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Does COVID-19 Change the Long-Term Prospects of Latecomer Industrialisation?

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Abstract

This study explores to what extent the COVID-19 crisis has been a turning point in the industrialisation process and the overall progress of countries towards sustainable development and what this implies for future inclusive and sustainable industrial development policies. The focus of the study is on latecomer economies.

In the first part of this study, we show how the prospects for industrialisation are changing. The reasons are manifold, yet the following global megatrends have particularly strong effects: i) digitalisation and automation of production; ii) global economic power shifts, with enormous ramifications for trade flows and global value chains; and iii) the greening of economies. These trends are interrelated in multiple ways and, in conjunction, shape the direction of structural change. They open up new avenues for inclusive and sustainable latecomer industrialisation – including digital technologies that reduce transaction costs for countries on the periphery that are willing to benefit from trade; the shift of labour-intensive investments from China to other latecomer economies; or the increasing demand for renewable energy and green hydrogen for which many latecomer countries offer excellent conditions. At the same time, digitalisation and increasing environmental standards raise entry barriers to markets, especially for country with weak innovation systems; likewise, automation tends to undermine latecomer countries' traditional advantages in labour-intensive industries.

While the COVID-19 pandemic has had a severe impact on the world economy, such impacts *will not change the ongoing megatrends fundamentally*. Thus far, the ongoing recovery from COVID-19 is not showing much structural transformation – despite many political voices, such as US President Biden, suggesting the need to "build back better". Nevertheless, the pandemic is likely to *accelerate or decelerate* some of the previous trends. The second part of our study assesses the effects of COVID-19 against the background of the already ongoing structural transformation, again with an emphasis on the prospects for inclusive and sustainable latecomer industrialisation.

Within the field of digitalisation and automation, two trends are likely to emerge even stronger from the pandemic. One is the trend towards online trading. The market is being increasingly dominated by international trading platforms, which in turn may trigger concentration in "upstream" activities such as manufacturing. This may crowd out weaker market actors. At the same time, platform economies are boosting delivery activities, such as courier services and the scooter industry. Another trend that may be accelerated by the pandemic is towards the reshoring of previously offshored productive tasks, as COVID-19 has exposed the risks of disruption in international supply chains. Yet, evidence here is mixed, and we may see other risk-hedging strategies rather than large-scale reshoring. In the field of global power shifts, we expect the pandemic to reinforce previous trends. Already pre-COVID, the gap between East/Southeast Asia (and China in particular) and other developing regions (especially Sub-Saharan Africa; the Middle East and North Africa (MENA) region; and Latin America) had been widening. While the former had successfully upgraded its industries and greatly increased its share in global trade and value added, the latter had fallen further behind. While China and several other Asian economies have weathered the crisis relatively well and recovered fast due to vaccination programmes and fiscal stimulus packages, high COVID-19 incidences are delaying the recovery in other regions, and this may weaken their positions on world markets in the long run. Finally, the

slow shift towards a green transformation of the world economy will not be affected much. We see three arguments in favour of a modest acceleration of this trend: i) public investments in green fiscal stimulus packages in some economies, for example, disbursing research and development (R&D) support for a global green hydrogen economy; ii) the fact that the crisis has once more unveiled the cost of depending on oil exports and thus the need for economic diversification in oil-dependent economies; and iii) the trend towards tele-work reducing transport requirements.

In the last section, we offer police recommendations derived from the analysis. These are aimed at national governments and international agencies active in the field of latecomer industrialisation – United Nations Industrial Development Organization (UNIDO) in particular, the UN agency in charge of industrial development that commissioned this study. Recommendations are grouped under five themes: i) Fostering economic resilience through economic diversification, with a range of practical opportunities derived from our analysis of the long-term trends affecting structural transformation; ii) the need to develop pharmaceutical and medical supply industries – both globally and at national levels – to cope with, or ideally prevent, future pandemics; iii) investing in digital capabilities, as value creation is shifting towards digital business models and the pandemic is accelerating this shift. Latecomer economies in particular need to ensure they can cope with rising entry barriers. Moreover, they need to be able to regulate emerging platform economies in ways that avoid monopolies and preserve market opportunities for local firms; iv) strengthening the basis for domestic revenue generation. Countries with sound public finances have been able to mitigate crisis effects through financial stimulus packages. We recommend fiscal reforms that tax environmental "bads" and reduce environmentally harmful subsidies in order to accelerate capabilities in emerging green industries and to enable social protection programmes to be financed; and v) harmonising industrial policies globally, as a new field of action for UNIDO in particular. The pandemic, but also global warming, are underlining the need for international agreements, especially in the domain of intellectual property rights and technology-sharing, to enable all countries to cope with such societal challenges.

Contents

Figures

Tables

Abbreviations

DSSI	Debt Service Suspension Initiative
FDI	foreign direct investment
GDP	gross domestic product
GHG	greenhouse gas
GVC	global value chain
IMF	International Monetary Fund
ISID	inclusive and sustainable industrial development
IT	information technology
MENA	Middle East and North Africa
MVA	manufacturing value added
NDC	Nationally Determined Contribution
PPP	purchasing power parity
R&D	research and development
RMB	renminbi
SME	small and medium-sized enterprise
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
USD	United States dollar

1 Introduction

This report has been written as a background paper for the UNIDO Industrial Development Report 2022. The report discusses to what extent the COVID-19 crisis has been a turning point in the industrialisation process and the overall progress of countries towards sustainable development and what this implies for future inclusive and sustainable industrial development (ISID) policies. It shows that the prospects for industrialisation are changing substantially. The reasons are manifold, yet the following global megatrends have particularly strong effects:

- Digitalisation and automation of production;
- global economic power shifts, with enormous ramifications for trade flows and global value chains; and
- the greening of economies.

These three megatrends are interrelated in multiple ways and, in conjunction, shape the direction of structural change, and of industrial development in particular. Some industries and business models are declining, whereas others are emerging and expanding. This creates both opportunities and threats for all economies. How these play out depends on country-specific economic structures and coping strategies.

Some changes are already in full swing, whereas others are still incipient. In the domain of digitalisation and automation of production, for example, factory automation is already changing each and every industry; likewise, the transition from traditional retailing to large-scale online platforms is advancing in great leaps; for other digital technologies – the internet of things, artificial intelligence, digital printing and blockchain technologies – analysts expect similarly far-reaching effects on the production systems, yet so far these have been relatively small. This study tries to capture both the ongoing and the expected trends, how they unfold in various ways and at different speeds across developed and developing countries, and what opportunities and threats they imply for countries seeking to achieve inclusive and sustainable industrial development (ISID).

The COVID-19 pandemic is the most recent driver of change, and its effects on structural change and industrial development are not yet entirely clear. This study starts from the premise that *COVID, in itself, will not fundamentally change the megatrends, but that it is likely to accelerate or decelerate some of them*. We therefore explore COVID's effects against the background of the already ongoing structural transformation, with an emphasis on the prospects for industrial development. This is the study's main innovative contribution, in contrast to a multitude of informative and detailed studies describing the pandemic's short-term effects. It is, however, a daring exercise as the empirical basis for assessing the structural effects of a crisis that only started one and a half year before the time of writing this report is obviously quite narrow. Our analysis can thus only present incipient trends, interpreting signals from stock markets, companies' investment plans, industry-specific intelligence reports or public policy plans including fiscal stimulus packages – all imperfect indicators of change, which, however, do help to identify trends.

The remainder of this study consists of three sections: Section 2 explores the three main megatrends of pre-COVID-19 structural transformation individually, but also emphasises their interrelatedness. Special emphasis is given to latecomer economies and their prospects

for inclusive and sustainable industrial development. Latecomer economies are those that face an uphill battle in globalisation because other economies (and firms) that industrialised earlier benefit from economies of scale, network effects and other deep-seated structural advantages; yet at the same time have some advantages, as they can draw on already existing technologies and business models that incumbents have developed in a long and painful process of trial and error (Mathews, 2006; Gerschenkron, 1962). Section 3 explores to what extent COVID-19 accelerates or decelerates these underlying trends. Thus, it revisits the same trends, looking at them "through a COVID lens". Finally, Section 4 draws policy conclusions for "building back better" after the COVID crisis, again putting ISID at the centre and differentiating between early industrialised and latecomer countries.

2 Megatrends affecting pre-COVID-19 structural transformation

This section analyses the megatrends of pre-COVID-19 structural transformation. Building on Naisbitt (1982), we define "megatrends" as profound transformations that i) last several decades; ii) deeply affect the social as well as the economic and political spheres; and iii) have a global impact. There is no consensus in the literature on what the main megatrends are, and there are many ways of defining their boundaries. Here, we are interested in trends that have a major effect on technological development and economic structural change, and thereby *directly impact on latecomer economies' prospects for inclusive and sustainable industrialisation*. This excludes some socio-cultural "megatrends" – such as the demographic transitions or changing gender relations – that only indirectly affect industrialisation. From our angle, three megatrends are particularly relevant:

- Digitalisation and automation of production, as technological innovation in these fields affects essentially all spheres of business development and deeply alters the competitive advantages of firms and nations;

- global economic power shifts, especially the emergence of Asia as a dominant hub of the world economy, and China's structural transformation towards a knowledge-driven high-income economy, as these developments imply a major restructuring of trade flows and global value chains; and

- the greening of economies, as the need to reduce environmental footprints, and particularly to decarbonise economies, again calls for radically different business models and systemic transformations with far-reaching effects on the positioning of latecomer economies in the world economy.

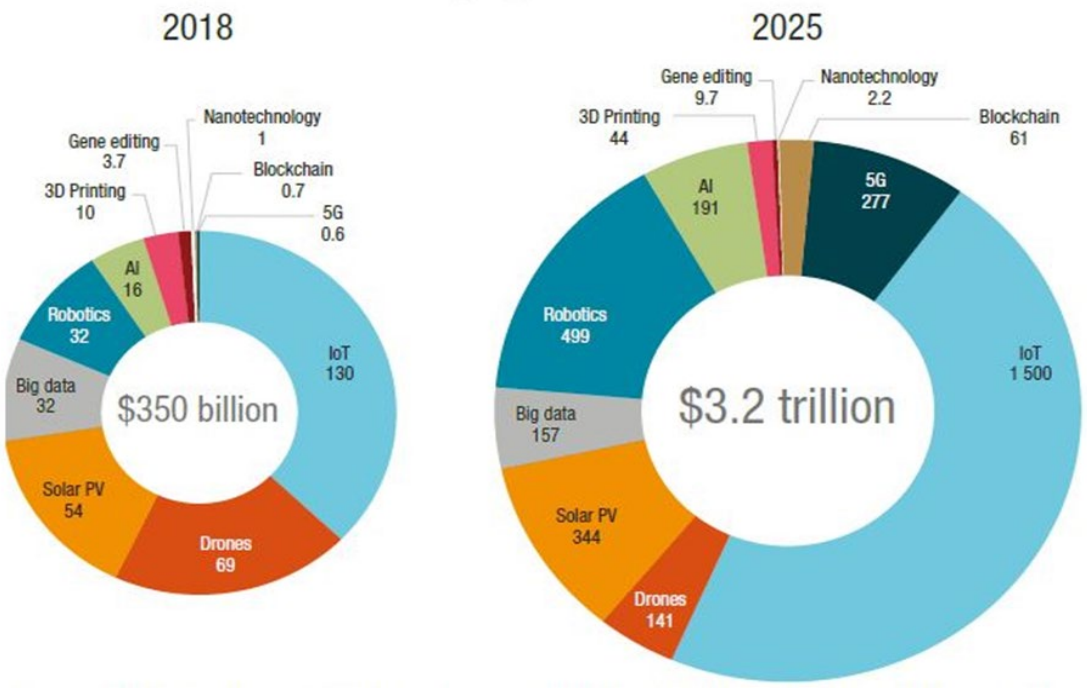
The ability to grasp the ongoing changes, to identify opportunities and threats on the horizon for one's own firm or national industry and to design business plans and industrial policies accordingly is essential for inclusive and sustainable development.

While subsections 2.1 to 2.3 present key features of each of the megatrends, subsection 2.4 underlines the manifold interlinkages between them, a fact often overlooked in traditional single-issue analyses.

