small and medium enterprises • Number of countries adopting industrial development strategies since 2012 reaches more than 80	
2018	• The United States and China mutually raise trade tariffs in three rounds before agreeing a 90-day halt to new tariffs in December • The TPP agreement is signed between 11 countries – without the United States • The United States, Mexico and Canada reach a new agreement (the USMCA), replacing NAFTA • 31 restrictive measures are introduced in national investment policies worldwide, the largest number since 2010, as countries including Australia, the United States, the United Kingdom, Germany and France establish investment screening mechanisms in "national security-related" industries • The African Continental Free Trade Agreement is signed by 44 of 55 members of African Union	
2019	• The EU establishes the first EU-wide framework for screening foreign investment into the Union, allowing the European Commission to issue opinions when an investment is considered as a threat to the interest of the whole EU • China and the United States impose new tariffs on goods exports, ranging from 5 to 25 per cent • 147 economies are managing at least 5,400 SEZs worldwide, an increase of almost 2,000 in a decade, with 500 more in the pipeline • The RCEP negotiation concludes without India • The WTO Appellate Body is rendered inoperational, with only one judge left in office • The EU and the United Kingdom agree on the latter's withdrawal agreement	… and in heightened trade tensions and a more critical stance towards FDI.
2020	**COVID-19**	

Source: UNCTAD.

The void is being filled by regional and megaregional trade and investment agreements. Prospective agreements could establish some of the world's biggest free trade zones. These include the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, the Regional Comprehensive Economic Partnership and the African Continental Free Trade Area Agreement.

The pandemic could accelerate the trend towards regionalism. The crisis has underscored the dangers of relying on any one country for inputs or final products. Countries will put a premium on the diversification of trading partners, and MNEs will look to regionalize supply chains. Ongoing accession processes could see a boost in interest, and new regional groupings may emerge.

The three major global governance policy trends – increased interventionism in national policies, heightened protectionism in international trade and investment, and more fragmentation in economic cooperation – all put additional stress on the system of international production. This will affect the key dimensions of international production configurations (table IV.14).

Protectionism disproportionally affects vertically specialized GVC industries such as automotive and electronics. Higher trade costs resulting from tariffs and costs of border procedures make up a higher share of the costs of intermediate and final products that cross borders multiple times (Hoekman, 2015). They affect the length of value chains, as well as the geographical distribution of value added (table IV.15).

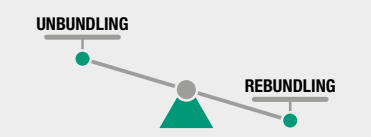
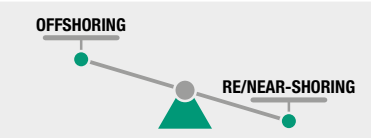
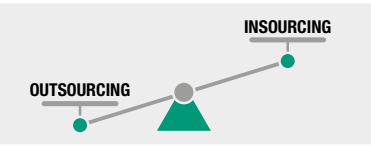
Investment protectionism does the same. Policy measures in the areas of intellectual property and R&D, as well as data protection, are increasingly used to secure competitive advantages. Such measures affect the length of value chains and the geographical spread of value added, along with the insourcing of production. Intellectual property protection and other behind-the-border strategic measures favour countries with strong innovation and R&D systems and high-skilled labour. Systemic competition and the risk of fragmentation of technology standards are important, as they can lead to parallel development of more regional or trading-bloc-based value chains.

Table IV.14. Policy/economic governance trends and determinants of international production

	Impacts on determinants of GVC length, geographical distribution and governance
More interventionism in national policies	• New industrial policies: – support *concentration and clustering of know-how and technology* in capital and innovation intense-industries – integrate *modular* value chains to enhance value capture – counteract *arbitrage opportunities*
More protectionism in trade and investment	• Increased *cost of cross-border trade* discourages fragmented and geographically dispersed value chains • High-tech *intellectual-property-intense* products/sectors face increasing scrutiny and barriers to trade and investment
More regional, bilateral and ad hoc economic cooperation	• *Trade-cost reductions* on preferential basis within regions/groups • Enhances market size; limits exploitation of *economies of scale* to regional confines

Source: UNCTAD.

Table IV.15. Policy/economic governance trends: international production impact

Binary trends	Description	Impact on key indicators
	• Pushback on globalized supply chains, policy measures counter arbitrage opportunities and favour more integrated production to increase value capture	FDI (−) GVC trade (−) Trade in goods (−) Trade in services (+/−)
	• Policy direction less favourable to specialization or focus on specific activities within GVCs, more horizontal FDI, reshoring and regional consolidation of GVC stages (e.g. in capital-intensive industries)	
	• Both policy measures and policy uncertainty will increasingly favour outsourcing of international operations	

Source: UNCTAD.

b. Sustainability trends

Concerns about the social and environmental impact of the international operations of MNEs and their supply chains have been an important feature of the debate on GVCs and international production for decades (see, e.g., *WIR99* and *WIR11*).[4] Gradually, increased regulation, pressure by civil society and improvements in the monitoring of social and environmental impact and ESG reporting have influenced the way MNEs operate abroad and affected, to some extent, international production configurations.

The impact, to date, has largely been limited to the governance dimension of international production configurations – and less so on the degree of fragmentation and geographical distribution. While all sustainability concerns and ESG issues – including social impact, labour standards, gender equality and many others – will continue to influence the behaviour and governance choices of MNEs, it is especially the environmental pillar that looks set to drive broader changes in international production configurations.

Recent climate change policies and green deals now being adopted in major constituencies and trading blocs will have a much more fundamental impact on the way goods and services are produced (table IV.16). These policies are no longer grand plans or statements of intent. Courts in several countries have started to force governments to obey their own air quality laws or to enforce their emission targets.

If such climate change policies were adopted uniformly around the world, the effect on international production and GVCs would already be significant, due to increased transportation costs and shifts in locational advantages as a result of, for example, variations between countries and regions in the availability of renewable energy. However, there are significant differences between climate change policies, emissions targets and their timelines across countries and regions. Those differences are likely to result in new barriers to trade in the form of carbon border adjustments.

New pressures on international production systems will come not only from policies and regulation, but also from the market (table IV.17). Consumer preferences for responsibly produced goods and services in mature markets have long outgrown their niche status. Such preferences are now gradually spreading to emerging markets. Consumer pressure and reputational risks are important drivers for MNEs to adopt mitigation measures.

Table IV.16. Evolution of policy environment for corporate responsibility

Year	Key events	Evolution
2008	**Global Financial Crisis** • Financial crisis accelerates inequality • British Columbia (Canada) becomes the first jurisdiction in North America to introduce a carbon tax	Crises arising from corporate practices relating to environmental, social and governance issues…
2010	• BP Deepwater Horizon oil spill results in record fines and litigation; stock price plunges and CEO is replaced • Women's Empowerment Principles (WEPs) is launched to guide business action for gender equality in the workplace • Launch of the ISO 26000 standard provides MNEs with a standardized definition for social responsibility	
2011	• UN Guiding Principles on Business and Human Rights explicitly addresses the obligations of MNEs to respect human rights • Occupy Wall Street movement brings the issue of inequality into political discourse around the world	…lead to pressure on MNEs to engage in socially and environmentally responsible behaviour throughout their GVCs…
2012	• Hurricane Sandy hits New York City, causing $70 billion in damage; *Bloomberg Businessweek* publishes headline "It's Global Warming, Stupid" • UN Principles for Sustainable Insurance launches with 30 leading insurance companies, representing over 10 per cent of global premium volume	
2013	• Rana Plaza disaster in Bangladesh exposes the unsafe working conditions of garment workers (especially women); major apparel brands increase efforts to improve labour practices in supply chain	
2014	• Singapore Transboundary Haze Pollution Act allows the Government to criminalize companies in or outside of Singapore for environmental pollution	
2015	• **UN launches the Sustainable Development Goals – 2030 Development Agenda** including for the first time the role of business in achieving the global development agenda • UK Modern Slavery Act requires MNEs to report modern slavery risks in their supply chains • COP21 – Paris climate agreement sets global targets of keeping temperature rises well below 2°C • Beijing+20 Global Leaders' Meeting on Gender Equality and Women's Empowerment commits to end discrimination against women by 2030	…fueling the creation of new multilateral and multi-stakeholder approaches to corporate sustainability…
2016	• UN-supported Principles for Responsible Investment marks 10th anniversary with over 1,500 signatories with over $60 trillion in assets under management	
2017	• Network for Greening the Financial System launches with eight central bankers; by 2020 it includes 65 central banks on five continents	
2018	• Mandatory gender pay gap reporting starts in France, Germany and the United Kingdom • Colombian youth file a climate change lawsuit demanding that the Government stop deforestation to protect their rights to a healthy environment and life, the first such case in Latin America	
2019	• EU anti-tax avoidance directive takes effect against aggressive tax planning by MNEs • Principles for Responsible Banking launched launches with UNEP and 130 banks from 49 countries, with over $47 trillion in assets under management • UN Sustainable Stock Exchanges (SSE) initiative marks 10th anniversary with more than 90 stock exchanges as members • Business Roundtable declares the purpose of the corporation is to serve stakeholders rather than shareholders • Dutch Supreme Court rules that the Government must do more to protect its citizens against climate change; legal actions over climate change brought since 1990 reach more than 1,300	…which are consistently increasing in scope (issues and industries covered) *depth* (companies and other stakeholders involved) and *focus* (level of detail of management tools, auditing practices and reporting standards).
2020	• Final report of EU taxonomy on sustainability launches • Blackrock letter to CEOs recognizes climate change as major investor risk • WEPs celebrates 10th anniversary with over 3,000 company signatories • UN Global Compact celebrates 20th anniversary with over 14,000 signatories • United Kingdom court rules that a third Heathrow runway is illegal because it is inconsistent with the country's commitments under the Paris Agreement	

Source: UNCTAD.

