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COVID-19 – Turning point in the process of industrialization?

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COVID-19 – Turning point in the process of industrialization?

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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 policy 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.

1 Introduction

This study has been written as a background paper for UNIDO's Industrial Development Report 2022 and discusses to what extent the COVID-19 crisis is a turning point in the industrialization process, 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 industrialization are substantially changing. Reasons for why they are changing are manifold; yet, the following global megatrends are particularly influential:

- *Digitalization and automation* of production
- *Global economic power shifts*, with enormous ramifications for trade flows and global value chains
- *Greening* of economies

These three megatrends are interrelated in multiple ways, and together will 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, creating both opportunities and threats for all economies. How these opportunities and threats 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 digitalization and automation of production, for example, factory automation is already changing every industry. Likewise the transition from traditional retailing to large, comprehensive 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 are relatively small. This study intends 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 transformation and industrial development are not yet entirely clear. This study begins from the premise that *COVID-19 in itself will not fundamentally change the megatrends; instead, it is likely to accelerate or decelerate some of them*. We therefore explore the pandemic's effects against the background of the already ongoing structural transformation, with an emphasis on the prospects for industrial development. This long-term approach 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 years prior to the 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 discreetly, but also looks at their interrelatedness. Special emphasis is given to latecomer economies and their prospects for ISID. Latecomer economies are those that face an uphill battle in globalization because other economies (and firms) that industrialized earlier benefit from economies of scale, network effects and other deep-seated structural advantages. Yet, at the same time, latecomers do 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-19 lens.” Section 4 draws policy conclusions for building back better after the COVID-19 crisis, again putting ISID at the centre and differentiating between early industrialized and latecomer countries.

2 Megatrends affecting pre-COVID-19 structural transformation

This section analyses key megatrends of pre-COVID-19 structural transformation. Building on Naisbitt (1982), we define megatrends as profound transformations that (1) last several decades, (2) deeply affect the social as well as the economic and political spheres, and (3) 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 latecomer economies' prospects for inclusive and sustainable industrialization*. This excludes some socio-cultural megatrends – such as the demographic transitions or changing gender relations that only indirectly affect industrialization. From our perspective, the following three megatrends are particularly relevant:

- Digitalization 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 (GVCs).
- Greening of economies, as the need to reduce environmental footprints, and particularly to decarbonize economies, calls for radically different business models and systemic transformations with far-reaching effects on the positioning of latecomer economies in the world economy.

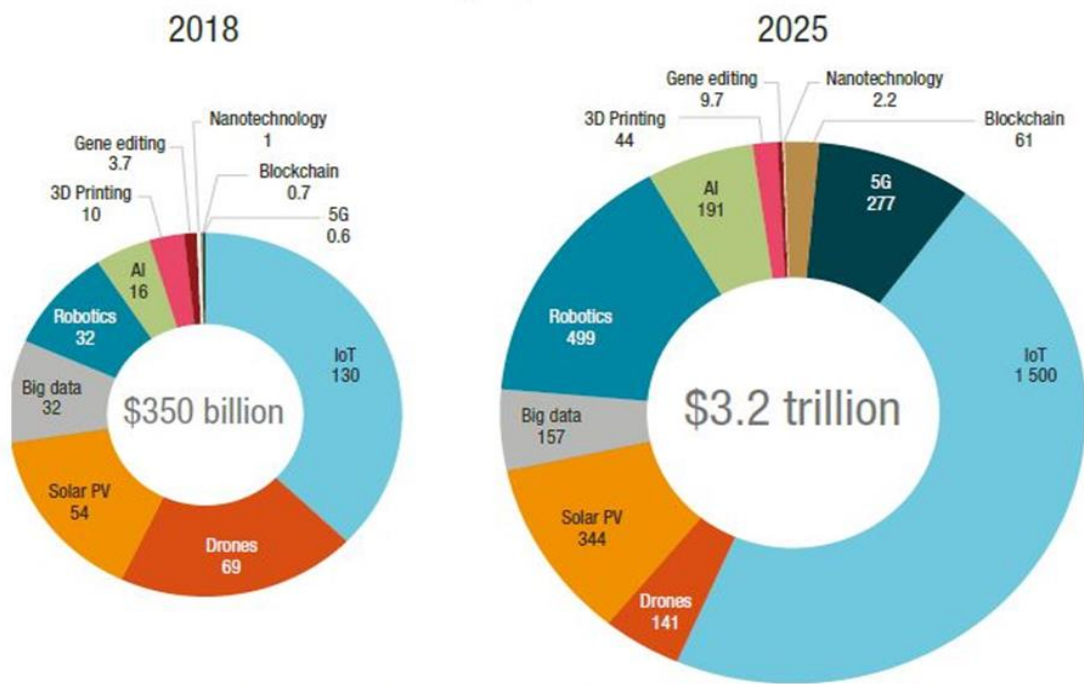
The ability to grasp the ongoing changes, identify opportunities and threats on the horizon for an individual firm or national industry, and to design business plans and industrial policies accordingly is essential for ISID.