2.1 Digitalisation and automation

Digitalisation and automation denote a range of technological changes with pervasive impacts across all sectors of industry. Many digital trends – such as the emergence of the internet of things, cloud technologies, automation and robotics, additive manufacturing, artificial intelligence, big data analytics and blockchain technology – are mutually reinforcing. They affect the way economies are organised through various mechanisms – reducing transaction costs, for example, helping to exploit economies of scale, enabling the customisation of products and services and/or reducing the need for direct labour. As digital innovations are highly interrelated and deeply embedded in essentially all industries, it is difficult to isolate and quantify the impact of each of the major digital innovations. Despite methodological difficulties, analysts agree on the enormous increase in business opportunities these technologies create, as exemplified in the following graph that tries to capture the market size of some "frontier technologies" (see Figure 1).

Figure 1: Market size estimates on frontier technologies (USD billion)



Source: UNCTAD [United Nations Conference on Trade and Development], 2021b, p. xvi;

New technological possibilities affect industrial organisation and competitive advantages in many ways, sometimes with far-reaching implications for latecomer industrialisation. Table 1 illustrates some of the potential causal effects, which, of course, play out in very country-specific ways. Assessing the effects on latecomer industrialisation is especially challenging when digital innovations affect tradable goods and services. Where this is the case, dynamic effects need to be factored into the analysis: countries that grasp opportunities early may benefit, whereas those that face obstacles in using the new technology may lose market shares and fall behind. As digital technologies are highly cross-sectional, these dynamic effects have the potential to unfold in just about every major industry.

Table 1: Select digital trends and their potential effects on latecomer industrialisation		
Digital trend	**Opportunities**	**Threats**
Diffusion of smartphones and related services	Reduced transaction costs, better information and financial service especially for small and medium-sized enterprises (SMEs) (Melia, 2019)	None
Automation of production	Increased firm-level productivity, possibility to close productivity gaps vis-à-vis advanced nations via technology imports (Lütkenhorst, 2018)	Erosion of labour-cost advantages, exclusion from global value chains through higher entry barriers, backshoring (Lütkenhorst, 2018)
Internet of things, artificial intelligence, machine learning, big data analytics	Higher productivity of production systems	High entry barriers in terms of systems know-how, capital and skills (UNCTAD, 2021b) => marginalisation from global production networks
3D printing	Opportunities for decentralised production, favouring remote locations (Fratocchi, 2017)	May further incentivise back-shoring
Blockchain technology	Increased transparency of business transactions, new smart and incorruptible governance modes as alternatives for weak institutions (Kleffmann, 2019; UNCTAD, 2021b)	Know-how so far largely concentrated in advanced nations => may widen technological gaps
Source: Authors		

Digital technologies allow for enormous productivity gains in certain industries, yet it is important to recognise the so-called "productivity paradox" (Brynjolfsson, 1993). While productivity is increasing in some industries, overall labour productivity growth is declining significantly – from nearly 5 per cent per year in 1973 to only 1 per cent in 2015 in a sample of 87 countries (World Bank, 2016, p. 3). There is a lot of controversy why this is the case. Two explanations appear particularly plausible: Firstly, productivity gains in manufacturing and some tradable services are highly labour-saving, pushing redundant workers into low-productivity survival activities; secondly, firms within the same sector may expand their market share at the expense of digital technology laggards without contributing to overall market or productivity growth. Such effects suggest the need for policies to counteract the undesirable processes of market concentration and social polarisation.

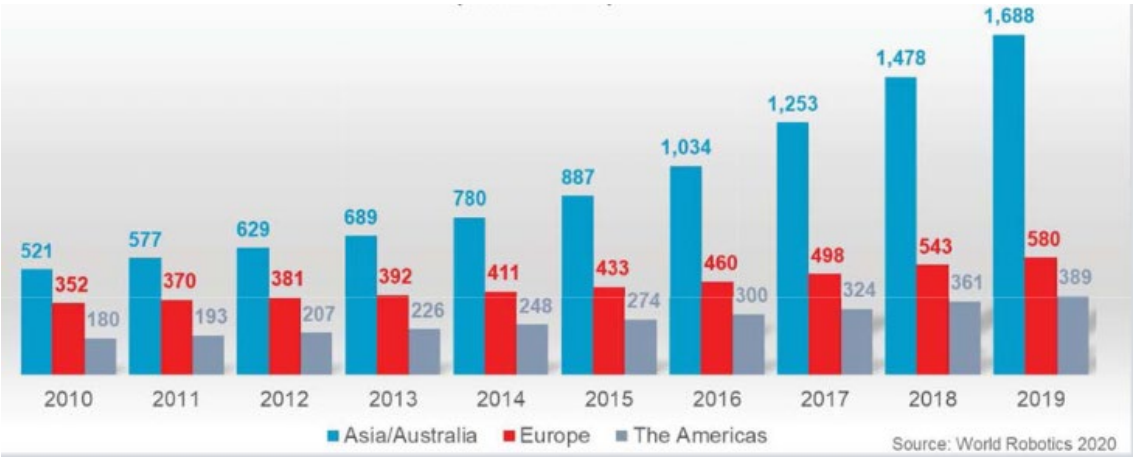
This leads us to another important observation: Digital tools in themselves are neither a blessing nor a curse. How they impact on development depends on the way they are regulated, on the co-investment in skills development, and on the business environment. The 2016 World Development Report called these the "analog complements for a digital economy" (World Bank, 2016, p. 29). Given the interdependence of institutional quality and development effects of IT use, it is unsurprising that we find a concentration of benefits in industrialised countries and China. Developing countries often lack the institutions, financial means and skilled labour required for adopting and adapting new technologies in the best possible way. For example, only 10 "frontrunning" economies account for 90 per cent of global digital technology patents and 70 per cent of related exports and a further 40

"following" economies are active users of these technologies; the remaining 117 listed countries are "latecomers" or, for the biggest part, "laggards" (UNIDO [United Nations Industrial Development Organization], 2020). In addition, digitalisation is proceeding faster in East Asian economies than in other developing regions, which may further accentuate the power shift to Asia (see Figure 2).

Two aspects are highlighted in the analysis here, because they are most likely to be affected by the COVID pandemic:

- The trend towards **automation of production**, and its extension to the automation of entire subsystems through the "internet of things": The International Federation of Robotics World Robotics 2020 Report shows a record of 2.7 million industrial robots in operation in the worlds' leading economies, an 85 per cent increase compared to 2014 (see Figure 2). While the new technologies may increase productivity in many industries, their use is uneven across sectors, countries, and firm sizes. So far, large-scale automation has been limited to certain industries such as transport equipment and machinery (Lund & Steen, 2020), yet the number of process steps that are being automated is increasing across all industries, and the internet of things is expected to accelerate this trend. Using robotics, sensors and digitally integrating production processes presupposes a range of "analogue complements": big capital investments and advanced skills, combined with up-to-date infrastructure and networks of suppliers that can service robot-intensive establishments. These requirements raise entry barriers, favouring capital-rich firms and countries with highly educated workforces. Moreover, automation substitutes unskilled and semi-skilled labour and may thereby further erode the advantages that developing countries have stemming from low labour costs. Firms that had previously offshored labour-intensive tasks thus have greater incentives for reshoring.[1] This jeopardises the traditional development pathway of low- or middle-income countries to economic growth through labour-intensive export-oriented manufacturing.

Figure 2: Operational stock of industrial robots (thousand units)

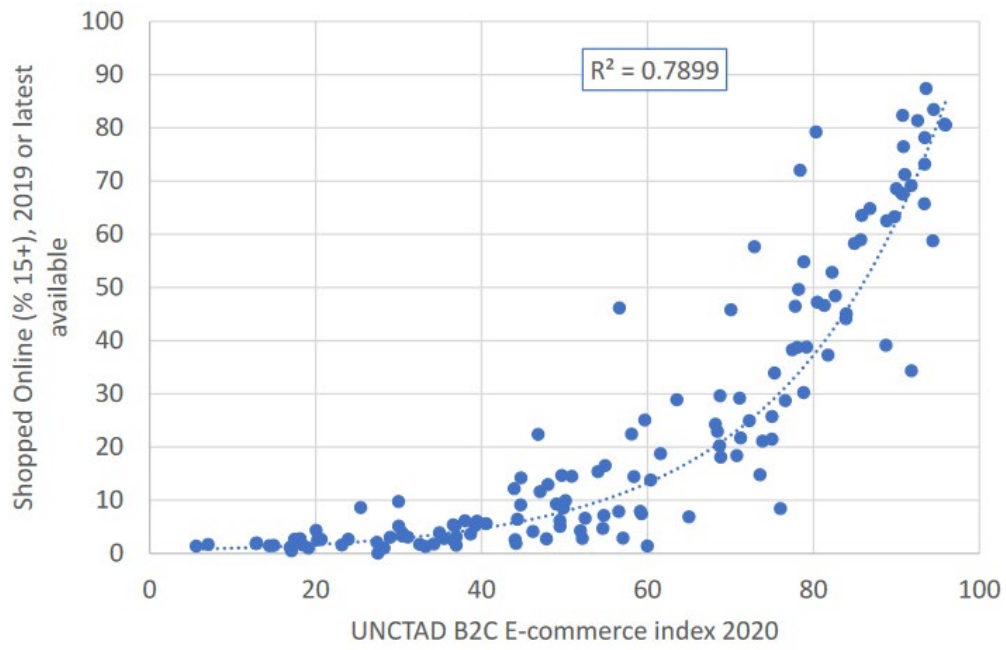


Source: Müller & Kutzbach, 2020

1 While reshoring is still fairly limited, Krenz, Prettner and Strulik (2021, p. 1) find that "on average, within manufacturing sectors, an increase by one robot per 1000 workers is associated with a 3.5 per cent increase of reshoring activity."

- The rapid worldwide deployment of **e-commerce** in various forms: E-commerce (that is, the trading of goods via electronic sales channels) has seen enormous growth in all parts of the world as it offers convenient new services to consumers. Evidence suggests a further accentuation of economies of scale on both the production and consumption side and high levels of concentration in e-commerce platforms (such as Amazon, eBay and Alibaba) as consumers prefer the market places with the largest offerings ("winner-takes-all markets"). This may favour foreign-owned over local platforms, and it calls for big economies of scale in upstream supplies, which may crowd out small and medium-sized suppliers and may substitute local production with imports. Yet, e-commerce can also be used for strengthening local production, for example through direct marketing and measures to increase the e-commerce readiness of local firms. The dissemination of e-commerce requires good internet access for households and firms as well as other services, including security of servers and reliability of postal services. This is captured by the UNCTAD Business-to-Consumer (B2C) E-commerce Index. The index shows a strong correlation between index values and online-shopping (see Figure 3).

Figure 3: Relationship between UNCTAD B2C E-commerce Index 2020 values and percentage of population aged 15 or older which engage in online shopping



Source: UNCTAD, 2020a. © 2021 United Nations. Reprinted with the permission of the United Nations.

Online shopping also correlates with income. A total of 23 per cent of the global population were online shoppers in 2019, but the share was 53 per cent in high-income and 16 per cent in upper-middle income but only 5 per cent in lower-middle income and 2 per cent in low-income countries (UNCTAD, 2020a). Moreover, there are stark regional differences. In China and other Asian countries, where internet access rates are high and young populations have a preference for new technologies and digital business models, online shopping is far ahead of other developing regions. The 2020 e-commerce readiness index value was 57 in South/East/Southeast Asia and 58 in Western Asia, compared to 49 in Latin America and 30 in Africa. All top 10 performers in developing countries were Asian (UNCTAD, 2020a).

Here, platforms are booming and huge numbers of start-up companies are testing new business models in this field.

2.2 Global economic power shifts

Global economic power is shifting between countries and world regions. Gross domestic product (GDP) growth and per capita income have substantially diverged in recent decades. The most striking change is the rise of East Asia Pacific and, to a lesser extent, South Asia, which grew much faster than all other regions. This implies an increasing weight of Asian economies in the world economy (see Table 2). According to Asian Development Bank predictions, Asia will double its current share in global GDP by 2050, reaching 52 per cent, whereas the share of all other world regions is declining. Especially Latin America and the MENA region, in 2000 still the richest developing regions, are lacking dynamism.