Table IV.17. Sustainability trends and determinants of international production

	Impact on determinants of GVC length, geographical distribution and governance
Sustainability policies and regulations	• Differential speeds of implementation of sustainability/green plans necessitate carbon border adjustments, increasing *trade costs* and counteracting *arbitrage opportunities* • Carbon pricing policies and green deals increase *transportation costs* • Sustainability policies reinforce protectionism and regionalism trends
Market-driven changes in products and processes	• Reputational profile, ESG performance and exposure to climate-related risks are increasingly considered material business risks, adding to supply chain *transaction costs* • Need for supply chain monitoring and traceability increases *transaction costs* • Market scrutiny reduces bandwidth to exploit *arbitrage opportunities* on labour costs, regulation and tax
Physical supply chain impacts	• Need for supply chain resilience and diversification of sources reduces *concentration of supply* • Changes in on infrastructure and transport routes could affect *transportation costs*

Source: UNCTAD.

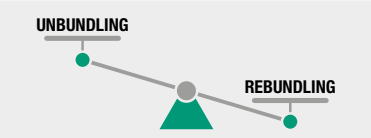
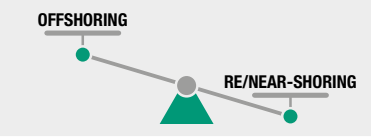
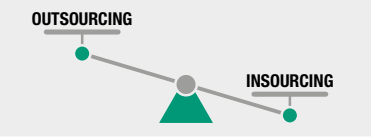
For several industries, mitigation and adaptation can represent new business opportunities, including the agricultural, consulting, water and insurance sectors. This can drive previously predominantly domestic industries to expand internationally.

Another important market pressure on MNE-governed international production systems is likely to come from financial markets. Companies already face increasing pressures from investors, banks, insurers and financial market regulators to address climate risks. Financial markets not only take into consideration potential liabilities and reputational risks related to the social and environmental performance of companies, they increasingly assess long-term risks associated with climate change, even beyond the direct operational performance of firms. The number of stock markets with mandatory sustainability reporting is expanding rapidly, up from 2 to 24 in the past decade.[5] Financial disclosure rules in several markets already require listed companies to disclose the physical risks from climate change when these risks impact a company's financial situation. The risk of stranded assets in the oil industry is an example. Pressure to mitigate supply chain risks across typical GVC industries from increased frequency of extreme weather events is becoming an important driver of change in international production configurations.

The physical impact of climate change on international production will also become increasingly important. Climate change will affect trade flows and specialization. Shifts in weather patterns, floods, forced changes in soil usage, damage to infrastructure and new transportation routes can cause changes in economic competitiveness and in comparative advantage at the industry level. Supply, transport and distribution chains will become more vulnerable to disruptions due to climate change. According to the IPCC (2014), climate change will affect all forms of transport relevant for international trade, including seaborne transportation, land-based transport modes, and aviation. Maritime shipping, which accounts for about 80 per cent of global trade by volume, could experience negative consequences, for instance from more frequent port closures due to extreme weather events.

The impacts of climate change for individual industries will be unequal, with the most significant impacts affecting those industries dependent on natural capital (e.g. agriculture, fishing, forestry) or vulnerable to extreme weather events (e.g. shipping, travel, energy).

Table IV.18. Sustainability trends: international production impact

Binary trends	Description	Impact on key indicators
	• Physical climate change impacts lead to horizontal diversification rather than vertical effects • Physical shortening of supply chains driven by increased trade and transport costs, but not necessarily less fragmented	FDI (+/–) GVC trade (+/–) Trade in goods (–) Trade in services (+)
	• Reshoring and regional consolidation driven by differential speeds of implementation of green plans and consequent border adjustments, reinforcing ongoing trends in the trade-investment policy environment	
	• Need for greater control over supply chains shifts use from arm's-length to NEMs, and from high-transaction-cost NEMs to insourcing	

Source: UNCTAD.

Furthermore, industries will be most affected in developing countries, which have less economic, institutional and technical capacity to cope with and adapt to climate change (World Bank, 2012). These impacts are likely to lead to periodic trade disruptions, which can in turn be an important driver of change in the design of global value chains. Efforts to increase supply chain resilience have already led typical GVC industries to build a degree of redundancy into their supply chains, after floods in northern Thailand in November 2011 caused severe disruption to global production chains. At the time, more than 400 MNEs were forced to suspend production due to disrupted supplier links.[6]

The economic consequences of climate change will be unevenly distributed and especially important in Africa and Asia, which combine increasing trade dependency with significant expected damages from climate change. The effects are particularly large for the regions that specialize in food and agricultural products. Countries that have larger domestic markets and more diversified trade patterns can absorb climate shocks better than countries that are more specialized.

* * *

The megatrends discussed in this section are a selection of trends that are expected to have the most significant impact on international production. They are not exhaustive. Moreover, they are not stand-alone trends. It is their combined impact that matters. For example, sustainability trends are reinforcing the development and application of energy-efficient technologies and causing a shift to EVs that will have important implications for international production in the automotive industry. Policy measures driven by sustainability concerns, such as regional green deals and carbon-border adjustments, even if they do not qualify as protectionism, will nevertheless add to existing pressures in international economic governance towards regional and national trade and investment policy perspectives. These policy trends (systemic competition and increased trade barriers) could in turn cause fragmentation in technology standards that could change the way digitalization, automation and additive manufacturing affect international production.

Looking at the link between sustainability concerns and international economic governance issues, social and environmental standards move increasingly to the fore in international trade and investment agreements. Sustainability conditionality for trade will increasingly become a driver of change in international production configurations. For example, the EU recently concluded a deal with Bangladesh to grant better access in exchange

for measures favouring safety regulations and human rights at work. The 2019 trade agreement between the EU and MERCOSUR includes several commitments related to sustainable development, including commitments to comply with the Paris climate agreement and to prevent deforestation. The European Green Deal, published by the European Commission in December 2019, outlines commitments to sustainability in trade policy, aiming to strengthen the mainstreaming of social and environmental concerns in EU trade agreements. If social and environmental conditionality becomes the norm and is applied on criteria such as carbon emissions, biodiversity and ecosystem preservation, the impact on international production and GVCs will be significant. The global trade regime allows governments to adopt measures to address environmental concerns linked to trade, provided these measures are not used as a 'front' to hinder free trade. The WTO is tasked to ensure that such environmental safeguards are not used to undertake trade protectionist measures.

The combined impact of sustainability trends and new technologies is equally important for the future of international production. Technological breakthroughs could support the development of circular economy concepts in production processes, aiming to eradicate waste and reduce the overall consumption of raw materials during production systematically rather than through incremental efficiency gains. This implies the recycling, upcycling or reuse, or composting or consumption of all material inputs and outputs, requiring coordination across the supply chain and favouring co-location and integration of economic activities within and across GVCs.

New technologies also allow hitherto predominantly domestic industries to internationalize, expanding the scope of international production. Some of these industries directly address sustainability concerns or respond to investment demand related to the achievement of the SDGs. For example, FDI in the health care services industry is growing in emerging markets, with digital technologies an important driving force *(AIR19)*.

D. POSSIBLE TRAJECTORIES FOR INTERNATIONAL PRODUCTION

The effects on international production of the technology, policy and sustainability trends are multi-faceted. They are at times mutually reinforcing, they occasionally push in opposite directions, and they will play out differently across industries and geographies. Depending on the starting point of individual industries – their archetypical international production configurations – they will tend to favour various trajectories, ranging from reshoring to diversification of GVCs, and from regionalization to replication and granularly distributed production.

As laid out in the preceding sections, international production is expected to undergo dramatic transformation over the coming years, enabled by technological change, driven by the changing economics of international production that those technologies will imply, and shaped by the interaction between policy and sustainability trends and the pandemic shock. The transformation could take many directions, but it is possible to crystalize several likely trajectories for international production going forward.

Despite the slowdown of international production since the global financial crisis, the three decades of international production described in section A have shown a trend in a single direction, from less to more. This looks set to change. The following sections present four possible trajectories for international production configurations for the decade to 2030. They all point to a retreat of international production to various degrees. Three trajectories – reshoring, regionalization and replication – all involve some form of pull-back of GVCs. The fourth, diversification, projects further growth, but with a lower geographical distribution of value added (greater concentration) and downward pressure on investment in physical productive assets.

The trajectories described here follow logically from the analysis of technology, policy and sustainability trends described in the previous section. They are not mutually exclusive. All four trajectories will materialize to varying degrees, with different propensities across industries.

1. Reshoring

In this trajectory, the most defining elements of modern GVCs – the fragmentation of tasks (unbundling) and geographic dispersion (offshoring) – are challenged. The direction is towards a simplification of the production process and the use of onshore or nearshore operations. Lower fragmentation and geographic dispersion, and more capital-intensive operations, will generally favour a return to more direct control by MNEs of their remaining overseas operations (insourcing). This model thus reverts the historical trends of international production: from unbundling to rebundling, from offshoring to reshoring and from outsourcing to insourcing.

Advanced robotics-driven automation plays a key role in this trajectory. By reducing the relevance of labour cost arbitrage opportunities, it disarms the most powerful driver of task

fragmentation and offshoring to low-cost locations. Automation makes reshoring a business-sustainable option for many MNEs. Reshored activities can also be re-bundled as robots simultaneously enable the integration of production steps. Activities would be concentrated in manufacturing hubs, leveraging economies of scale. The trend in governance turns from outsourcing to insourcing to sustain the higher capital and knowledge investments required for accelerated automation. The resulting trajectory leads towards a high-tech version of global production networks prior to the explosion of GVCs, with MNEs producing close to home through highly integrated, internalized operations and exporting final goods to foreign markets.