Table 2: GDP per capita growth 2000-2020, main developing regions, purchasing power parity (PPP) (constant 2017 USD)

Region	GDP per capita 2000	GDP per capita 2020	Increase (%)
East Asia and Pacific	7,268	17,682	143.3
China	*3,452*	*16,411*	*375.4*
South Asia	2,607	5,782	121.7
Sub-Saharan Africa	2,665	3,641	36.6
Middle East and North Africa	12,313	15,498	25.9
Latin America and Caribbean	12,676	15,169	19.7
World	11,080	16,194	46.2

Source: World Bank, 2021b

Due to the size and growth of its economy, China clearly stands out as a special case. Since 1980, China has seen an annual GDP growth of mostly above 10 per cent, although its growth rate has been decreasing in the last decade, to 6 per cent per annum in 2019 (World Bank, 2021a). Between 2000 and 2018, China's share in global GDP increased from 3.05 to 14.08 per cent (The Global Economy, 2021, based on World Bank data).

Driven by the divergence in growth rates, there occurred a similar divergence in manufacturing value added (MVA). Relative to 1990, global MVA more than doubled by 2016, but it grew by around 50 per cent in developed countries and 450 per cent in emerging and developing countries, increasing the share of the latter in global MVA from 22 per cent to 45 per cent (UNIDO, 2018). This increase has been driven by relative increases in MVA in the Asian region (from 39 per cent of emerging and developing country MVA in 1990, to 75 per cent in 2016) at the expense of substantial reductions in share of MVA in emerging and developing countries in Africa, Europe and Latin America.

This regionally unbalanced development has important ramifications for future ISID:

- The restructuring of trade flows and global value chains, where Asian economies account for a rapidly growing share of world production and trade. Between 2000 and 2020, the share of Asia in global trade increased from 32 per cent to 42 per cent, largely

driven by Eastern Asia increasing its share from 19 to 26 per cent. The share of Sub-Saharan Africa remained very small, increasing only slightly from 1.4 to 1.6 per cent. In contrast, the share of Latin America and the Caribbean decreased from 6 per cent to 5 per cent, Europe decreased from 42 to 38 per cent, and Northern America from 16 to 10 per cent (UNCTAD, 2021d). This is also reflected in a rapidly growing share of supplies for the pool of the largest 2,000 public companies, where Asian suppliers' share rose from 13 per cent to 36 per cent in just seven years (2013-2020; Falk et al., in press). The growing imbalance between Asia and the rest of the world should be a concern, but also a source of inspiration for those world regions that are losing trade shares. Huge industrial clusters, like those in China's Pearl River Delta, have enormous cost advantages stemming from economies of scale in production and transport as well as from network economies. Hence, there is a considerable risk of less competitive regions falling further behind in global competition. At the same time, other developing regions should closely study and draw lessons from the industrial policy strategies of successful Asian countries.

- The rise of consuming middle classes: As the most dynamic countries are population-rich Asian economies, the bulk of global middle-class growth is happening in Asia. Figure 4 shows some remarkable trends in middle-class consumption: i) an almost doubling of consumption spending within 15 years; ii) an unprecedented increase of middle-class spending in Asia Pacific; and iii) very little growth and a strong decline in relative terms in North America, Europe, and Central and South America. The middle classes are developing new and more diversified lifestyles, thereby creating new demands that may be harnessed to unleash a new dynamism of inward-oriented industrial development. As the Asia Pacific region is becoming the centre of global middle-class consumption, the consequent industrial development effects can be expected to further accentuate the ongoing power shift.

Figure 4: Spending by the global middle class (PPP, constant 2011 billion USD and shares)

	2015		2020		2025		2030	
	#	%	#	%	#	%	#	%
North America	6,174	18	6,381	15	6,558	13	6,681	10
Europe	10,920	31	11,613	27	12,159	23	12,573	20
Central and South America	2,931	8	3,137	8	3,397	8	3,630	6
Asia Pacific	12,332	36	18,174	43	26,519	51	36,631	57
Sub-Saharan Africa	915	3	1,042	2	1,295	2	1,661	3
Middle East and North Africa	1,541	4	1,933	5	2,306	4	2,679	4
World	34,814	100	42,279	100	52,234	100	63,854	100

Source: Kharas, 2017

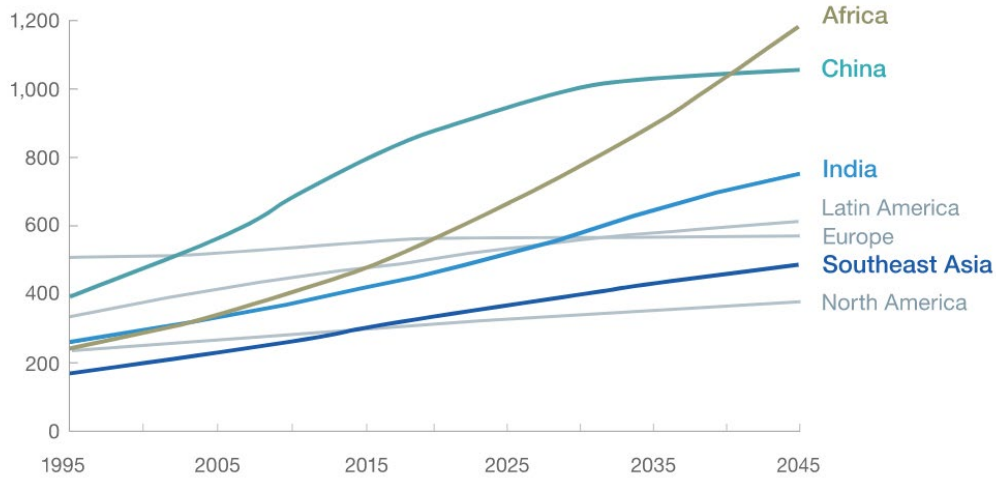
- Along with middle-class growth, urbanisation is accelerating across all developing regions, most notably in Sub-Saharan African and some other still predominantly rural countries (see Figure 5). In principle, the concentration of people and wealth in cities has a range of dynamic effects on industrial development, creating and diversifying markets for construction and consumer goods and creating economies of scale and innovations via agglomeration effects (World Bank, 2009). There is a clear positive correlation between countries' levels of income and urbanisation. Yet, the extent to which

countries reap the industrial development potential of urbanisation differs. Gollin, Jedwab and Vollrath (2015) show that

> in countries that are heavily dependent on resource exports, urbanisation appears to be concentrated in 'consumption cities' where the economies consist primarily of non-tradable services. These contrast with 'production cities' that are more dependent on manufacturing in countries that have industrialized. (Gollin et al., 2015, p. 35).

- Consumption cities seem to perform worse in terms of generating impulses for productive development and also in terms of welfare (Gollin et al., 2015). This suggests an important role of public policies in promoting productive activities along with urbanisation – for example through entrepreneurship development programmes.

Figure 5: Size of the urbanised population (millions)



Note: Data for 2016-2045 are projected.

Source: McKinsey & Company, 2017

- Export-led industrialisation – the main driver of successful latecomer development, especially in Southeast and East Asia – is likely to give way to domestic demand-led industrialisation. This is due to a combination of five trends: i) the relative decline of global outsourcing over the last few years; ii) rising tensions between major trading blocs; iii) increasing entry requirements to global value chains; iv) the increase of middle-class purchasing power; and v) the concentration of demand in urban agglomerations. China, where President Xi Jinping announced a greater reliance on "internal circulation" (Yao, 2020), is an outstanding example of this trend, which we expect to become a major shift in many developing regions. Greater reliance on domestic demand does not necessarily translate into less trade. While the importance of global value chains as steppingstones for industrial development may decrease, regional trade is expected to increase as rising domestic demand implies that neighbouring economies may become more attractive markets for each other (UNCTAD, 2013).

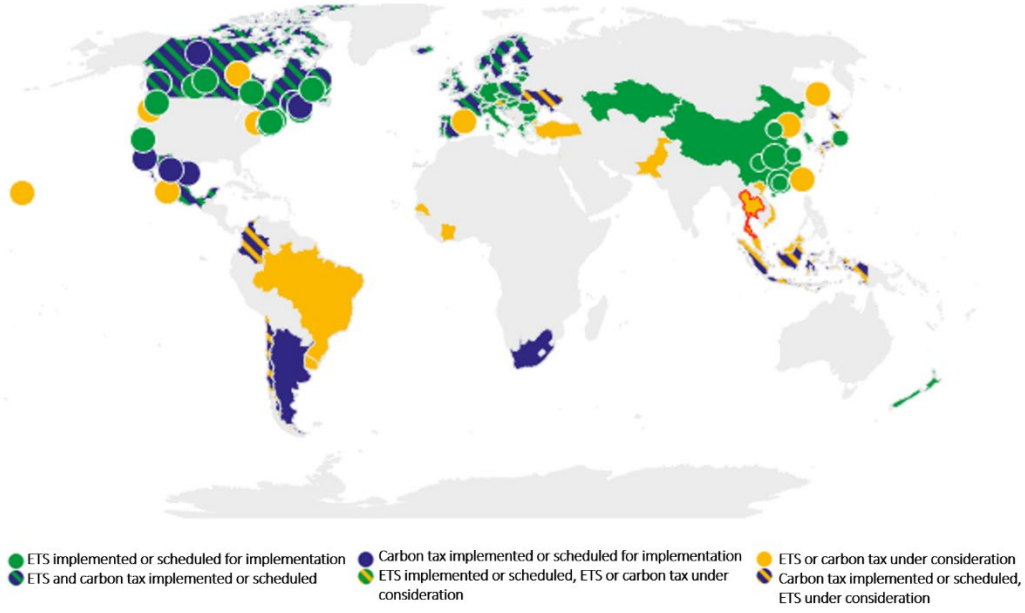
- China is advancing its economy from factor-cost based to knowledge-driven, triggered by enormously rising industry wages as well as expanding R&D capabilities. As China has been the labour-cost driven "work bench of the world" for more than two decades,

its shift to a knowledge-based economy opens up opportunities for export-oriented industrialisation in other low-labour-cost economies.

2.3 Greening of economies

Changing incentives are strengthening the global trend towards greener economies. For example, ever more countries are updating their Nationally Determined Contributions (NDCs), that is, their commitments under the Paris Agreement to reduce emissions and adapt to the impacts of climate change, committing to net zero carbon emissions targets. Moreover, as part of the Glasgow Financial Alliance for Net Zero, more than 160 firms with USD 70 trillion in assets have committed to net-zero emissions. In the same vein, divestment initiatives and greener financial market regulations are shaping the trend towards greener finance. Also, we are witnessing a growing trend towards carbon pricing (World Bank, 2021c). The share of global greenhouse gas emissions covered by pricing mechanisms is steeply rising, and while prices are mostly far too low to reflect social costs, they are increasing rapidly: as of July 2021, the EU carbon price had surpassed the level of Euro 50/ton, up from Euro 33 at the beginning of the year (Ember, 2021). Figure 6 shows the jurisdictions applying carbon taxes or emissions trading schemes.

Figure 6: Regional, national and subnational carbon pricing initiatives



Source: World Bank, 2021c

Overall, there is a clear trend towards more stringent environmental regulations, additional green economic policies, and greener corporate governance. Measures for greener economies are, however, adopted unevenly across countries, with higher levels of ambition in some of the world's major economies, mainly the European Union, the United States, Japan, and increasingly also China. The EU Green Deal is a prime example, as it politically and financially underpins commitment to climate neutrality by 2050 and spells out

roadmaps for key sectors (European Commission, 2019). Yet, this does not mean that developing countries can continue exploiting their traditional competitive advantages, leaving "green development" to rich countries. This is because measures developed by these leading economies will become global standards through a number of mechanisms:

- Countries with more ambitious targets will ensure a level playing field by incorporating environmental provisions in trade agreements, a trend clearly shown by Brandi, Schwab, Berger and Morin (2020), by adopting Carbon Border Adjustment Mechanisms, and by influencing international financial regulations;

- large corporations, many of which are "lead firms" (Gereffi, 1999, p. 2) and thus by definition standard-setters in global value chains, use corporate standards to ensure suppliers comply with the standards expected in their main markets (Prakash & Potoski, 2006; Cao & Prakash, 2011; Perkins & Neumayer, 2012); and

- even in the absence of direct compliance requirements, the technologies and business models used in the world's major economies typically become "dominant designs" (Utterback & Abernathy, 1975, p. 639 ff.), that is, de-facto industry standards to which firms need to adhere if they want to maintain or increase their market shares.

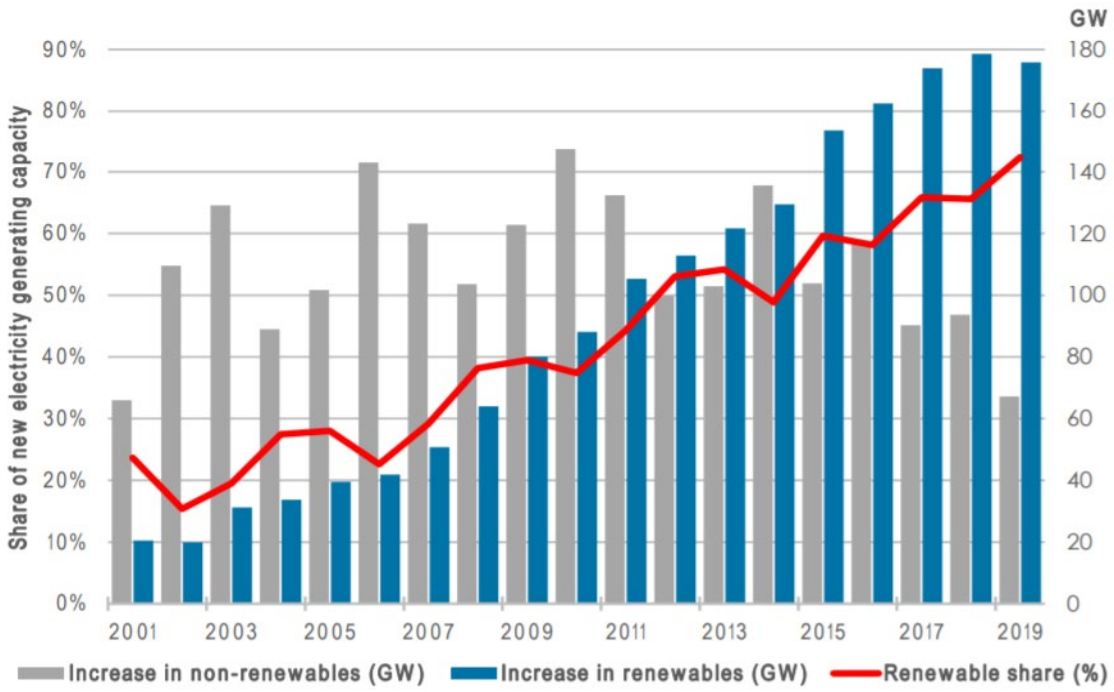
The incentives discussed above are expected to have a wide range of effects on industries. Three main **greening effects on industrialisation** can be distinguished:

- First, the mainstreaming of green principles in established industries is shifting the competitive advantage *within industries* to firms with greener business models, products and processes, for example firms betting on green steel, low carbon cement, organic agriculture, and energy-efficient buildings and materials. For example, due to energy efficiency improvements and increasing use of scrap steel for more recycled material flows, the energy required to make a ton of crude steel is 40 per cent lower than it used to be three decades ago (Koch Blank, 2020). The EU steel production, which is committed to achieving climate neutrality by 2050, needs to reduce total emissions to zero, which in turn drives up the commercialisation of green steel production; in parallel, complementary market creation policies promote the global diffusion of low-emission primary steelmaking (Vogl, Åhman, & Nilsson, 2021). Organic foods and beverages make up a strongly expanding market share of the global food industry (Reganold & Wachter, 2016). Today, with 71.5 million hectares of agricultural land being managed organically by approximately 2.8 million farmers, the global sales of organic food and drink reached more than Euro 96 billion (Willer, Schlatter, Trávníček, Kemper, & Lernoud, 2020).

- Second, the growing incentives for greening of economies drive the *creation of entirely new markets* and industries such as solar photovoltaics, wind turbines (see Figure 7 for renewables), lithium batteries, green hydrogen, bio-based fuel and non-fuel products, electric vehicles, and the related minerals as well as relevant recycling processes in that context. Global demand for hydrogen, which has increased more than threefold since 1975, keeps on growing (IEA [International Energy Agency], 2019). Many countries are investing strongly in green hydrogen and experts expect a substantial use of green hydrogen over the next five to ten years. Green hydrogen, as an energy carrier, has enormous potential to drive green economies as it can provide a link between renewable electricity generation and the hard-to-electrify sectors such as steel, cement, chemicals,

maritime shipping, and aviation (IRENA [International Renewable Energy Agency], 2020b). Likewise, sales of electric cars amounted to 2.1 million in 2019, exceeding those in the previous record year of 2018 (IEA, 2020a).

Figure 7: Renewable share of annual power capacity expansion



Source: © IRENA, 2020a

- Third, while the change in incentives is creating new competitive advantages in many parts of the economy, it also erodes existing advantages in other industries, for example in oil-related and gas-related industries and sectors and energy-intensive industries such as steel, cement and aluminium (IEA, 2020b). The cost of writing off such "stranded assets" is immense. In a 1.5 degree-scenario, energy producers would have to leave more than 80 per cent of fossil fuel of their reserves in the ground; even in a 2 degree-scenario, around 50 per cent of the reserves would be theoretically worthless (Livsey, 2020). Stranded assets are estimated to amount to a discounted global wealth loss of USD 1 to 4 trillion and a considerable share of this loss is driven by ongoing changes of technological pathways and therefore does not hinge on the implementation of the Paris Agreement (Mercure et al., 2018). Ansari and Holz (2020) model the risks of asset stranding for the Middle East, China, and Latin America, showing that the Middle Eastern and Latin American crude oil sectors as well as the Chinese coal sector are prone to asset stranding; while it is difficult to assess these risks given considerable uncertainty about the ambition of worldwide climate policies and the development of energy systems, fossil-fuel based economies are well-advised to diversify their economies away from such assets (Carbon Tracker, 2021).

For **latecomer economies**, the changing incentives and greening effects on industrialisation open up new opportunities for competitive advantages (Pegels & Altenburg, 2020; Lema, Fu & Rabellotti 2020). Especially the growing demand for low carbon energy provides manifold opportunities. Here, latecomer economies can exploit competitive advantages in

three ways (IRENA, 2019a): One option is to export electricity or green fuels. Many developing countries have expanded investments in solar, wind, hydro and geothermal energy and/or green fuels. Cases in point are India's solar mission, Morocco's investment in solar and wind parks, Kenya's geothermal industry, Mozambique's and Ethiopia's hydropower projects, and Brazil's ethanol industry. These investments have greatly reduced dependence on imported fossil fuels, and in some cases hold big promises for exports or for co-location of foreign investment in energy-intensive production. The second option for latecomer countries to exploit competitive advantages in the energy sector is to be involved in controlling the raw materials used in clean energy production. For example, key raw materials such as lithium, nickel and cobalt are offering new competitive advantages to countries such as Bolivia or DR Congo. The third option is to gain a competitive edge in relevant energy-technology innovations, such as batteries for electric vehicles. Here, entry barriers are of course very high and only countries with strong innovation systems will be able to reap the benefits. China is the most prominent example, with impressive achievements in lithium-ion battery technologies, electric vehicles, solar panels and many other important green technologies.[2] Moreover, new opportunities arise in agro-industries, from labour-intensive organic farm products to bio-based substitutes of plastics and synthetic fibres.

Last but not least, the increasing shift towards circular economies might open up new opportunities, even if only gradually implemented in rich economies. The switch to circular economy models may affect raw material exports negatively. At the same time, reusing, repairing, or recycling products from plastic, metal or paper and composting organic waste can also generate new opportunities in labour-intensive sorting and additional investments in recycling-related industries. In Bangladesh, for example, waste management and recycling employ an estimated 400,000 persons, considering direct and indirect effects (GHK, 2010, p. 60). A large share of these circular-economy-related jobs, for instance those linked to material sorting and initial steps of processing, are especially suitable for low-skilled workers.

2.4 Interdependence between trends and their implications for ISID

The prior analysis has shown how the three megatrends affect industrial development, creating both risks and opportunities for countries at different stages of industrialisation. Table 3 summarises the main megatrends of pre-COVID-19 structural transformation and some of their implications for ISID.

2 See the compilation of case studies in two recent Special Issues of World Development (Altenburg & Pegels, 2021) and Industrial and Corporate Change (Lema et al., 2020).

Table 3: Megatrends from an industrial development perspective		
Megatrends	**Worldwide implications for structural transformation and industrial development**	**Opportunities and threats for latecomer ISID**
Digitalisation and automation	Lower transaction costs Productivity growth in a wide range of IT-using industries, but also crowding out of traditional employment, leading to labour market segmentation	Efficiency gains in many domestic operations
	Reduced demand for (especially unskilled or semi-skilled) labour	Fewer possibilities to industrialise (especially manufacturing) on the basis of labour cost advantages Opportunities for online work in the knowledge economy in select pockets of highly-skilled workers
	Increasing entry barriers (skills, capital costs, "winner-takes-all" dynamics)	Risk of global oligopolies in areas where entry barriers are high (Industry 4.0, artificial intelligence, big data), potentially excluding latecomers Areas with lower entry barriers (online trading, 3D printing) for SMEs and freelance, partly informal jobs
Global economic power shifts	Restructuring of trade flows and global value chains, regional concentration in Asia	New global value chain opportunities for Asia, risk of falling behind for other developing regions
	China's shift towards a knowledge-driven economy threatens industries in old industrialised regions, reduces China's competitiveness in labour-intensive export industries	New opportunities for labour-intensive export industries as China's gradually moves out of this segment
	Rise of consuming middle classes and acceleration of urbanisation	Domestic demand-led industrialisation becomes more important relative to export-led industrialisation Urbanisation and middle-class consumption create new impulses for agro-industrial development and diversification
Greening of economies	Decarbonisation of economic systems, especially energy systems, but also all other industries	New growth opportunities in renewable energies, energy efficiency, green hydrogen and energy-intensive investments if energy system is green Risk of asset stranding and economic crises in high-carbon industries
	Taxing emissions, energy and resource consumption may make use of labour relatively more economical	New opportunities in labour-intensive activities, for example, organic farming
	Greening of global value chains (GVCs) through public and private standards, environmental clauses in trade agreements, etc.	Need to adapt to higher standards, increasing entry barriers for countries with weak institutions and small enterprises
	Incentives for making economic systems circular	Reduced demand for virgin materials may affect exporting industries (for example, minerals, oil for plastics production); some new opportunities for labour-rich economies in repair and recycling activities; need to adapt to upcoming reparability and recyclability standards in high income countries
Source: Authors		

Importantly, **these changes do not just add up**. Instead, they are highly interdependent und mutually reinforcing. Here are some examples of the interdependencies that are important from the perspective of ISID.

- Digital technologies affect the greening of industries in many ways, both positively and negatively. They help to reduce energy and material consumption, for example in buildings (such as smart lighting and heating), transport (such as avoidance of congestion), industry (such as increased accuracy and reduction of scrap), and energy production and transmission (such as smart grids). On the other hand, increased use of digital technologies will directly boost the use of the energy necessary to run these technologies (for instance energy-consuming data processing and storage as well as blockchain technology). Moreover, digital technologies are likely to stimulate economic growth, which in turn will increase resource consumption and pollution. For example, growing online trade boosts demand for delivery services and thereby increases the use of packaging material (Lange, Pohl, & Santarius, 2020) and for vehicle fleets used for deliveries. While this creates environmental pressure, it also opens up new opportunities for green businesses, such as Vietnam's emerging industry for e-scooters (Boudreau & Kieu Giang, 2020). Technological innovations will increasingly seek improved environmental performance, for example, integrating various renewable energy sources through smart grids, optimising resource flows through IT, or developing new smart mobility solutions.

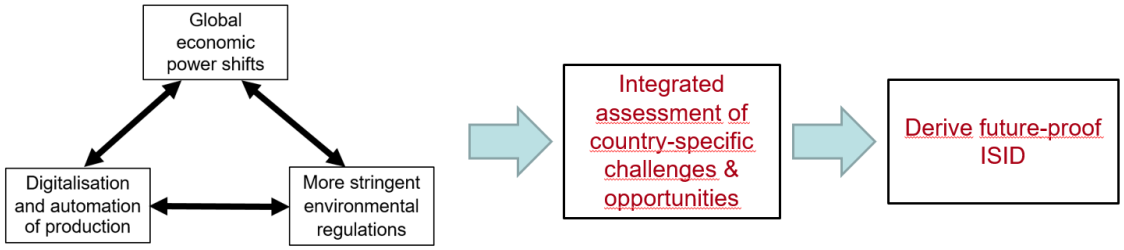
- The current distribution of global economic power will likewise be affected by digitalisation and automation. The uptake of digital innovations by firms and households depends on the level of "digital readiness" which in turn requires upfront investments in infrastructure and skills. While some innovations, such as mobile money and blockchain technologies, may be easily accessible and beneficial for low-income economies (Melia, 2019), automation tends to erode their traditional comparative advantages based on labour costs and reduces the incentive for outsourcing of production. More importantly, increasing "digital content" across all industries further raises entry barriers as it requires the ability to handle complex systems, highly skilled work forces, additional capital investment and, in some cases, entails huge economies of scale. The internet of things, artificial intelligence and big data, for example, will clearly be dominated by corporations in high-income economies and China. This will tend to reinforce existing power imbalances.