In the manufacturing sector, this trajectory is primarily relevant for higher-technology, GVC-intensive industries, a heterogeneous group including the machinery and equipment, electronics, and automotive industries (box IV.1). A degree of retrenchment of international production in these industries seems inevitable, with mounting pressure for shorter and more sustainable value chains and more diversified and flexible production systems. The choice to reshore depends on the economic profitability of automation and cost-benefit considerations taking into account diverse factors, including quality, supply security, protection of intellectual property rights, distance from customers, reputational and political risks, and many others. In these industries the economic viability of automation is already established and confirmed by the large and growing role of robots. As the price of robots decreases further over the next 10 years, the synergy between automation and reshoring will be the major driver of GVC patterns. The scenario is different for lower-tech industries, such as textiles and apparel, where labour cost differentials are still key competitive factors.

Some high-tech industries are likely to see further protectionist pressures, either because they provide essential goods – such as medical equipment, as exemplified during the COVID-19 crisis – or because they are considered strategically important from an economic or a technological perspective (for example, automotive and electronics).

Other manufacturing industries, such as regional processing industries, have more limited scope for reshoring. Reshoring, like offshoring, requires operational mobility, and these industries tend to have structural ties to locations, for access either to raw materials (for processing industries) or to market specificities (for pharmaceuticals).

Some reshoring can also be expected in services, particularly lower value added services, such as parts of retail and wholesale value chains and transportation and logistics value chains.

Table IV.19. Reshoring

International production impact	• Shorter, less fragmented value chains • Rebundling of supply chain and production stages • More concentrated value added • Less offshoring, less outsourcing
Key drivers	• Technology (automation, robots) • Policy environment (including push for higher degree of self-reliance post-pandemic, push for build-up and protection of strategic industrial capacity)
Prevalent industries	• Higher-technology GVC-intensive industries
Results	• Lower FDI, divestment and relocation • Possible initial increase in FDI by NEM partners in home markets • Lower GVC trade

Source: UNCTAD.

Box IV.1 The shift to EVs could shrink automotive production networks

The automotive industry is likely to see significant change in the years to 2030 in production, investment and GVCs, driven by technology, economic governance, new product demand and sustainability regulations. The latter look set to cause major change in the industry this decade, with several countries having established objectives to phase out internal combustion engine cars by 2030, and many others offering purchase incentives for electric vehicles (EVs).

Today, the industry is highly GVC intensive, with complex networks of OEMs and multiple layers of suppliers operating in many locations. The shift to EVs could cause a consolidation and restructuring of international production networks.

Total capital expenditures in the industry are projected to increase over the decade to 2030 due to development needs for EVs, mobility solutions, new component requirements and infrastructure needs associated with EVs. However, the share of FDI in total investment will be under significant pressure. Today, 15 economies are major automotive hubs, accounting for 88 per cent of global production in 2018. Production and value added are expected to become even more concentrated, because of platform sharing and especially the shift to EVs with far fewer components and shorter value chains. The drivetrain for an average internal combustion engine has more than 2,000 moving parts, while EVs have 20, with value added concentrated in few parts – a major component of EVs is the battery, which accounts for about 40 per cent of total cost. As a consequence, EV supply chains involve far fewer suppliers. For example, Tesla has only about 300 suppliers located in a few countries, against thousands of suppliers worldwide for most traditional car manufacturers (box table IV.1.1). Higher concentration of value added around battery producers and software providers will also reduce geographic spread.

While many countries today have a slice of the global automotive value chain, the opportunity to capture value in future could be lower, especially for developing countries that are not integrated in higher-technology and digital GVCs. However, new opportunities could emerge to attract investment in complementary or adjacent economic activities, and in infrastructure for EVs.

Box table IV.1.1. Global supply chains of automotive OEMs

Tesla	BMW	Toyota	Nissan	Audi
• 300 suppliers (Model S) • Production in few countries (e.g. United States, China, Germany) • Few key suppliers in batteries and key system parts	• 4,500 suppliers • Production locations in 50 countries • Suppliers account for 70 per cent value added	• Production locations in 28 countries • Suppliers account for 65 per cent of value added	• 5,000 suppliers • Sunderland (United Kingdom) plant: 224 suppliers in 22 countries	• 1,000+ suppliers • Production plants in 18 locations in 13 countries

Source: UNCTAD, based on company websites.

Although the physical deployment of these services requires a presence in foreign markets, that presence may become lighter because of digitalization – enabling central coordination of tasks – and because of automation eroding labour cost advantages. The most notable case is the growth of e-commerce, resulting in major centralization of sales and marketing activities.

The trend towards reshoring may receive a boost from the post-pandemic imperative of mitigating supply chain risks. The political and public mood could see a degree of reshoring as healthy. The push to ensure the national or regional supply capacity of intermediate goods for local production and final goods for consumption, especially strategic goods and services, is likely to increase, with a change in tone from a protectionist narrative to a risk management perspective.

The pandemic could also be a catalyst, because MNEs will aim to benefit from state support programmes and fiscal stimulus packages. Within the expansionary fiscal policies following the crisis, incentives for reshoring of activities may become common, as well as incentives to rely on a local supplier base.

2. Diversification

The main alternative to reshoring is diversification and redundancy – a trajectory that leverages GVCs, rather than dismantling them, to build resilience. As concentration of production and supply chain dependence are the main issues, companies and countries may find diversifying internationally more effective than reshoring (and de facto re-concentrating domestically). This means giving up some scale economies by involving more locations and suppliers in the value chain.

Digitalization of the supply chain is pivotal to the process of diversification, as much as automation is the technological trigger of reshoring. Firms in many GVCs will have the opportunity to maintain and potentially extend their complex network of international operations, by leveraging digital technologies to improve coordination and control. These dynamics will take place within a hybrid, highly fragmented environment where manufacturing activities are increasingly integrated with digital services (servicification of manufacturing). Diversified, servicified and digitally enhanced GVCs represent an Industry 4.0 version of the traditional GVC, in substantial continuity with the historical, expansive trend of international production.

Digitalization allows MNEs to extract further efficiencies from international production networks, by reducing governance and transaction costs and enhancing centralized coordination and control. Although digital platforms could improve bottom-up access to and participation in GVCs by third-party suppliers, value added could become even more concentrated geographically, and parts of value added across manufacturing and services industries could shift towards fewer large digital MNEs (for a detailed discussion on the concentration of digital platforms and its policy implications, see UNCTAD, 2019a).

Applications of digital technologies to foster international diversification and build supply chain resilience include real-time visibility into the availability of raw materials and finished goods; enhanced control over processes, people and assets, including the tracking of external suppliers down to the bottom of the supply chain; use of AI and machine learning to constantly re-assess and re-plan activities, ensuring more timely responses to shocks and discontinuities relative to traditional business planning techniques based on historical data; and the use of mobile technology and augmented/virtual reality to enhance flexible working arrangements.

The trend towards diversification will be more pronounced in industries that have significant economic benefits to capture from complexity and fragmentation of GVCs.

Table IV.20. Diversification

International production impact	• Continued fragmentation of supply chains • Increased platform-based supply chain governance • Increased offshoring and outsourcing of services • More concentrated value added
Key drivers	• Technology (digitalization, platforms, AI, blockchain) • Sustainability trends (including push for supply chain risk management post-pandemic, supply chain monitoring capacity)
Prevalent industries	• Services, GVC-intensive industries
Results	• Lower FDI in physical productive assets, more intangibles • Increased trade in services and data flows

Source: UNCTAD.

At the top of the list are GVC-intensive industries, unbundling and offshoring being at the core of their value proposition. For the higher-technology industries in this set, automation is expected to lead to some reshoring of production, but cross-border supply chains will remain complex and, in any event, are not easy to reconfigure in the short term. Lower-tech industries, such as textiles and apparel, are less likely to undergo a robot-led transformation, at least in the short to medium term. The number of robots in this industry is still the lowest in manufacturing, for reasons of both economic and technical feasibility. As additional low-cost countries aim to increase their participation in GVCs, the economic benefits to be captured from labour cost differentials will remain significant. Reshoring will thus not be the dominant trajectory. These industries are likely to maintain their complex and articulated network of international operations for some time, leveraging digital technologies to increase diversification while enhancing coordination and control.

In addition to low-tech GVC-intensive industries, international diversification enabled by digital technologies will also affect service industries, particularly higher value added services. For these tasks, ranging from professional and business services to finance, engineering and marketing activities, AI-based automation is still at the early stage of development. Conversely, the broad application of enhanced digital technologies could make these industries the new frontier of offshoring driven by labour cost arbitrage (Baldwin, 2019). High and medium value added services, traditionally highly centralized, will be increasingly delivered offshore through teleworking. Teleworking opportunities are being enhanced by advanced digital communication tools, including teleconferencing, augmented reality, virtual reality and 5G. Cloud storage and computing make it possible to perform complex tasks remotely, while improvements in translation software will facilitate communication. In addition to technological enablers, better education and technical skills in developing countries are providing a growing pool of qualified workers. In financial services, digital

Box IV.2 Fintech is changing international production configurations in financial services

More than one-third of global FDI stock is in financial services. This makes it the biggest industry in FDI (although the large share is inflated by finance functions of MNEs across all other sectors, classified as FDI in the finance sector). Banking is the biggest subsector in financial services, followed by insurance.

The international production configuration of the global banking industry has undergone significant change over the past decade, driven by new prudential regulations after the global financial crisis and significant retrenchment as developed-country, and especially European, banks pulled back from overseas activities. The new decade promises further change, driven by technology trends.

Digital technologies in the finance sector (fintech), including new payment gateways, services with blockchain technology and Big Data-driven intelligence, are driving the financial industry to become hypermodular and introducing hypercustomization and hyperlocalization of services.

Hyper-modularity is already exerting a significant impact on international production configurations. It involves the breaking up of financial services traditionally served by a single bank, analogous to the earlier fine-slicing of production processes in manufacturing. Services from credit scoring, deposits and loans, and payments and transfers to investment and advisory are now provided by many fintech companies as technology has lowered the operational cost of such functions. In addition, fintech companies are often better connected to other digital ecosystems, such as e-commerce and data analytic applications. Many big banks are transitioning to fintech, and many non-financial technology firms are entering the market.

Hyper-customization, often enabled by Big Data-driven intelligence, allows service providers to offer a more tailored service. This can accelerate the inclusion of the unbanked and SMEs along GVCs.

Parts of financial services once reliant on labour-intensive operations (such as customer service) are gradually introducing AI-based systems (such as chatbots). Higher degrees of automation will favour information technology (IT) hubs nearby, rather than cost-competitive but farther away services or hubs. European banks are likely to favour nearshoring in parts of the region where local IT talent is abundant. This could affect investment in traditional hubs for IT and business process outsourcing in developing regions.

Source: UNCTAD.

technologies (fintech) will lead to an increasingly fragmented, dispersed and diversified delivery model (box IV.2). Few highly strategic, intellectual-property- or data-intensive services are likely to be spared this process, for strategic and security reasons.

3. Regionalization

Regional value chains apply the standard model of fragmented and vertically specialized value chains at the regional or local level. The regionalization of value chains can be the result of either a pull-back from GVCs (with global MNEs replicating value chains at the regional level) or the growth of international production on a regional basis (with MNEs structuring their operations near-shore). The shift from global to regional brings the extremes of the value chains geographically closer. At the same time, the geographical distribution of value added would tend to increase.

Digitalization plays a major role in facilitating the coordination of regional value chains. In the case of centrally coordinated regional value chains, the replication of entire chains regionally implies a significant increase in complexity, with a need for both vertical and horizontal coordination of international production. Digital development, including not only digital technologies but also digital infrastructure, especially in developing economies, will serve as a key enabler of regional value chains.

Regional processing industries that have a strong upstream link with local sources of raw materials, such as the food and beverage industry and the chemical industry, already exhibit an international production configuration consistent with organization through regional value chains, characterized by fragmented value chains replicated across many locations (high geographic dispersion). A likely trajectory for these industries is to further consolidate their regional footprints. The food and beverage industry, for example, not only relies on perishable raw materials that make physical proximity between sourcing and consumption a competitive factor, but also is characterized downstream by regional market segmentation and a premium for localized production.

In principle, GVC-intensive industries can also replicate their model at the regional level. This is already happening to same extent, for example in the automotive industry. The growth of a market for inexpensive consumer products in developing countries – such as in electronics or textiles – will also push regional value chains in these industries. Barriers to the development of regional value chains in traditional GVC-intensive industries include the persistence of economies of scale and high capital costs of machinery, as well as labour cost differentials and the need for specialized labour or suppliers.

Table IV.21. Regionalization

International production impact	• Shorter physical supply chains, but not less fragmented • More geographically distributed value added
Key drivers	• Policy environment (regional economic cooperation, need for regional self-reliance post-pandemic, build-up and protection of industrial capacity) • Sustainability trends (push for supply chain resilience) • Technology (digitally enabled)
Prevalent industries	• Regional processing industries, GVC-intensive industries, primary sector
Results	• More intraregional FDI, relocations • More intraregional trade

Source: UNCTAD.

Some of these factors, especially those related to labour costs, could become less important in time, paving the way for the mainstreaming of regional value chains in GVC-intensive industries.

A form of regionalization could affect primary industries, where advanced economies, heavily reliant on the offshore supply of commodities, could intensify efforts to reduce dependence (box IV.3). This already applies to the energy sector but could extend, for example, to agriculture, where the trend towards more sustainable local and regional sourcing is likely to accelerate.

The momentum for value chain regionalization is high and likely to grow further over the coming years, including through progress on several regional integration initiatives. Also, in the aftermath of the pandemic, many countries could come to see regionalism as a realistic and valid alternative to globalism for building a degree of local self-reliance and resilience.

The policy trend towards regionalization of international production is fueled on the one hand by considerations of regional strategic autonomy – mainly in developed regions – and on the other hand by regional development objectives in less developed economies. From the perspective of the latter, regional value chains break dependency from developed markets, capital and technologies, stimulating the process of local development; they allow higher participation in value chains; they foster internal specialization and industrial diversification within the region and open opportunities for structural transformation and value chain upgrading.

However, regional value chains are not easy to establish. For a region to attract or develop an entire value chain is more difficult than for a country to attract investment in a task or industry segment where it has a competitive advantage. Regional value chains require regional coordination and conducive systemic conditions. While the political momentum for a shift to regionalism is mature, the implementation will not be immediate.

Box IV.3 Capex and FDI under pressure in the oil and gas industry

The oil and gas industry is among the hardest hit by the COVID-19 crisis because of the double shock of plummeting demand and a precipitous drop in prices (into negative territory for the first time). However, structural changes in the industry were already well underway prior to the pandemic. The effects of the shift away from oil, driven by sustainability objectives and clean energy policies, and the impact of policies aimed at diversification and domestic production to reduce strategic reliance on major oil producers had already been visible in international production configurations and global investment flows in the industry for some time (*WIR16*). With rising concerns about stranded assets, capital expenditures (capex) by major oil MNEs have fallen substantially since 2013. The five largest (ExxonMobil, Chevron, Total, Shell and BP) nearly halved their new investment. In 2020, oil companies have responded to falling prices by announcing further large cuts to their spending on new production capacity; capex this year is expected to be 20-35 per cent lower than planned.

Global FDI stock in the extraction of oil and gas peaked in 2013 at $490 billion and has declined since, to $264 billion in 2018. Investment in oil production is traditionally concentrated, as it is tied to resource endowments and the availability of hard infrastructure for transportation, storage and refining processes. Pipelines, refineries, transport service and storage are concentrated around a relatively few geographical hubs. However, the nature of cross-border investment in the industry is changing. A global policy push to transition towards cleaner energy is directing MNEs to channel more investment into natural gas and renewables, and into technology and infrastructure to serve the EV market (e.g. charging stations in the downstream retail businesses of oil majors). More investment is also expected to go towards carbon neutrality projects (e.g. energy-efficiency services, carbon capture). As renewables are less tied to geography, this will drive a shift towards less concentrated and regional or local investment in energy generation.

The trend towards shifting capex from oil to alternative energy is also driven by financial investors divesting away from oil to support climate change mitigation. For instance, Norway's sovereign wealth fund announced that it will divest companies dedicated solely to oil and gas exploration and production, pulling out almost $6 billion from some 95 companies. The Rockefeller Family Fund similarly disposed of its holdings of ExxonMobil.

Source: UNCTAD.

The sustainability dimension adds to the policy context to prepare the ground for consolidation of regional value chains. The most obvious benefit of regional value chains is to reduce distances, decreasing the environmental impact of long-distance transportation of intermediate and final goods.

4. Replication

Replication is characterized by distributed manufacturing close to the point of consumption and supported by new production technologies – distributed manufacturing is generally associated with the application of additive manufacturing or 3D printing. Manufacturing models enabling replication range from networks centrally coordinated by MNEs to the bottom-up atomization of production whereby every firm or even household independently produces what is needed. The former is an international production trajectory; the latter is almost the antithesis of international production.

Centrally coordinated distributed manufacturing is characterized by short value chains, with manufacturing production steps bundled together and replicated in many locations. Consequently, geographic dispersion of economic activities is high, with concentration of high-value activities in few locations but broad participation in the manufacturing process. Governance is likely to be polarized, with ambiguous overall impact on FDI intensity: stronger control from MNEs of the value-adding design and coordination phase and significant opportunities for local outsourcing of the highly commodified, replicated manufacturing steps.

Distributed manufacturing should not be wholly equated with 3D printing. It is more generally enabled by synergies between automation and digitalization. Automation makes it possible to routinely reproduce the same production process in many locations with minimal labour absorption and minimal marginal costs, while digitalization favours efficient central coordination of the network. 3D printing is itself a technology combining automation and digitalization.

The replication trajectory is not applicable across all industries. Among the four trajectories of international production, it is in perspective the least likely to lend itself to broad application across industries. In addition to constraints to applications of 3D printing related to raw materials, more broadly it demands specific business conditions. First, the production process needs to be relatively simple. As manufacturing complexity increases,

Table IV.22. Replication

International production impact	• Shorter, less fragmented value chains, rebundling of production stages • Higher geographical distribution of activities, but more concentrated value added • Increased outsourcing
Key drivers	• Technology (automation and digitalization, 3D printing) • Policy environment (including push for production capacity of critical supplies post-pandemic)
Prevalent industries	• Hub and spoke industries, regional processing industries
Results	• Lower FDI • Increased trade in services, intangibles, data flows and payments of royalties and licensing fees • Lower GVC trade

Source: UNCTAD.

Box IV.4 COVID-19 and international production in health care industries

The pandemic has put a spotlight on bottlenecks in the international supply chains of health care equipment and medicines. MNEs in health care industries have not only faced the same short-term supply chain disruptions as other industries, but have also been affected by emergency policy measures of national governments, including restrictive trade measures, tightened investment regulations and general requisition measures to meet national needs (box table IV.4.1).