- Finally, the ongoing global economic power shift interacts with the greening of economies in many ways. High economic growth in the emerging Asian economies with the consequential rise of consuming middle classes increases environmental pressures, for instance, via car ownership, meat consumption and long-distance travel, thereby creating new demands to update environmental regulations which then foster green technological and business innovations. At the same time, increasing wealth is strongly correlated with decreasing fertility, which reduces environmental pressures in the long run (Kharas, 2017). As a general rule, the value of factor endowments changes: increasing demand for renewable energy, bio-based materials and innovative green business models contrasts with decreasing demand, or at least decreasing growth of demand for oil, coal, raw materials, and polluting industries. As these endowments differ across countries, economies will reap benefits and bear costs to different degrees. Advanced, innovation-based economies may reap most benefits from green technology innovations, whereas

latecomer economies may benefit from increasing demand for renewable energy, bio-economy products, and low-emission agriculture.

The simultaneousness of the megatrends and their complex interdependencies make it even more difficult to anticipate emerging opportunities and threats for any specific country or industry. At the same time, such anticipation is important to make timely investments in the infrastructure and capabilities needed to cope with, or exploit, these changes. Technology and market foresight thus becomes increasingly important. Figure 8 illustrates the link between megatrends and proactive industrial policies.

Figure 8: Turning global shifts into ISID strategies



Source: Authors

3 COVID-19 as an accelerator or decelerator of trends?

The COVID-19 pandemic has strongly affected the global economy. In 2020, global GDP contracted by 3.3 per cent, stronger in advanced (-4.7 per cent) than in emerging market and developing economies (-2.2 per cent) (IMF [International Monetary Fund], 2021). Excluding China's early and strong recovery, however, the latter also recorded a 4.3 per cent contraction (Word Bank, 2021). The recession was triggered by lockdowns which negatively affected investment and trade. The economies that experienced the largest declines were those with a heavy reliance on services and tourism, those with large domestic outbreaks, and those that faced sharp declines in industrial-commodity exports due to the fall in external demand.[3] Global trade was reduced by 8 per cent in 2020 (UNCTAD, 2021a). The sharpest reduction in trade occurred in the second quarter of 2020, with global merchandise trade falling by more than 20 per cent (relative to the same quarter of 2019). Trade reductions were largest in developed economies, and particularly in exports. Foreign direct investment (FDI) globally fell by 42 per cent to USD 859 billion in 2020 (UNCTAD, 2021a). In terms of total volume, developed (-69 per cent, to USD 229 billion) and transition countries (-77 per cent to USD 13 billion) were more strongly affected than developing countries (-12 per cent to USD 616 billion). Overall, FDI in 2020 was 30 per cent below the lowest level of global FDI in the aftermath of the 2009 financial crisis, highlighting the severity of the pandemic on investment flows (UNCTAD, 2021a).

3 Others documents, mostly for developed countries, show that firms most hit were those in non-essential sectors (Goolsbee & Syverson, 2021) and those exposed to trade, particularly trade with China (Ramelli & Wagner, 2020).

While the recession was severe, it was also relatively short. Recovery started in early 2021, long before the pandemic was defeated, and this recovery was strong. The World Bank (2021a) estimated that GDP grew globally by 5.6 per cent in 2021 and 4.3 per cent in 2022. However, the critical question we are asking in this section is whether, and to what extent, the crisis will affect **the long-term prospects** for inclusive and sustainable industrial development, with a particular emphasis on latecomer development.

At the time of writing this section – in August 2021, that is, less than a year and a half after the pandemic started to propagate outside of China – it is too early to present well-founded evidence on long-term effects. Yet, it is possible to observe market dynamics based on industry-specific intelligence reports and to discuss the reasons for and against new structural change dynamics; also, certain markets are anticipating long-term change, so changes in stock market values, or strategic sourcing decisions by big corporations may be taken as indications of long-term change. Not least, some countries have designed fiscal stimulus packages including certain intentional elements to drive structural transformation, with an emphasis on measures to increase digital readiness and in some cases accelerating the shift to greener industries.

Available evidence suggests that COVID does not seem to have a triggered a radical paradigm change in terms of structural transformation and international division of labour. Most trends seem to be continuing along the same lines as before the crisis. Yet, there are exceptions, in terms of shifting targets and sectoral priorities both in the private and public spheres. While these are mostly not radical, the crisis is accelerating some pre-crisis trends and decelerating others.

In this section, we reconsider the trends described in the second section. Sub-sections 3.1-3.3 reassess, one by one, the three megatrends through the lens of COVID-related changes, zooming in on those trends where we expect more than a temporary recession.

3.1 Post-COVID digitalisation and automation

The pandemic has accelerated the use of digital solutions in business. To remain in business, many firms explored new online operations, including many small and medium-sized enterprises – a size class that has traditionally lagged behind in the adoption of digital technology (OECD [Organisation for Economic Co-operation and Development], 2021a). This OECD report also states that

> [m]any changes are poised to last, given the investments made. Among SMEs that increased digital use during the pandemic, about two-thirds of the self-employed, micro firms and small firms and 78 per cent of medium-sized firms declared these changes to be permanent. (OECD, 2021a)

At the same time, digital activities – as all other economic activities – have been severely affected by the pandemic, yet in very different ways. Some activities suffered severely, whereas others received an additional boost from the pandemic. E-commerce and online entertainment (including Netflix, youtube and adult entertainment) have clearly benefited. Netflix added 26 million new subscribers in the first two quarters of 2020, compared with just 28 million in the whole of 2019, while streaming services in Latin America had been projected to grow by 36 per cent over the year (UNCTAD, 2020a, p. 31). Also, sectors that

already worked largely digitally or could shift a large amount of their activities towards telework were less affected by the pandemic. Eighteen per cent of the global labour force were able to work remotely, yet proportions differed vastly between 12 per cent of workers in low-income countries (as low as 6 per cent in Sub-Saharan Africa), 10 per cent in lower-middle-income, 22 per cent in upper-middle-income and 27 per cent in high income countries (ILO [International Labour Organization], 2020a).

Among the digital activities that suffered from massive lockdowns are many place-based services that trade face-to-face services via digital apps (for instance, transport services such as Uber). In a rapid assessment, the Fairwork Foundation (2020a, p. 2) estimated that 50 million platform workers globally had been adversely affected, criticising that a stunning half of "gig workers worldwide […] have lost their jobs; those still working have lost two-thirds of their income on average". Classified as self-employed, gig workers shoulder the full entrepreneurial risk and lack benefits such as sick pay or sick leave, or unemployment insurance. Most platform providers did not safeguard workers' bonuses or incentive levels despite a drop in customers or a temporary suspension of services (Fairwork Foundation, 2020b). While in principle, online work may be expected to be less affected than analogue services, online workers nevertheless experienced income losses because of increased competition: online labour supply quickly grew since many employees had lost their old jobs and shifted their income-raising activity online while demand for most online services fell behind, especially for those depending on "brick and mortar" business process outsourcing (Stephany, Dunn, Sawyer & Lehdonvirta, 2020, p. 570).

Looking beyond the **temporary** effects of the crises, **two main aspects** are currently being discussed where COVID might change the course, or at least the speed, of digitalisation and thereby affect **structural transformation** and the prospects for industrial development beyond the immediate effects of the crisis.

First, **the trend towards online trading has accelerated**. As shown in the previous section, e-commerce had already started to replace traditional retailing before the pandemic. During lockdowns, e-commerce received a big boost worldwide. The globally leading platforms increased their revenues significantly in 2020. E-commerce increased its share in global retail from 14 per cent in 2019 to 17 per cent in 2020 (UNCTAD, 2021c). In the case of Amazon, the year-to-year increase for the year 2020 was +37.62 per cent, compared to an increase of +20.45 per cent in 2019 (Macrotrends, 2021). Amazon's stock price rose by 73 per cent from USD 1,898 to USD 3,284 over the course of the year 2020; Ebay's stock price rose by almost 40 per cent from USD 35.96 to USD 50.25. For Chinese market leader Alibaba, revenue from Chinese commerce retail business for the six months ending 30 September 2020 was RMB (renminbi) 196,791 million (USD 28,984 million), an increase of 30 per cent compared to RMB151,387 million for the same period in 2019. Revenue from Alibaba's *international* commerce retail business for these six months was RMB 14,801 million (USD 2,180 million), an increase of 28 per cent compared to RMB 11,574 million for the same period of 2019 (Alibaba Group Holding Limited, 2021, p. 6). In Latin America, the Buenos Aires-based e-commerce platform Mercado Libre made a spectacular jump in net revenues increased by 73 per cent between 2019 and 2020 (Statista, 2021b). The leading platform in Africa, Jumia, increased its volume of transactions by over 50 per cent, from 3.1 million to 4.7 million for a six-month's-span in 2019 and 2020, respectively (UNCTAD, 2020a).

There are three main reasons why the pandemic may have shifted buying behaviour from shopping in "brick and mortar" shops and malls to online buying, related to the demand and the supply side, and the market intermediations:

- On the demand side, consumers were confronted, over shorter or longer periods of time, with closed physical points of sale, in many countries with the exception of goods for daily needs, such as food, drinks and hygiene articles. Many of them made their first-ever experience with online shopping and/or acquired the technical pre-conditions to go online. Once they experienced the advantages in terms of price and variety they may not, or only partially, return to pre-pandemic buying behaviour.

- On the supply side, traditional retailers have learned that, without an online presence and a virtual sales channel, they will lose huge parts of their revenues and risk going bankrupt. They either started to use the big trading platforms or opened their own online shops. It is rather likely that after the pandemic, multi-channelling of sales (in-store and online) will persist, especially if firms have undertaken costly investments to serve the online channel during the pandemic.

- During the pandemic, intermediaries opened their platforms for smaller sellers and invited them to join with discounts on fees. In addition, logistic companies adapted their vehicle fleets and (formal and informal) employment to the growing volume of e-commerce.

E-commerce has also expanded in terms of customer segments (elderly people) and goods traded – groceries and other everyday essentials experience rising market shares as consumers shifted online to avoid contagion (UNCTAD, 2021c; OECD, 2020b). Online shopping became a new routine that is expected to stay in post-pandemic times. Surveys show that over half of the consumers believe they will continue to shop online more often than pre-pandemic, and over 40 per cent of them expect to use online entertainment services longer (UNCTAD, 2021c).

The success of e-commerce comes with a higher uptake of online payment systems. For instance, Paystack – organising payments for over 60,000 African merchants – recorded a brief slump of transactions when lockdowns first became effective, but then sprang to a level five times higher than before the pandemic (UNCTAD, 2020a). However, challenges remain, for example with regard to access of certain population groups to internet and payment mechanisms, digital skills and concerns about costs and security of payments, among others.

E-commerce platforms are typically characterised by "winner-takes-all" markets, where one or a few firms manage to capture extraordinary market shares even though their product offer is only marginally superior, mainly because market dominance increases attractiveness for consumers, which in turn reinforces economies of scale. Moreover, oligopolies in commerce may reward economies of scale in production and thereby trigger market concentration along entire supply chains. It may therefore be desirable to support more inclusive local e-commerce alternatives. Local SMEs may strengthen domestic sales and distribution, either by joining forces to establish new local business-to-consumer platforms or by selling via established platform's marketplace solutions. They could, for instance, build on China's experiences with Alibaba Group's Taobao platform, trading goods via local and mostly rural online shops. By mid-2019 over 4,000 "Taobao villages" – that is,

villages with 100 or more active online shops on Taobao operated by local residents generating at least RMB 10 million (USD 1.5 million) in e-commerce sales annually – were operative (Wang, 2019), supporting community-driven entrepreneurship in rural places. Similarly, the Kenyan platform GoBEBA connects local micro, small and medium-sized enterprises with their customers, even allowing customers without a smartphone to place orders via SMS or a phone call (Owino, 2019). GoBEBA tripled gross merchandise value within weeks following the COVID-19-outbreak in Kenya. Kenya's Association of Manufacturers helped by providing customers with a digital directory for online shopping opportunities from local manufacturers (Banga, 2020).