In response, MNEs in health care industries have taken exceptional measures to increase production capacity and source through alternative channels, and have entered into strategic partnerships with governments and other MNEs – including manufacturers in other industries – to produce critical equipment and medicines. However, a number of supply chain weaknesses have emerged. Philips (Netherlands) has manufacturing facilities for sophisticated electronic health care equipment in 30 locations spread evenly across Asia, Europe and North America, but it produces respirators – the key equipment required for hospitals during the crisis – in only one, in the United States. The requisitioning by United States authorities of all production, mooted at one point, would have made it impossible to meet demand and even to satisfy pre-existing orders in other markets.

Serious questions have also been raised in the pharmaceutical industry, which for some common but important active ingredients relies on manufacturing facilities and suppliers concentrated in only one or two countries (mostly India and China). The location of logistics and warehousing operations, the "plumbing" in international production networks, has also caused unexpected consequences, for example, when orders of face masks produced in China and destined for Italy and Spain were temporarily held up by authorities in a distribution center of the Swedish health care firm Mölnlycke in Lyon, France.

Although current measures still focus on alleviating the short-term disruptions and meeting the surge in demand, MNEs in health care industries will face pressure to adjust their global production networks in the coming years. They are likely to opt for greater geographical diversification and other strategies to make their supply chains more resilient, leading to degrees of slack and redundancy (risk management measures) as well as replication, with production of similar equipment across all major trading blocks.

Box table IV.4.1. Selected emergency policy measures affecting health care industry supply chains

Category	Economy	Measure
General	Spain	Requisition measures on private health care production and materials such as face masks and tests
	France	Requisition measures on respiratory protection masks
	United States	Defense Production Act to compel production and supply of ventilators and respiratory protection masks
Investment measures	European Union	Guidance concerning FDI and free movement of capital from third countries, and the protection of Europe's strategic assets
	Australia	Investment review to protect national interest and local assets from acquisition
Trade measures	India	Export ban on ventilators and sanitizers, and restricted export of some active pharmaceutical ingredients
	Germany	Temporary export ban on medical equipment, lifted shortly after
	European Union	Export authorization requirement on personal protective equipment (PPE) and medical equipment outside the region
	Poland	Export restriction of medicinal products and medical equipment
	Russian Federation	Export ban on 17 types of medical equipment, PPE included
	South Africa	Export ban of critical medicines, face masks and hand sanitizer
	Switzerland	Export restriction on PPE and essential medical goods

Source: UNCTAD, based on various sources.

the cost of automation becomes unsustainable for replication at large scale. The second important element is the opportunity to capture significant market-specific advantages through customization.

The pharmaceutical industry is an often-used example *(WIR17)*. The industry is characterized by centralized R&D, production in major hubs and networks of market-seeking, distribution-oriented FDI; these features result in the "hub and spokes" configuration, with few locations generating the majority of value added and a large number of countries of final distribution contributing a small but non-negligible share. The rapidly evolving pharmaceutical and biotechnology landscape is driving greater product variety, shorter product life cycles and smaller drug volumes. Future pharmaceutical supply chains are expected to involve new production models that manufacture medications to order, closer to the point of consumption, often with a degree of customization to local markets or even the medical needs of individual patients. This requires more widely distributed micro-factories. The pandemic is expected to increase attention to 3D printing as a means to secure decentralized, reliable and flexible supplies of critical goods. Resorting to 3D printing of medicines, clinical masks or ventilators has proven to be a realistic option to prevent dramatic shortages of drugs and medical equipment in future (box IV.4).

Beyond pharmaceuticals, distributed manufacturing may have applications in customized segments of (otherwise) mass industries such as apparel or food that are characterized by limited production complexity. Heavy industries or industries characterized by significant technical complexity are unlikely to be structurally affected by the distributed manufacturing model apart from specific components used as inputs.

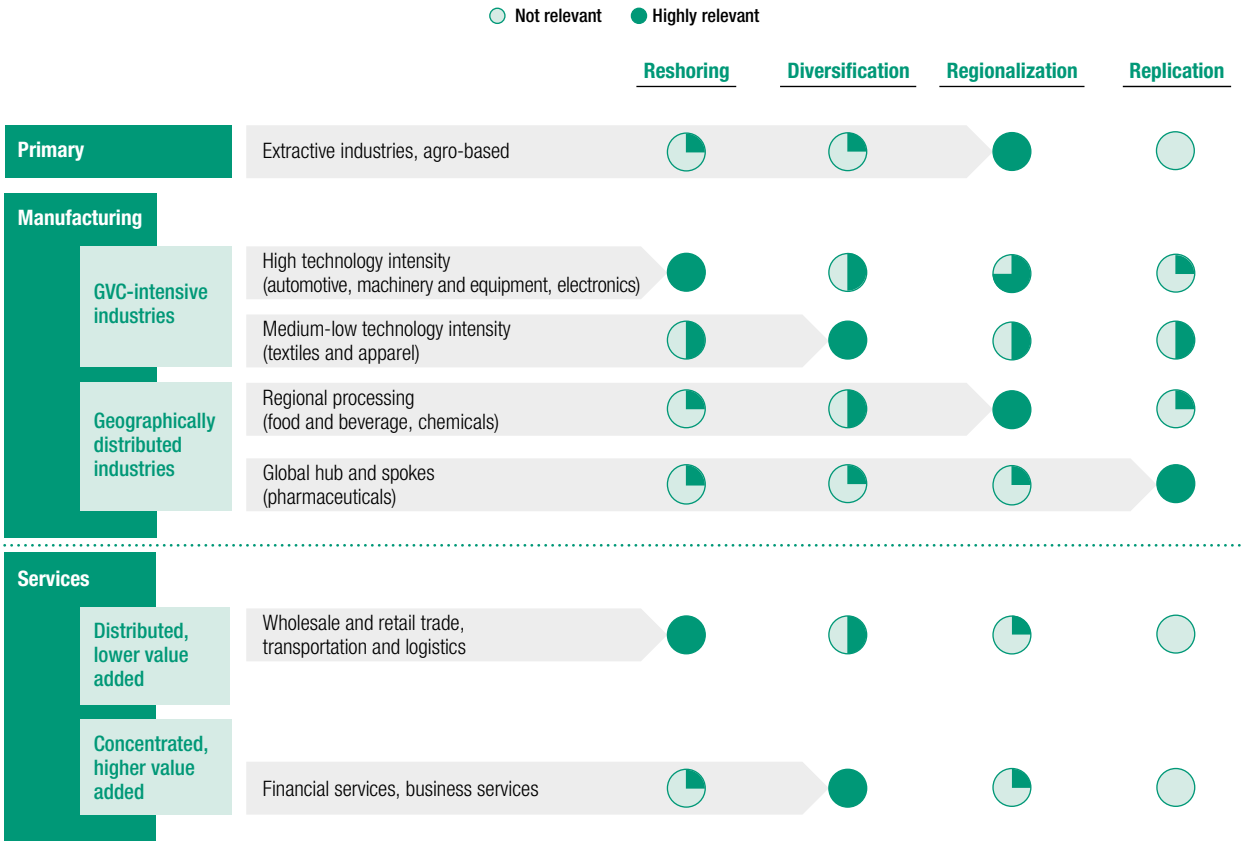
Although the notion of increased national self-sufficiency in strategic industries is going to come to the fore in post-pandemic policymaking, distributed manufacturing will hardly thrive in a protectionist policy environment. The bulk of distributed manufacturing is likely be established through FDI or contract manufacturing under centralized MNE coordination. For example, in the pharmaceutical industry, although physical production is generally light, the amount of knowledge, technology and investment that feeds into R&D requires scale. The same argument applies for most biomedical devices, with some notable exceptions, such as clinical masks, where great product simplicity allows easy reproduction through basic 3D printing processes. In this respect, centrally coordinated distributed manufacturing is one of the most globalized models, implying a network of "light" production facilities under "heavy", centralized, cross-border coordination. With 3D printing for example, while trade of physical goods across borders is minimized, the flow of data, services and intangibles increases.

* * *

Notwithstanding the probable impact that technology trends, the policy environment and the global sustainability imperative will have on international production in this new decade, significant uncertainty on the time horizon as well as the degree and scope of the transformation remains. The vulnerability of the global economy to a black swan event of the magnitude of the pandemic demands caution when analyzing any scenario for the evolution of international production, the activities of MNEs and foreign investment.

The three megatrends discussed in this chapter – technology, policy and economic governance, and sustainability – and the resulting possible trajectories of international production will not unfold in a linear manner. They remain liable to being shaped by global political developments; thus, there will be significant differences in their impact across industries and regions (figure IV.12). To start with technology, although its effect on GVCs across all industries is undeniable, there are fundamental questions about whether the impact will be transformational or incremental. For example, despite the expectations surrounding additive manufacturing, the total market value is still rather low.

Figure IV.12. The relevance of different trajectories, by industry



Source: UNCTAD.

Even with the swift projected growth rate, by 2030 only a fraction of gross output in GVC industries would be accounted for by additive manufacturing. Similarly, there is significant uncertainty about the scale of automation and robotization of GVCs by 2030. Another caveat is that even if rapid technology advances enhance the possibilities of automation in GVCs, this does not necessarily imply that building the supporting infrastructure and ensuring the requisite technical capacity to automate will be economically more advantageous than conventional means of production.

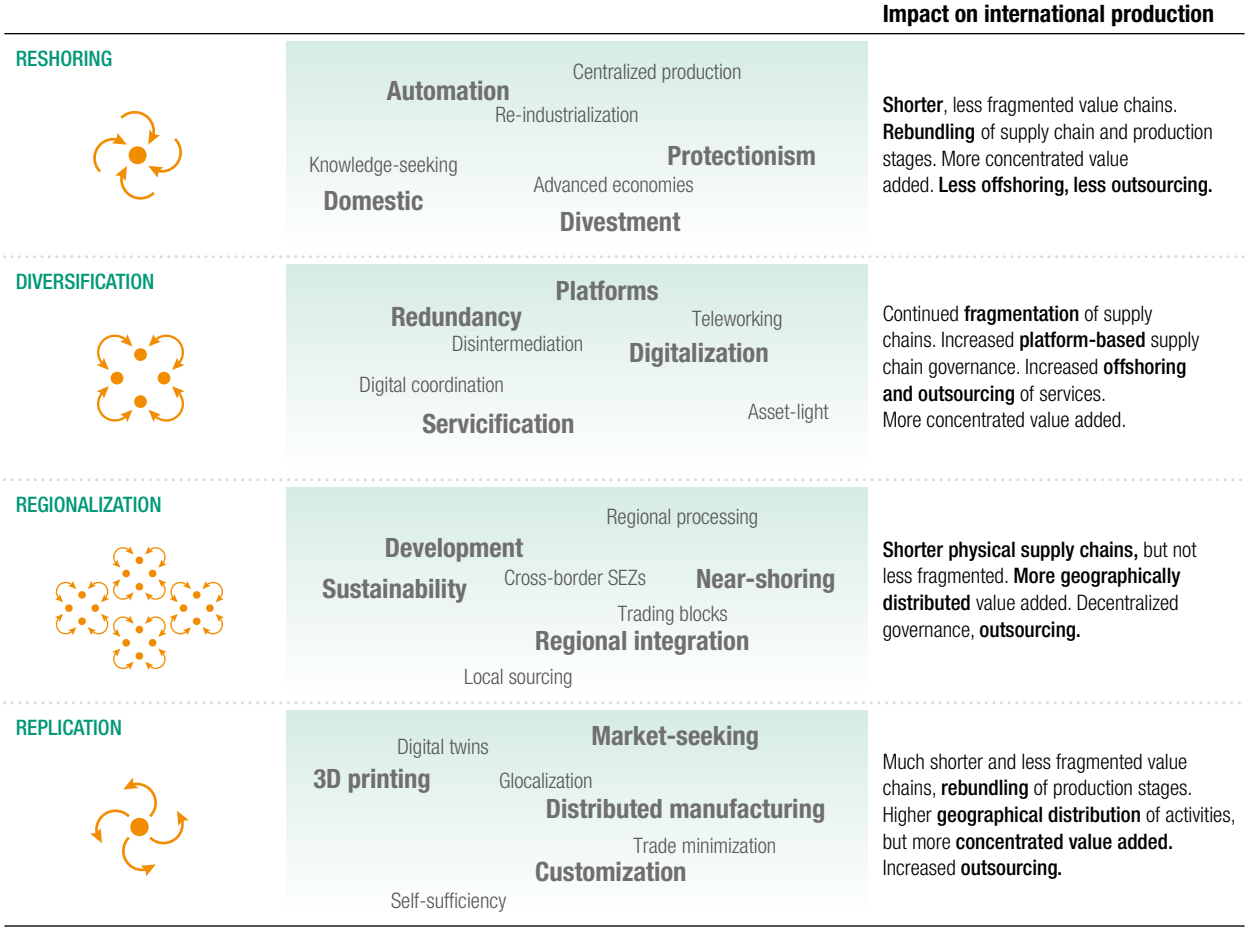
How the sustainability imperative will affect international production by 2030 is also contingent on an array of factors. The United States' notice in 2019 of its intention to withdraw from the Paris Agreement on Climate Change Mitigation underscores the fragility of the global framework underpinning sustainability policies and regulations. Similarly, there is a concern that market-driven changes in products and processes due to reputational risks could be side-stepped by firms through greenwashing. The absence of enforceable global standards on the labeling of products and processes, as well as the variation in reporting mechanisms of the environmental impacts of firms, further raises the possibility that sustainability plans will not be implemented fast enough to have a transformational impact on international production this decade.

Adding further complexity to the uncertain equation of the degree to which the three megatrends will affect international production by 2030 are the interlinkages between them. Technology and sustainability trends depend on policy developments. Policy measures themselves are contingent upon both political outcomes in major economies as well as the state of international cooperation. An emerging trend in the last

decade was the incorporation of targeted environmental standards in both bilateral trade agreements as well as in the more recent wave of megaregional treaties. The Trans-Pacific Partnership, for instance, incorporated a dedicated chapter on a range of environmental issues, including enforcement of environmental laws, cooperation in capacity building for environmental protection and the promotion of mutually supporting trade and environment policies. Similarly, during negotiations for the Trans-Atlantic Trade and Investment Partnership, the EU proposed that the United Nations Framework Agreement on Climate Change underpin its environmental protection aspects. However, the roadblocks to the implementation of these agreements as originally envisaged underscore the difficulty in arriving at enforceable environmental standards, not only for member States but also for MNEs operating abroad, through bilateral and regional economic cooperation.

The COVID-19 pandemic may also render the future of multilateral cooperation uncertain. Once the dust settles, it could well result in renewed realization of the importance of international cooperation not only to prevent future global health calamities, but also to alleviate the economic and social ramifications. This, in turn, could act as a forceful enabler for international production, especially if it comes in the form of coordinated fiscal measures and industrial policies at the global and regional levels to support export-oriented GVCs and if it removes impediments to internationally traded goods and services. Summing up, the trends and trajectories projected in this chapter provide a broad indication for the directions that international production may take in the decade to 2030 (figure IV.13).

Figure IV.13. Elements of trajectories and impacts on international production



Source: UNCTAD.

E. A DECADE OF TRANSFORMATION AHEAD: POLICY IMPLICATIONS

1. Reconfiguration of international production

Although the expected transformation of international production is not unidirectional, overall the trends show a system under severe pressure with heightened risks of a retreat of GVCs, giving way to regional value chains and reshoring, and declining cross-border investment in productive assets. Given the importance of international production for post-pandemic recovery, for economic growth and job creation, and for the development prospects of lower-income countries, policymakers need to promote a trade and investment policy environment that is conducive to a gradual adjustment of international production networks to the new realities.

Global supply chains have been hit hard during the COVID-19 crisis. To limit the damage – and the depth of the recession the world is entering – it is of vital importance to get them started again as soon as possible after the pandemic is under control. However, international production is not only affected by the immediate impact of the COVID-19 crisis. The coming years – and the decade to 2030 – will see more fundamental changes to the system of international production. The slowdown of trade and investment over the last decade was a harbinger of a decade of transformation ahead. This chapter has shown how international production is affected by megatrends in three areas – technology, economic governance, and sustainability – each of which has complex policy implications on its own.

The *NIR and the digital economy* are changing traditional investment drivers and determinants. They increase the weight of intangibles and services in global value creation and place new demands on host-country supply chain partners and technological infrastructure. The adoption of digital technologies in MNEs across industries is rapidly changing patterns of international production, because it allows MNEs to reach overseas markets with a much lighter international asset footprint *(WIR17)*. New technologies force policymakers to respond to shifting patterns of international investment and to changing investment determinants. Attracting international investment in a digital economy that relies less on some factors, such as low-cost labour, and more on others, such as infrastructure, skills and low-cost energy, requires different competitive advantages.

The changes over the last decade in *international economic governance* and in policy attitudes towards international trade and investment have also forced a rethink among investment and development policymakers around the world. They have led to a trade and investment policy paradox. On the one hand, barriers to trade have increased, inward investment has become subject to greater scrutiny, and outward investment is discouraged in some countries. On the other hand, competition for trade and investment has also

increased, with more than 100 countries adopting new trade- and investment-dependent industrial policies over the decade *(WIR18)* and an explosion in the number of SEZs. Modern industrial policies are increasingly diverse and complex, including myriad objectives, such as development of the knowledge economy, competitive positioning in industries deemed crucial for future growth (e.g. robotics, bio-tech), and build-up of sectors important for sustainable development (e.g. renewable energy, agri-food, water management).

The latter aspect shows the increased emphasis on the *sustainable development agenda* in investment policies. Sustainability also increasingly drives MNE strategic decisions and operations. The approach that governments take in industrial and investment policies reflects this, as does the value proposition that implementing institutions such as investment promotion agencies and SEZs market to investors. In industrial development strategies and in most SEZs, laxer social and environmental rules or controls are no longer considered a competitive advantage to attract investment *(WIR19)*. And services related to sustainability, such as quality health services, waste management standards and renewable energy sources will become increasingly important.

Thus, each of the three megatrend areas individually has fundamental implications for investment-development policymakers. The same is true for the crisis caused by COVID-19, which is expected to lead to a push for greater supply chain resilience and a higher degree of autonomy in the production of critical supplies.

However, it is important for policymakers to consider *the combined and cumulative effects* of all the trends and the current crisis. Policies in response to COVID-19 can precipitate changes that were already in the making. For example, the introduction of robotics in certain industries may be technologically possible but held back by considerations of economic feasibility. If new resilience requirements or trade barriers change the cost calculation, this can tip the scales.

Overall, it is clear that international production, and especially cross-border investment in productive assets, will come under severe pressure. In some industries this may become a decade of transformation; in others it will look like a retreat. There are significant risks attached to the possible further slowdown or even reversal of international production.

First, an abrupt or forced retreat will make the recovery more difficult. A downturn in international production adds a protracted supply shock to the demand shock, slowing down the recovery. It also deepens the crisis in economies least equipped to deal with it. In the immediate aftermath of the global financial crisis, leading economies concluded that it was important to avoid a knee-jerk reaction towards economic nationalism to safeguard the fragile recovery at the time. In fact, it was the international sector – GVC-intensive industries – that led the recovery.