The surge of e-commerce has boosted the role of delivery services. Preliminary evidence suggests that new jobs in delivery and warehousing were created – for instance, Britain's largest food delivery platform Deliveroo more than doubled the number of its bike couriers during 2020 (Surico, 2020). Labour demand for delivery services is therefore expected to increase substantially, despite concerns about employment quality. Most digital platforms are merely technology providers with few own employees but large numbers of contracted labour. The necessary investments (for example, in cars, motorcycles or digital devices) have to be made by platform workers, who bear the full entrepreneurial risks but cannot take entrepreneurial decisions such as on pricing or goods and products offered (Rosenblat, 2019).

With the boom in delivery services, demand for two-wheelers is increasing across the world, especially in Asia. New business models associated with two-wheeler services include app-based grocery shopping and delivery and other on-demand courier services, online motorcycle taxi services and many more. Gojek and Grab are new service companies claiming to employ 2 million scooter drivers each in Indonesia only; the business valuation of both companies exceeds USD 10 billion (Budiman, n.d.). In the Asia-Pacific region, the market is increasing from USD 47 billion in 2016 to around USD 124 billion forecasted for 2024 (Statista, 2021c). In addition to delivery services, COVID is boosting demand as consumers prefer two-wheelers over public transport to avoid traffic jams. Also, there is a trend towards electric motorcycle, scooter and bike manufacturing to avoid a further increase of air and noise pollution stemming from combustion engines (Boudreau & Kieu Giang, 2020).

Second, there is an inconclusive debate about if, and to what extent, new **automation and digital technologies will lead to reshoring of production or other restructuring of global value chains** (Seric & Winkler, 2020). The pandemic has highlighted the vulnerability of global supply chains. In a survey among high-level executives in 1,181 companies in the United States and four European economies, Euler Hermes Global (2020) found that "almost all (94 per cent) companies surveyed reported a COVID-19 induced disruption to their supply chains." Many globally sourced products are currently in short supply, including medical supplies, machinery, certain food items, and construction materials. Especially disruptive is the shortage of semiconducters which has forced big corporations, especially in the automotive, IT and electronics industries, to cut down production.

Some of these disruptions are *directly* caused by the pandemic. At the time of writing this report, for example, 160,000 containers were stuck in Yantian, the port of Shenzhen, due to a Corona outbreak among port workers (Mayer-Kuckuk, 2021). Similarly, there is anecdotic evidence from several industries – for example fish processing – where fishing fleets could not leave ports due to infected crews (NDR [Norddeutscher Rundfunk], 2021). Supply

disruptions in semiconductors are *indirectly* related to the pandemic, as producers underestimated the speed of post-COVID economic recovery, and lead times for increasing production volumes are considerable. Yet supply disruptions also take place for other reasons, such as the recent trade war between the United States and China, natural disasters, or the recent ship wreck in the Suez Canal.

Two recent surveys conducted by McKinsey (2020) and Euler Hermes Global (2020) explored how managers of globally operating firms try to cope with the vulnerability of global supply chains. The McKinsey survey shows that 93 per cent of respondents indicated that they planned to increase the level of resilience across their supply chains using a variety of mechanisms. The intended actions most often indicated were "dual sourcing of raw materials" (53 per cent); "increased inventory of critical products" (47 per cent); "near-shoring and increased supplier base" (40 per cent); and "regionalised supplier chains" (38 per cent). The Euler Hermes survey also reveals a variety of responses, including hedging through insurance; stockpiling; digitalisation; increasing due diligence on suppliers; and searching for new suppliers. Interestingly, "less than 15 per cent of companies consider reshoring" (Euler Hermes Global 2020). In most cases, the cost advantages in outsourced locations still outweigh the related supply risks. "Nearshoring", that is, producing closer to the home market, is favoured by roughly 30 per cent of the companies surveyed. However, survey results should be read with caveats as they are based on general perceptions rather than concrete investment plans.

Overall, there are thus indications of firms diversifying their sources. One example is Wistron Corporation, one of Apple's main suppliers, which is planning to become less dependent on China by expanding production in Vietnam, Mexico and India and sourcing from nearby countries. Also, nearshoring is expected to increase, as reflected not only in survey results, but also in political initiatives, such as a joint declaration of several EU member states to support microprocessor and semiconductor production in Europe. Yet so far, there has been little actual evidence of firms relocating at a major scale.

While some authors argue that the supply chain disruptions following the pandemic will change the organisation of global production (Barbieri et al., 2020; Pla-Barber, Villar, & Narula, 2021; Enderwick & Buckley, 2020; Gereffi, 2021; Shih, 2020; Zhan, 2021), others have argued that the large initial fixed cost of global sourcing and production, and the perceived transitory nature of the pandemic, prevent firms from rigorously adjusting existing production, trade and investment (Antras, 2021). In the same vein, Bacchetta et al. (2021) suggest that a major reshoring of production from emerging and developing to developed countries is not expected for the majority sectors. Some reshoring is expected among multinationals, but such relocations are largely driven by pre-COVID developments (for instance, increasing wage rates in China, trade disputes) rather than the COVID shock (ASME [American Society of Mechanical Engineers], 2020). GVCs in price-sensitive, yet not strategically relevant sectors (garments, toys) are especially unlikely to experience reshoring as a consequence of the pandemic. In view of the difficult economic and social post-COVID processes ahead in the most important markets, cost considerations might play an even more crucial role in relation to basic consumer goods. This may differ in sectors considered as strategic for the competitiveness of advanced economies. Diversification of the supplier basis and larger higher inventories will be part of the strategic responses of lead firms to enhance their resilience – catalysed partly, but not entirely, by the pandemic. This

might give more suppliers of strategic raw materials and intermediate products in different world regions opportunities to become integrated into GVCs.

3.2 Post-COVID global economic power shifts

As shown earlier, the pandemic's immediate effects on production, investment and trade have been severe. However, effects have been unequal across sectors, countries, the labour market, and the income distribution.

Interestingly, the effect has been more severe and mortality rates higher in advanced economies than the rest of the world (Deaton, 2021). As Velasco put it, "the expected tsunami of increased global inequality did not arrive […] the gap between rich and poor countries actually narrowed" (Velasco, 2021) during the pandemic. Long-term trends may, however, be different. There are three reasons to assume that economies in richer economies will bounce back faster (see also Deaton, 2013):

- **Access to vaccines is very unequal** (Stamm, Strupat, & Hornidge, 2021). Rich economies will therefore contain COVID within their territories better than poor economies, with the effect that lockdowns and economic restrictions can be lifted earlier.

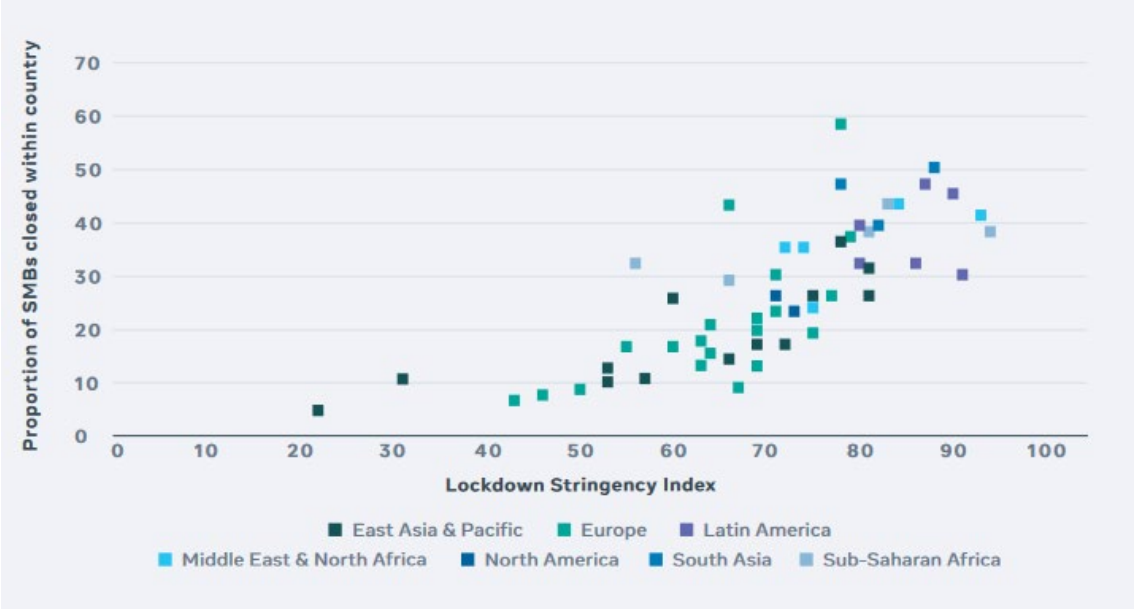
- Developed countries have invested more in **fiscal stimulus packages** following the pandemic than developing countries (IMF, 2021). While high-income countries spent an average of 10 per cent of their GDP on stimulus packages, emerging economies spent 3 per cent and least developed countries only 1 per cent (Malpass, 2020). If firm survival and ultimately economic growth depends on financial stimulus, limited government support in emerging economies likely lessens the power shift towards emerging economies.

- With increasing government subsidy programmes following the pandemic, **debt levels** have increased particularly in emerging and lower-income economies (176 per cent of GDP in 2019), with private debt rising to 123 per cent of GDP, and government debt also rising, although to lesser extent in lower-income than in emerging economies (World Bank, 2021a). According to Misereor (2021), the number of critically indebted countries in the Global South rose to 132 out of 148 countries surveyed in 2020, while in November 2020, 21 countries partly defaulted. If rising debt influences growth prospects or reallocates resources away from investment in structural transformation, these debt increases could lessen the economic shift towards emerging economies.

At the same time, considerable differences emerged between developing regions. In terms of GDP in 2020, Latin America and the Caribbean experienced the largest reductions (-6.9 per cent); Sub-Saharan Africa experienced moderate reductions (-3.7 per cent); and East Asia even grew (+0.9 per cent), driven by growth in China (2.0 per cent). The same patterns appear when looking at FDI. In Latin America and the Caribbean, it contracted by -37 per cent; in Africa by -18 per cent; and in Asia by a modest -4 per cent (UNCTAD, 2020b). COVID thus seems to deepen the shift of economic power towards Asia, leaving Latin America and the Caribbean and Africa even further behind.

Within countries, those in lower-skilled occupations, in informal employment, in small and micro firms, or those being female have been impacted most in terms of reductions in hours-worked and wages (ILO, 2020b).[4] A survey among more than 30,000 small and micro enterprises in over 50 countries has confirmed a strong correlation between stringency of lockdowns and closure of small firms (see Figure 9).

Figure 9: Small business closures correlate with the stringency of lockdowns



Source: Facebook, OECD and World Bank, 2020b, p. 12

The same study also found that

> consumer-focused sectors have been hit hardest. For example, 54 per cent of tourism agencies and 47 per cent of SMBs operating in the hospitality and event management sector reported that they were closed at the time of the survey. Micro-businesses, defined here as SMBs owned and operated by one individual, have closed to a greater extent than those with multiple employees. Approximately 30 per cent of micro-businesses reported that they were closed at the time of the survey. (Facebook/OECD/World Bank, 2020)

Similarly, a study by Balde, Boly and Avenyo (2020) shows that informal workers in Burkina Faso, Mali and Senegal were hit particularly hard by the pandemic, both in terms of job loss and lower earnings.

Another recent study on the effect of the pandemic on the informal sector in Côte d'Ivoire and Ethiopia provides more detailed insights (Strupat, 2021). Following the COVID shock, 30 per cent of households in Côte d'Ivoire (and 20 per cent in Ethiopia) lost their employment, of which many depend on daily labour, while the negative effects were more pronounced in urban areas (45 per cent in Côte d'Ivoire and 33 per cent in Ethiopia)

4 For addition information on labour markets, mainly from developed economies, see Adams-Prassl, Boneva, Golin and Rauh (2020), Yasenov (2020), and Campello, Kankanhalli, and Muthukrishnan (2020).

compared to rural areas (23 per cent and 19 per cent). In turn, the loss in employment resulted in a reduction of income for 60 per cent of households in Côte d'Ivoire and 56 per cent in Ethiopia and increased the number of households living below the international poverty line from 28 per cent before the pandemic to 47 per cent after pandemic in Côte d'Ivoire, and from 45 per cent to 67 per cent in Ethiopia. The large effect of the pandemic on the informal sector can in part be explained by limited government support – in Côte d'Ivoire 7 per cent of households in the informal sector received some type of government support, while 4 per cent in Ethiopia did.