Second, longer term, it will harm the development prospects of lower-income countries. International production has been a driver of growth for decades and has contributed to lifting millions out of poverty. The development strategies of many of the poorest countries explicitly rely on opportunities to attract FDI and to participate in GVCs; a retreat of international production would make their development ladder more rickety.

Third, a retreat of international production could have many side effects on prices, competition and innovation. Important gains of international production in an open trade and investment system have been, for example, the steep drop in the cost of equipment for the generation of renewable energy and for broadband networks, enabling massive investment in projects to boost clean power and bridge the digital divide. Innovation in vital areas such as biotech and fintech, relevant for health, food security and access-to-finance SDGs, depends on competition in global markets.

Hence, while a policy push towards a degree of self-sufficiency in the production of vital goods, more general pressure for a wider distribution of industrial manufacturing capacity globally, and calls for a partial decoupling of supply chains from factory Asia are likely to grow stronger, policymakers should be aware of the risks involved. These risks are compounded by the fact that reconfiguring supply chains for firms, and re-industrialization for economies, are lengthy and complex processes.

That said, the transformation of international production is inevitable. Policy action to make international production more sustainable – which could go hand-in-hand with measures to mitigate the effects of the pandemic and limit future risks – is both necessary and urgent. The policy debate at the international level should not be about saving international production networks, but about making them more sustainable while preserving their development benefits.

The wishlist of improvements for the system of international production was already long: more value capture in host countries, more productive investment and less financial and intangible flows, less tax avoidance, more equitable distributive effects, better ESG impacts, a greater contribution to technological and capacity development, and many others that have been discussed in past issues of the *WIR*.

The culmination of the three megatrends discussed in this chapter combined with the COVID-19 crisis adds three further design criteria for the future of international production: (1) more resilient supply chains that are (2) less prone to spreading crises and less contagious, in both physical terms (pandemics) and financial terms (spreading economic crises), and (3) a lower propensity towards geographical concentration of industrial capacity that increases strategic reliance and de-industrialization around the world.

2. Meeting the challenges and capturing the opportunities

The diverse impacts of the megatrends that will play out over the decade to 2030 imply a shrinking pool of investment in physical assets, pressure on value capture from GVC activities, and changes in drivers and determinants of international production that will often negatively affect the chances of developing economies to attract MNEs' operations. But the transformation is not without new opportunities. In fact, they are plenty, arising from the build-up of new regional value chains and small distributed manufacturing activities, and from the diversification of value chains for redundancy and resilience.

The industry-specific trajectories that international production will take over the decade to 2030, discussed in section D, all have different implications for investment-development policymakers (table IV.23). The push for reshoring will cause a shock for economies that depend on export-led growth and GVC participation. Diversification and digitalization will imply a challenge to value capture in GVCs but will also lead to new opportunities to participate in them. Regionalization will make cooperation with neighbours on industrial development, trade and investment of critical importance. And replication will change the model of investment promotion focused solely on large-scale industrial activities.

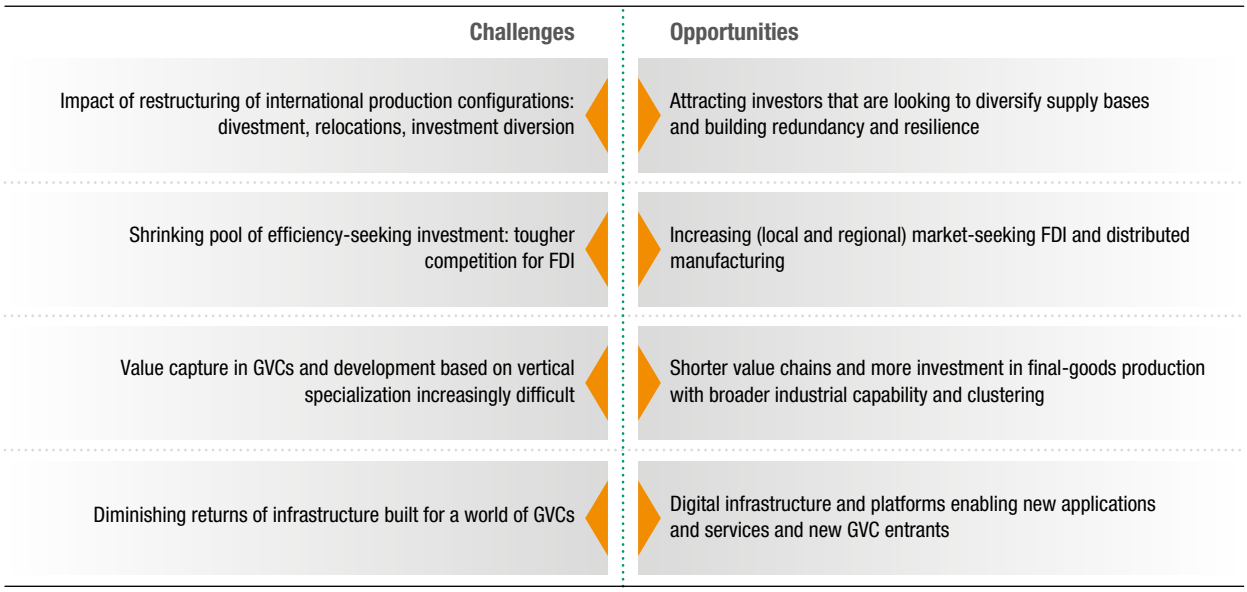
The various nuances in the different trajectories notwithstanding, the overall directional trend in international production points towards shorter value chains, greater concentration of value added and declining international investment in productive assets. As much as international policy efforts can do to maintain a favourable environment for cross-border trade and investment, national policymakers still need to prepare. But policymakers do not just have to prepare for a downturn in international production, they also need to be ready to capture opportunities arising from the transformation (figure IV.14).

Table IV.23. Key investment-development implications of different trajectories for host economies

Reshoring	• Possible shock of restructuring, including divestment, relocation; investment diversion • Shrinking pool of efficiency-seeking FDI • Need to re-industrialize or cope with (premature) de-industrialization • Access to and upgrading along the GVC development ladder becomes more difficult
Diversification	• Broader opportunity to participate in GVCs, but loosely governed, platform-based and asset-light • Acceleration of the shift to intangibles and services-based GVCs • Concentration of value, value capture in host countries becomes more difficult • Quality of hard and soft digital infrastructure drives GVC participation
Regionalization	• Shift from global efficiency-seeking investment to regional market-seeking investment • Shift from investment in dispersed vertical GVC segments to investment in broader industrial bases and clusters • Nearshoring replicates restructuring effects of reshoring (but softens others) • Regional economic cooperation, industrial policy and investment promotion indispensable to build regional value chains
Replication	• Shift from investment in large-scale industrial activity to small-scale distributed manufacturing • Local manufacturing base and producer services a prerequisite to attract final stages of GVCs • Increased outsourcing to local producers and service providers, value capture and technology dissemination not guaranteed • Greater need for cost-effective physical supporting infrastructure and quality digital infrastructure (hard and soft)

Source: UNCTAD.

Figure IV.14. Challenges and opportunities arising from the transformation of international production



Source: UNCTAD.

The challenges are especially acute from the perspective of developing countries. Their development and industrialization strategies often depend to a significant degree on attracting FDI, increasing participation in GVCs, and gradual technological and value added upgrading. However, more advanced economies are also affected by some of the same challenges. Selective reindustrialization will take time. There is no guarantee of success because skills and supplier bases are not always present; high expectations for the number of jobs to be brought back are unlikely to be met; and costs will be significant, including both investment costs associated with restructuring and with capital-intensive production, and economic costs – including higher prices. The cost considerations, in particular, add significant uncertainty about the ultimate direction and speed of the transformation. For example, the cost of diversification to achieve the desired increase in supply chain resilience has yet to be calculated and will not be the same for all industries and firms.

Although the challenges for investment-development policymakers are daunting, the opportunities are also important. To start with, each of the trends that drive the transformation brings its own opportunities:

- *The NIR and the development of the digital economy* – improved access to markets for SMEs in developing countries; building up new economic activities in app development, local content development or digital services for export; and leapfrogging in industries ranging from telecommunication to financial services (*WIR17;* UNCTAD, 2019).
- *Policy and economic governance trends* – pushing for barrier-hopping investment and capturing diverted investment; promoting intraregional investment that benefits from regional trading blocks and nearshoring.
- *Sustainability trends* – attracting investment in new sustainability-related products and services and promoting investment projects in infrastructure, renewables and other SDG-relevant sectors (*WIR14,* and chapter V of this report).

The opportunities specifically associated with the transformation of international production as a result of the combination of all these trends in addition to the impact of the crisis caused by COVID-19 include short- to medium-term possibilities – such as positioning for the promotion of resilience-seeking investment – and longer-term prospects that will require a shift in development strategy and industrial policy as well as regional cooperation in trade and investment policy. The opportunities imply a paradigm shift in investment for development (figure IV.15).

The difficulty from a development perspective is that the challenges and opportunities will not present themselves symmetrically across groups of economies at different income levels and at different stages of development. The shrinking pool of efficiency-seeking investment will make it more difficult for countries in the early stages of development to increase participation in GVCs. Those same countries will find it equally difficult to benefit from a larger pool of market-seeking investment, which will favour larger middle-income and high-income countries. Low-income countries could face increased risks of an absolute decline in FDI and reduced participation in global production networks. For them, regional economic cooperation and being part of a larger integrated market becomes even more important.

At any stage of development, countries' development strategy and industrial policy can no longer rely to the same degree on a narrow mix of export-oriented investment. Investment promotion strategies need to adapt to the transformation and re-assess their industry focus and targeting approach (box IV.5). Important investment policy instruments, such as incentives and SEZs, need to cope with a shrinking pool of industrial investment. For SEZs, in particular, that makes it even more important than before to avoid over-investing in large-scale facilities for industry and to focus on lean development (*WIR19*).

Figure IV.15. The transformation of international production and the investment-development path

From	To
• Export-oriented	• Export "plus plus" – Plus production for local markets – Plus infrastructure development
• Efficiency-seeking investment	• (Regional) Market-seeking investment
• Targeting GVC segments/tasks	• Building diversified industrial clusters
• Prioritizing large-scale industrial investors	• Competition for diversified investments based on flexibility and resilience
• Cost-based competition for single-location investors	• Room for small-scale manufacturing facilities and servicess
• "Big infrastructure"	• "Lean infrastructure" – digital and sustainable

Source: UNCTAD.

Box IV.5 The transformation of international production: rethinking investment promotion strategies

The transformation of international production has important implications for investment promotion strategies. Investment authorities, SEZ authorities and investment promotion agencies should consider the following strategic responses:

- Assess likely trajectories of industries and GVC segments in the existing FDI profile.
- Assess retention options for economic activities at risk of reshoring or relocation.
- Assess opportunities to promote locations as nearshore or regional supply chain flexibility and resilience bases.
- Review the investor targeting approach, its dependence on vertical specialization and the potential need to shift towards more diversified industrial clustering and (regional) market-seeking investment.
- Consider opportunities to engage in or enhance cooperation with investment promotion agencies in the region to promote multi-country industrial clusters and regional cross-border SEZs.
- Consider diversifying SEZ offerings: not just large-scale, export-oriented, industrial investment, but a range of types extending down to facilities for small-scale manufacturing (e.g. maker spaces) and collaborative services environments.
- Enhance capabilities to promote investment in infrastructure and domestic services; enhance cooperation with PPP units to promote project-finance FDI in synergy with public investment (including in SDG-relevant sectors, renewables, agriculture and health).

Source: UNCTAD.

Policymakers in developing countries, at all levels of development, need to consider the implications of the transformation of international production for their investment policy framework. A new framework, fit for the decade of transformation, should incorporate four key elements (table IV.24):

1. Embarking on a **new investment-development path.** Shifting strategic policy direction from a GVC-driven, segment-targeted export orientation towards RVC (regional value chain)-based export expansion, with domestic industrial clustering to build linkages and resilience. In following the new path, countries should balance modern (open) industrial development policies (*WIR18*) with built-in national economic security and resilience mechanisms.
2. Developing a **new ecosystem.** Promoting a business environment attractive to new investment activities and conducive to technology dissemination and sustainable development. An important component of the new ecosystem should be the modernization of infrastructure for digital, physical and institutional connectivity at regional and subregional levels.
3. Building **dynamic productive capacity.** Shifting the focus from narrow specialization to the expansion of the manufacturing base. Strengthening industrial clustering (including cooperatives of micro and SMEs for scale and scope of production) and retooling SEZs and science parks are viable approaches that match with MNE regionalization and diversification strategies. Such approaches can also help low-income countries to foster a resilient and inclusive economy by crowding in domestic micro and SMEs and facilitating backward linkages.
4. Formulating a **new investment promotion strategy.** Adapting investment promotion and facilitation to the new investment-development path. This includes resetting priorities for investment promotion, targeting diverse investment activities and business functions, and facilitating green and digital investors, as well as impact investors, to promote investment in the SDGs.

Overall, the trends that will drive the transformation of international production, in particular the NIR and the sustainability imperative, and the need for MNEs to restructure for resilience in the short term and the transformation trajectories in the longer term, will offer a myriad of investment opportunities for developing countries. To seize these opportunities, formulating the right policy mix at the right time matters.

* * *

The trends and trajectories presented in this chapter are subject to many degrees of uncertainty. The business response is a first unknown. Resilience is now the new imperative, but where MNEs will decide to reposition on the efficiency-resilience spectrum remains to be seen. It will depend on the costs, on the pressure for short-term results to guarantee survival and on political incentives. It also depends on their corporate structure and governance, as well as on their business model in different industries. The same resilience-building technology may be available in some industries and not in others, or at completely different costs in different countries and regions at different development levels.

Future policy developments are also unpredictable. For now, the pandemic appears to accelerate the trend towards more economic nationalism, but the need to repair the economic damage might yet reverse the trend and lead towards more cooperation. Similarly, sustainability trends will continue evolving across different dimensions of international production. The pandemic appears to be generating increased sustainability momentum in some countries but this may not be the case in others. Furthermore, the pressure to restart economies may lead to delays in the implementation of sustainability plans.

Table IV.24. Investment-development ecosystem in a new era of international production

New investment development path	Building a new ecosystem	Building dynamic domestic productive capacity	New investment promotion strategy
New strategic orientation • Old path – Export-led growth and transformation, GVC segment/niche targeting approach to integrating into the global economy based on cost efficiency, which creates silos in the host economy • New path – Technology and sustainability driven productive capacity building through industrial clustering, at national and regional or sub-regional level	**National enabling framework** • Macroeconomic policy appropriate for a new international production system • Strengthen national technology and innovation systems in line with NIR and digitalization • Policy package for SDGs including sustainability and inclusiveness	**Build production capability** • Expanding domestic productive capacity and re-engineering domestic industrial base • Establishing SEZ platforms for industrial clustering • Building joint cross-border industrial parks on regional industrial cooperation basis	**Towards a new approach** • Reorienting: from global efficency-seeking FDI to regional and subregional production-related FDI • Targeting: from specific value segment to industrial clusters promotion for diversification-related FDI • Adding: technology applications promotion and facilitating firm-level strategic alliance with MNEs
Industrial transformation • Diversifying: creating and attracting new industrial development activities, particularly related to new technology and sustainable development • Deepening: clustering through upstream and downstream extension and linkages to crowd in MSMEs • Upgrading: product, process and function through greening and digitalizing	**International enabling framework** • Regional and bilateral treaties to promote and facilitate trade, investment and technology flows • Regional cooperation and geo-economic positioning • Regional framework for industrial collaboration	**Nurture technological capabilities** • Promoting adoption of digital applications • Continuous human resources and skills development in sync with technological evolution • Technology alliance through cross-border collaborative arrangements; and partnerships of firms and research institutions	**Link investment to sustainable development** • Partnering between FDI and public investment in SDGs such as agriculture, health, education and digital infrastructure • Promoting impact investment • Incubating social entrepreneurship
Balance between openness and resilience • Open industrial development policy • Mindful of the need for job creation and inclusive growth • Protect national economic security and build resilience	**Modernize infrastructure** • Investing in regional infrastructure, particularly transport, logistics and high-speed Internet connectivity • Digitalizing manufacturing facilities • Upgrading producer services, e.g. regional marketing network, trade corridors	**Support emerging industrial sectors** • Coordinate the manufacturing policy environment with policies for services, data flows and other intangibles to promote emerging industrial sectors • Enforce strong and adaptive intellectual property regimes	**Reorient investment institutions** • Establishing agencies with both investment and technology facilitation functions • Promoting synergies between SEZs and IPAs • Prioritizing investment in SDG sectors, including by developing bankable projects

Source: UNCTAD.

Over the coming years, as developments in these areas materialize, it will be important to regularly monitor and reassess the trajectories presented in this report, and their implications. Some trajectories or combinations of trajectories will prevail over others. They may result in different international production configurations across industries.

The impact on individual economies and groups of economies will vary. This report aims to provide a broad enough analytical framework to encompass the most likely directions and to address the range of policy options available to navigate the decade of transformation ahead.

Notwithstanding the high degree of uncertainty and the range of possible trajectories for international production, the general direction of travel seems clear. GVCs, trade and investment are heading for a period of turbulence that will present ample challenges and opportunities for developing countries.

For the past three decades international production and the promotion of export-oriented manufacturing investment have been the pillars of the development and industrialization strategies of most developing countries. Efficiency-seeking and resource-seeking investment will remain important, but the pool of such investment is shrinking. This calls for a degree of rebalancing towards growth based on domestic and regional demand and on services.

The large amounts of capital looking for investment opportunities available in global markets do not look for investment projects in manufacturing, but for value-creating projects in infrastructure, agriculture and services. Some services that have always been predominantly domestic are internationalizing, such as health care, just as traditional international production industries are retreating or restructuring. That creates new opportunities for promoting investment in new areas.

Promoting investment in infrastructure and services implies marketing new sectors (especially those that are relevant for the SDGs), targeting a different type of finance (project finance rather than traditional FDI) and targeting a different type of investor (institutional investors rather than MNEs) operating in a different policy ecosystem (financial market standards and regulations).

Investment in the green economy and the blue economy, as well as in infrastructure and domestic services, presents great potential for contributing to achieving the Sustainable Development Goals (SDGs). Chapter V – a new chapter in this report – looks specifically at trends in investment in the SDGs.

NOTES

[1] The same conclusions are drawn in Miroudot and Nordstrom (2019).

[2] For example: *The Future of GVCs* (OECD, 2017); *Reshaping Global Value: Technology, Climate, Trade - Global Value Chains under Pressure* (World Economic Forum, 2019).

[3] A similar classification has been used by others to analyze the impact of Industry 4.0 (Hallward-Driemeier and Nayyar, 2017).

[4] For further summaries of the longstanding debate on ESG issues in the international operations of MNEs, see also Narula, 2019; Narula and Van der Straaten, 2020; and Van der Straten et al., 2020.

[5] Database of the Sustainable Stock Exchanges (SSE) Initiative.

[6] For example, floods affected electronics component manufacturer ROHM and Co, causing production delays in Honda plants in the United States and the United Kingdom. Computer hard drives from Seagate were in short supply, affecting global manufacturers such as Acer. Sony's NEX-7 camera suffered a launch delay because of the flooding.