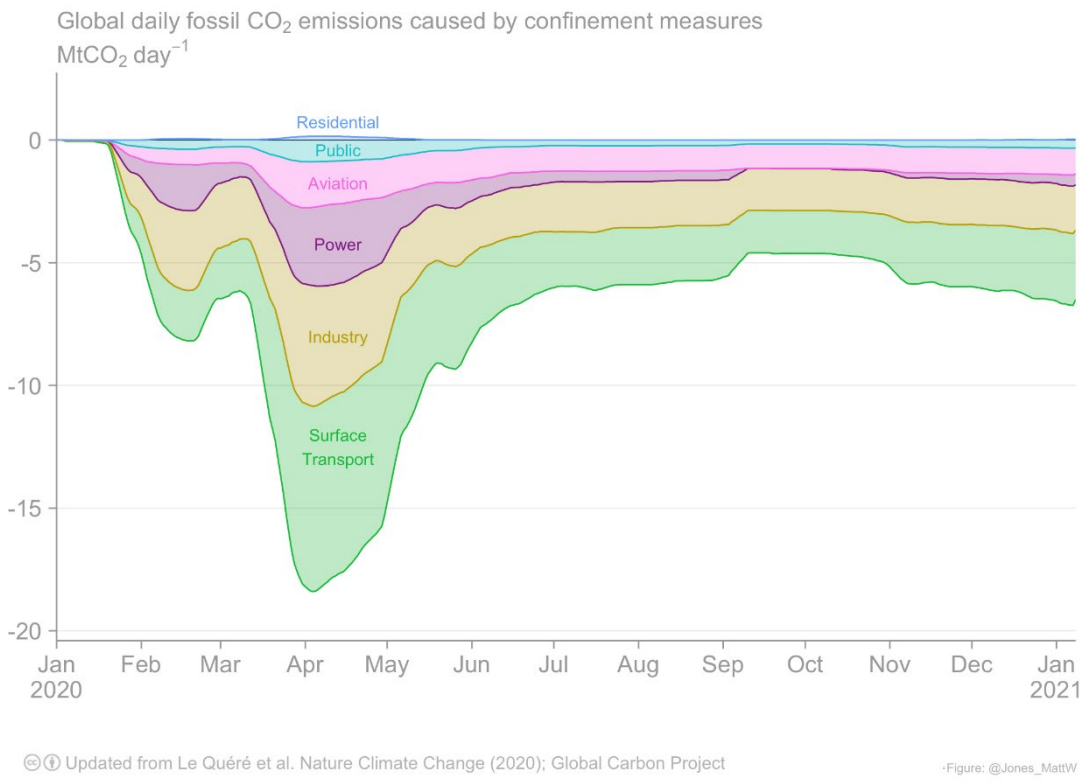
Despite the initially large effects, production, investment and trade have largely readjusted to levels before the pandemic. As shown above, a strong recovery kicked in as of late 2020/early 2021 in all regions of the world, compensating for many of the losses suffered in 2020. Almost all major economic indicators – from GDP growth, trade and investment data to commodity prices – have returned to their pre-crisis level. Globally GDP growth was 3.2 per cent in 2018 and is expected to increase to 5.6 per cent in 2021, while world trade volumes grew with 4.2 per cent in 2018 and are expected to grow by 8.3 per cent in 2021 (World Bank, 2021a). Aggregate portfolio flows too have recovered from their March lows, although about half of the emerging market economies have continued to experience outflows in the last three months of 2020 (IMF, 2020). At the firm level, most firms seem to have retained their production capacities, expecting a relatively short recession. This was also observed in previous recessions, such as during the 2007 financial crisis: When the shock is perceived as transitory, firms downscale production, trade and investment but keep existing production structures and quickly readjust to pre-shock levels (see, for instance, Bricongne, Fontagné, Gaulier, Taglioni, & Vicard, 2012).

This said, the economic revival is uneven across regions. Growth predictions for low-income countries (2.9 per cent in 2021 and 4.7 per cent in 2022) are less optimistic than for the world as a whole (5.6 per cent and 4.3 per cent, respectively), and growth will be resumed later (World Bank, 2021a). In these countries, GDP decline during the pandemic had been less severe, and lower access to vaccines is delaying their economic recovery. Moreover, the pandemic has significantly boosted public and private debt which may jeopardise the recovery in the medium term. On the other end of the spectrum, China is predicted to experience one of the highest growth rates post-pandemic, and it had experienced only small reductions in per capita income (World Bank, 2021a). Revival is stronger in Asia than in Latin America and the Caribbean, the Middle East and North Africa, and Sub-Saharan Africa (Leininger et al., 2021). Overall, the pre-pandemic shift in economic power – and particularly the rise of China – seems to have been reinforced by the crisis.

3.3 Post-COVID greening of economies

The pandemic has resulted in a reduction of economic activity and has thereby *temporarily* reduced material consumption and carbon and other emissions (see Figure 10). Crisis-driven improvements in environmental sustainability, however, are expected to be of short duration, as the key economic incentives driving environmental behaviour are not expected to change substantially (UNEP [United Nations Environment Programme], 2020).

Figure 10: CO_2 emission reductions across different sectors in 2020



Source: Global Carbon Project

Inmediate COVID-19 impacts on air quality, biodiversity and other indicators of environmental sustainability have been positive. For example, lockdowns in the wake of the pandemic have led to biodiversity records in certain areas (Sánchez-Clavijo et al., 2021), have improved the water quality in lakes (Yunus, Masago, & Hijioka, 2020) and have decreased the population-weighted concentration of nitrogen dioxide and particulate matter levels in the air by about 60 per cent and 31 per cent in 34 countries in 2020 (Venter, Aunan, Chowdhury, & Lelieveld, 2020). CO_2 emissions have decreased by about 7 per cent in 2020 compared to 2019.[5] These effects are mostly due to mobility restrictions on ground transport. The decline in CO_2 emissions from oil use in the transport sector accounted for over 50 per cent of the global drop in CO_2 emissions in 2020, emphasising the fugacity of the reduction in emissions and its conditionality on restrictions on economic activity (IEA, 2021). While the pandemic decreased electricity demand, the accelerating expansion of power generation from renewables was the biggest contributor to lower emission from this sector with now 29 per cent of global electricity generation stemming from renewables, compared to 27 per cent in 2019 (IEA, 2021). Nevertheless, monthly estimates suggest that global overall CO_2 emissions in December 2020 were about 2 per cent higher than in December 2019 (IEA, 2021). Moreover, despite this temporary decrease in emissions, the resulting concentrations of greenhouse gases in the atmosphere continued to increase (UNEP, 2020)

5 The drop in overall greenhouse gas (GHG) emissions is expected to be smaller as non-CO_2 is likely to be less affected.

The **long-term and structural effects** of the COVID-19 pandemic on the greening of industries are likely to be small, with **three exceptions** that will probably drive the greening of economies in the wake of the pandemic.

First, several big economies are using the fiscal stimulus packages in the wake of the COVID-19 pandemic to accelerate the shift to green industries and this may promote green markets around the world. High-income countries, particularly the EU and the United States (in light of new legislation in the new administration and the Biden Climate Plan) but also South Korea and Canada, have shaped their fiscal stimulus packages in favour of greening their economies (VividEconomics, 2021). In various countries, including EU member states, China, the Republic of Korea and Nigeria, stimulus packages include direct or indirect measures aimed at reducing carbon emissions (Carbon Brief, 2020). At the same time, however, many countries have failed to make use of this window of opportunity for greening their economies and multiple stimulus packages are "brown" rather than "green". To date, stimulus packages of 15 out of the G20 countries might have a net negative environmental impact (VividEconomics, 2021). For instance, China, India and Mexico have proposed stimulus measures that will cause damage to the environment by backing fossil fuels and especially coal. In the same vein, OECD data suggests that the green stimulus of OECD countries and key partner economies might even be outweighed by stimulus targeted in sectors with mixed and negative environmental implications while focusing heavily on climate change mitigation and neglecting other environmental dimensions (OECD, 2021b). While only a limited number of countries have so far used fiscal stimulus packages to promote the greening of their economies, some of the changes adopted in major OECD economies may indirectly benefit developing economies. This is particularly relevant in the case of green hydrogen. OECD countries are stimulating investments into the development of a global green hydrogen economy. This would not only create major opportunities to expand the generation of solar, wind, geothermal and hydropower in developing countries, but also to invest in industrial processes to convert electricity into green hydrogen; moreover, demand for secondary feedstocks such as ammonia and methanol would increase, and developing countries that offer green hydrogen and secondary feedstocks might attract foreign investments in energy-intensive industries that need to meet decarbonisation targets (ESMAP [Energy Sector Management Assistance Program], 2020; IRENA, 2019b). Moreover, green hydrogen could allow developing countries to locally produce an extremely versatile fuel, thereby increase energy security as countries would be less exposed to oil price volatilities, help lowering high energy costs due to energy imports and create a domestic, renewable fuel that could contribute to local job creation and new social opportunities (ESMAP, 2020).

Second, the COVID-19 pandemic underlines the urgency to diversify oil-dependent economies. The COVID-19 crisis has hit oil-exporting economies harder than any other group of countries (OECD, 2020a). While this is not a new phenomenon, it reinforces the need to diversify away from crisis-affected raw materials, especially oil (Ansari & Engerer, 2020; Tröster & Küblböck, 2020; UNESCAP [United Nations Economic and Social Commission for Asia and the Pacific], 2020; World Bank, 2020a). Some Gulf countries have already in the past shown good intentions in their economic development plans to diversify their economies but have struggled to make good progress towards this objective (Callen, Cherif, Hasanov, Hegazy, & Khandelwal, 2014; Albassam, 2015). Economic diversification has now gained renewed urgency in light of the COVID crisis, in the Arab states of the Gulf (Kabbani & Momoumi, 2021) and also in other regions, including highly

oil-dependent economies such as Nigeria. Moreover, low oil prices provide a window of opportunity to strengthen carbon pricing and reduce subsidies for fossil fuel, which can help to mobilise needed domestic resources and drive the greening of economies (see, for example, World Bank, 2020a). Yet, in G20 countries, fossil fuel subsidies have remained the same or even increased in 2020 in comparison to their slight reduction in the previous years (Geddes et al., 2020).

Third, telework has been widely applied during the pandemic and has led to new routines that are expected to stay. This includes a shift from office to home office work as well as a partial replacement of physical business meetings with virtual conferences. In a global survey, around 15 per cent of all respondents stated their companies' workforce were in home office before the pandemic, and as of December 2020, 35 per cent of respondents expected the workforce to be teleworking from a remote location permanently (Statista, 2021a). These trends will reduce transport-related pollution even after the pandemic is over.

4 ISID policies to build back better

Summing up, strong megatrends persist beyond the COVID pandemic, affecting the prospects for inclusive and sustainable development of latecomer economies. The pandemic itself has had severe temporary effects but only fairly small repercussions in terms of structural change. Table 4 summarises the exceptional trends that might actually change the long-term course of structural transformation.

This concluding section discusses the implications for "building back better" strategies, that is, shaping industrial development to be inclusive and environmentally sustainable. The analysis takes account of the structural transformations and the influence of the COVID-19 crisis analysed in Sections 2 and 3, and, in this light, derives recommended policy actions. It is aimed at national governments as well as international agencies concerned with the structural transformation of latecomer economies, including UNIDO, the UN agency that assists countries in economic and industrial development and commissioned this study.

The directionality required to "build back better" requires a change in attitudes to government intervention in markets. This change towards greater acceptance of industrial policy and more ambitious regulation in favour of societal goals, both in academic discourses and in practice, was already observable before the pandemic. In 2020, the World Economic Forum prominently called for a "Great Reset" away from free-market fundamentalism and towards the assumption of stronger responsibility for sustainability (WEF [World Economic Forum], 2020). In the same vein, higher expectations are being set for corporations to adopt a stakeholder rather than a shareholder value model, and that public policy may strengthen its primacy over markets. The current wave of new due diligence laws regulating multinational corporations is a case in point (Business and Human Rights, Resource Centre, n.d.).

Table 4: Tangible COVID effects on structural change and their implications for latecomer development		
Megatrends	**Tangible COVID effects on structural change (beyond temporary recession)**	**Opportunities and threats for latecomer ISID**
Digitalisation and automation	Trend acceleration towards online trading and telework Firms considering automation and reshoring	"Winner-takes-all" dynamics may benefit advanced economies, risk of global platform economies crowding out local retailers and suppliers, increase of delivery services Opportunities to harness digital platforms for local development if managed well Reshoring might reduce export opportunities
Global economic power shifts	China is emerging even more strongly; also high-income countries with healthy finance and strong fiscal stimulus packages likely to emerge stronger. High indebtedness (in low-income countries) may jeopardise long-term development	Risk of falling further behind when pace of vaccination is low and post-pandemic debt levels are high. Enhanced need for domestic revenue mobilisation => opportunity for fiscal reforms that encourage inclusive and green transformation
Greening of economies	Some countries deployed green fiscal stimulus packages, for example, green hydrogen initiatives Crisis unveiled risk of mono-structures, especially dependency on single commodities	New opportunities related to renewable energy surplus generation, electrolysis and attraction of energy-intensive industries Enhanced incentives for diversification of fossil-fuel dependent economies
Source: Authors		

The current crisis has further highlighted the need to intervene in economies, at least in times of crises, in many ways – by stimulating and providing liquidity; by protecting the vulnerable as well as strategic industries; and by accelerating research and production of critical health products, among other requirements. The realisation that even advanced economies are not immune to sudden, systemic shocks may increase policy space to make better use of such directive instruments as public procurement and investment, regulation, or the introduction of Pigouvian taxes to put a price on public "bads". After the crisis, we can therefore expect some of this increased willingness of governments to regulate markets to stay, including targeted support for health industries, new legislation to protect the vulnerable from unfair contracts, and maybe increased protectionism at least in strategic industries, and some politically induced reshoring.

We see five major policy priorities and focal areas for government intervention emanating from the crisis and the global trends discussed in the above sections: fostering economic resilience; developing pharmaceutical and medical supply industries; investing in digital capabilities; generating revenues for the structural transformation; and globally harmonising industrial policies to manage global public goods and prevent future global crises. These priorities will be discussed in detail in the subsequent sections.

4.1 Fostering economic resilience through economic diversification

The crisis has shown how much economic resilience matters for safeguarding human development, and for inclusive and industrial development in particular. This holds for small and large firms, for workers as well as for entire economies. A lack of diversification reinforced the economic effects of the crisis on countries dependent on oil exports or tourism, and foreign direct investment. COVID-19 may not remain the only virus to become a global pandemic and force governments to lock down parts of the economies. Furthermore, environmental crises are looming, especially those related to global warming (Hoegh-Guldberg et al., 2018). The COVID-19 pandemic has made this risk of future fundamental and global crises more tangible. The role of economic diversification in making economies resilient is now very much in the focus of policymakers.

The megatrends described in the above sections offer new avenues, the current potential of which obviously depends on manifold specific country conditions. Here are a few emerging opportunities:

- Globally operating firms need to make their global value chains less "just-in-time" and more resilient by diversifying their supplier base (White, 2021). Dependence on "just-in-time" imports of strategic goods is risky, even if economically efficient (Jones, 2021). This may create new opportunities for developing countries.

- Urbanisation is accelerating across all developing world regions and projected to remain strong until 2050. At the same time, consuming middle classes are growing rapidly. This creates new opportunities for firms tapping into the rapidly growing demand for the manufacturing of consumer goods, construction, transport, retail, leisure, architectural and many other services. Much of this additional demand will be accessible for domestic firms, as many urban services are not internationally tradable and goods for local middle classes come with lower entry barriers in terms of quality, economies of scale, standardisation requirements, and so on, compared to international markets. Peri-urban agriculture in particular may benefit from urbanisation. As Reardon, Awosuke, Haggblade, Minten and Vos (2019) show for Sub-Saharan Africa, local agri-food markets are particularly dynamic, rapidly diversifying and largely served by African SMEs – which in turn may increase the crisis resilience of local food systems.

- If city governments set incentives for energy-intensive and low-carbon cities, new demands will be created. This ranges from simple manufactures, such as locally produced renewable building materials and solar water heaters, to complex industrial products that may be produced in larger emerging economies, such as electric vehicles and metro rail coaches.

- Many developing countries have abundant sustainable energy resources (hydro, wind, solar, geothermal, and bioenergy) which can attract investments in related industries. Growing demand for storable and transportable energy in the form of green hydrogen provides additional opportunities for creating industrial linkages, adding value, and attracting energy-intensive industries (ESMAP, 2020).

- With the ongoing transition from a fossil fuel-based to a bio-based economy, much higher investments will be channelled into sustainable uses of renewable biological resources to produce energy and industrial goods. Bioenergy has gained a firm place in

the energy mix. Likewise, the increasingly critical views on plastics produced from fossil fuels increase demand for substitutes based on biomaterials. An innovative bio-economy may explore opportunities for leapfrogging into new live science-based bio-products. The raw material base includes shifts in land use to produce wood, bamboo, ethanol plants, algae and so on, as well as the exploitation of millions of tons of biological waste and residual materials. Urbanisation will boost demand for building materials; yet given the need for decarbonisation we expect increased use of materials such as wood, straw and clay which have a lower carbon footprint than concrete, steel and aluminium. The recycling of building and other raw materials will create additional markets, but also reinforce the need for exporters of raw materials to diversify their economies (Nechifor et al., 2020).

- As China becomes a knowledge-intensive high-wage economy, it loses its competitiveness in labour-intensive export industries, from garments and shoes to toys and electronics assembly. Other countries can move into these markets. According to Chinese government estimates, 85 million such jobs are under threat of automation and/or might eventually be relocated to countries with labour cost advantages. For instance, Ethiopia has already received Chinese investments in garment and shoe manufacturing, thereby creating about 30,000 new jobs.

Exploring how these (and other) trends will unfold in the future and what promises and threats they hold for any given country with its current economic structure requires investments in technology and market forecasting. Observatories as well as close interactions between firms and government can help to understand emerging trends and adopt appropriate preparatory action. Moreover, given our observation that some Asian regions cope far better with the challenges of structural transformation than other regions, international knowledge sharing about industrial policy design should be intensified; UNIDO is well-positioned to fill the role.

4.2 Developing pharmaceutical and medical supply industries

To cope with, or ideally prevent, the catastrophic effects of pandemics, there is a need to develop pharmaceutical and medical supply industries – both globally and at national levels. Furthermore, the current under-servicing of the health markets of many developing countries, and aging populations in industrialised countries, will maintain demand growth even in the absence of pandemics. As Andreoni (2021) points out, this need can be translated into an industrial policy strategy. Priority medical device products can be grouped into four categories, namely disposables; surgical and medical instruments; therapeutics; and diagnostic equipment. Each of these offer niches for manufacturing, with disposables typically having the lowest requirements for technological capacities, while diagnostic equipment often involves high-tech, complex production processes.

4.3 Investing in digital capabilities

One of the structural changes which the pandemic has most pronouncedly accelerated is the increased use of digital solutions. Across the board, IT capabilities have become more important, resulting in the need for countries to invest in digital infrastructure and the IT

readiness of their workforces. The adaptation of workforces to the shifts in the nature and opportunities of employment can be supported by targeted education policy, such as re-training offers and changes to school and university curricula. Skills to integrate digital technologies into workflows will be in particular demand, and new opportunities for (global and remote) online work will arise. Providing and safeguarding inclusive access to digital infrastructure will be a key policy task to enable workforces to make use of the arising opportunities. Crucially, skills and capabilities also need to entail specialised know-how on data security and protection against cybercrime which, in light of accelerating digitalisation, has also become more pervasive and potentially disruptive.

To counteract an unhealthy market concentration, digital capabilities need to be developed in an inclusive way, improving in particular the conditions of SMEs, disadvantaged communities and countries with low levels of penetration of internet access and other digital technologies. Specifically, the pandemic has highlighted the need to help small firms cope with e-commerce and promote direct marketing. This has gained particular importance in the light of increasing market power of large international e-commerce firms, which can use their economies of scale and experience in last-mile logistics to gain shares in markets which were previously served locally.

Supporting firms specialising in last-mile logistics and supporting the formation of local networks could be a way forward. The example of food delivery services may be a case in point, with restaurants facing lockdowns turning to services such as DoorDash or Uber Eats to bridge the last mile to their clients.

Last but not least, regulating the platform economies in ways that safeguard local industries is essential. This includes antitrust laws guaranteeing sufficient competition as well as collaboration with these platforms to ensure they encourage local production rather than imported goods and services.

4.4 Revenue generation for structural transformation

Funding committed to combating the pandemic and its economic effects has exceeded USD 21 trillion globally (Cornish, 2021). Analyses based on the COVID-19 economic stimulus index developed by Elgin, Basbug and Yalaman (2020) show that the capacity to mobilise these funds is largely concentrated in industrialised countries. Countries such as the United States, Canada, and Germany were able to mobilise 20-25 per cent of their annual GDPs to cushion the economic effects of the crisis and initiate an economic recovery, China mobilised around 6 per cent, while developing countries largely relied on external funds by bi- and multilateral donors.

Proactively making use of the opportunities discussed in the above sections under financial constraints is thus a formidable task, in particular in the developing world, where public finances were already under strain before the pandemic. Political leeway may, at least in the near- to mid-term, be restricted by an upcoming debt crisis following the requirement for rescue funding and the economic crisis in the aftermath of the pandemic. Between 2020 and 2023, the IMF (2020) estimates a funding gap of about USD 890 billion in Sub-Saharan Africa alone. Debt servicing moratoria, such as under the COVID 19 Debt Service Suspension Initiative (DSSI) and initiatives such as the Common Framework for Debt

Treatments beyond the DSSI, will have to play a key role in safeguarding short-term financial viability (Berensmann, Ordu, & Senbet, 2021).

At the same time, governments need to strengthen the basis for domestic public finance and consider options to cut harmful subsidies and raise progressive taxes, with the main burden falling on high income brackets and those parts of the population and enterprises less affected by the crisis. As Gupta and Jalles (2021) show, past pandemics have been a catalyser for fiscal reforms in the countries affected. Fiscal reforms can also be a window of opportunity to introduce or expand taxation on environmental "bads", such as carbon emissions. This would not just generate revenues, but also accelerate alignment of the industrial structure with an emerging green economy, thereby introducing instruments to make national economies future-proof in the light of discussions around carbon border adjustment measures in major global markets such as the European Union. It is economically more efficient to tax such "societal bads" as pollution rather than "societal goods" like labour, capital, or general consumption via value added tax. Such horizontal policy measures thus follow a Pigouvian logic by incentivising the allocation of resources according to the true societal costs and benefits of economic activities. They are thus a key policy tool to guide structural change and industrial development towards inclusiveness and sustainability.

4.5 Globally harmonised industrial policies as an emerging field of policy action

The role of industrial policies has changed in the last ten to fifteen years. Traditionally, their aim has been to increase productivity, competitiveness and employment. Increasingly, however, industrial policies are also being used to cope with wider societal challenges (Altenburg & Lütkenhorst, 2015) – overcoming regional imbalances; decarbonising the economy; avoiding the waste of energy and materials; building industrial capabilities in health-related industries to cope with pandemics; and building liveable cities are just some examples. Some of these challenges are global in nature and therefore require coordinated approaches across national boundaries. The pandemic has revealed the need to build up distributed production capacities for vaccines in all world regions. Climate change calls for investments in developing key technologies such as green hydrogen; a variety of energy storage technologies; second-generation biomass technologies; carbon capture and storage; and many others which are essential for containing global warming but which, due to various market failures, do not attract sufficient private investments.

Traditionally, industrial policies have aimed at strengthening *national* industries in global competition and thereby accelerating *domestic* spillovers and employment, even when such developments might result in a zero-sum game with losses in other countries. Yet, with the emerging *global* challenges described above, industrial and innovation policies need to move beyond the national level. There is a huge demand for global governance aimed at steering such policies towards solving global challenges in a coordinated way. This includes agenda- and priority-setting; knowledge- and benefit-sharing (including the renegotiation of intellectual property rights); funding and spending arrangements; as well as effective ways of putting research into practice (Figueroa & Stamm, 2012). Moreover, lessons can be drawn from the (typically national) technology missions of the past in order to design effective *global* missions (Mazzucato, 2021). UNIDO in particular may find avenues to strengthen its role, adding a new role as moderator of global agreements to its traditional role as the ISID knowledge hub for national governments.

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