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

2.1 Digitalization and automation

Digitalization 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 (IoT), cloud technologies, automation and robotics, additive manufacturing, artificial intelligence, big data analytics and blockchain technology—are mutually reinforcing. They affect the way economies are organized through various mechanisms—for example, reducing transaction costs, helping to exploit economies of scale, enabling the customization 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 illustrated in Figure 1, which presents market size of key “frontier technologies.”

Figure 1: Market size estimates on frontier technologies, \$ billion, 2018-2025



Source: UNCTAD [United Nations Conference on Trade and Development], 2021b, p. xvi; © 2021 United Nations. Reprinted with the permission of the United Nations

New technological possibilities affect industrial organization and competitive advantages in many ways, sometimes with far-reaching implications for latecomer industrialization. Table 1 illustrates some of the potential causal effects, which play out in country-specific ways. Assessing the effects on latecomer industrialization 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 share and fall behind. And 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 industrialization

| Digital trend | Opportunity | Threat |
|---|--|---|
| Diffusion of smartphones and related services | Reduced transaction costs, better information and financial service, especially for 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) |
| IoT, AI, machine learning, big data analytics | Higher productivity of production systems | High entry barriers in terms of systems know-how, capital and skills (UNCTAD, 2021b), which may lead to marginalization from global production networks |
| 3D printing | Opportunities for decentralized production, favouring remote locations (Fratocchi, 2017) | Increased incentivization of 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, which may widen technological gaps |

Source: Authors' elaboration

Digital technologies allow for enormous productivity gains in certain industries; yet it is important to recognize the so-called “productivity paradox” (Brynjolfsson, 1993): While productivity increases in some industries, overall labour productivity growth is declining significantly – from nearly 5 percent per year in 1973 to only 1 percent in 2015 according to a sample of 87 countries (World Bank, 2016). There is still a lot of controversy why this is the case. Two explanations appear particularly plausible. First, productivity gains in manufacturing and some tradable services are highly labour-saving, pushing redundant workers into low-productivity survival activities. Second, 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 undesirable processes of market concentration and social polarization.

This leads us to another important observation: Digital tools in and of themselves are neither a blessing nor a curse. How they impact industrial development depends on the ways they are regulated, on the co-investment in skills development and on the business environment. The World Development Report *2016* called these factors the “analog complements for a digital economy” (World Bank, 2016). Given the interdependence of institutional quality and development effects of digital technology use, it is unsurprising that we find a concentration of benefits in industrialized countries as well as 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 percent of global digital technology patents and 70 percent of related exports, while a further 40 “following” economies are active users of these technologies. The remaining 117 listed countries are considered “latecomers” or, more precisely, “laggards” (UNIDO, 2020). In addition, digitalization 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 specific aspects of digital transformation are worth a closer look in the analysis here, because they are most likely to be affected by the COVID-19 pandemic:

- The trend towards **automation of production**, and its extension to the automation of entire subsystems through the IoT. The International Federation of Robotics World Robotics 2020 Report shows a record 2.7 million industrial robots in operation in the worlds’ leading economies, an 85 percent increase compared to 2014 (see Figure 2). While new technologies may increase productivity in many industries, their use is uneven across sectors, countries and firms. So far, large-scale automation has been limited to certain industries such as transport equipment and machinery (Lund and Steen, 2020). Yet, the number of process steps that are being automated is increasing across all industries, and the IoT is expected to accelerate this trend. Using robotics, sensors and digitally integrating production processes requires a range of those so-called “analog 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 developing countries’ advantages in low labour costs. Firms that had previously

offshored labour-intensive tasks thus have greater incentives for reshoring.¹ This jeopardizes 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)

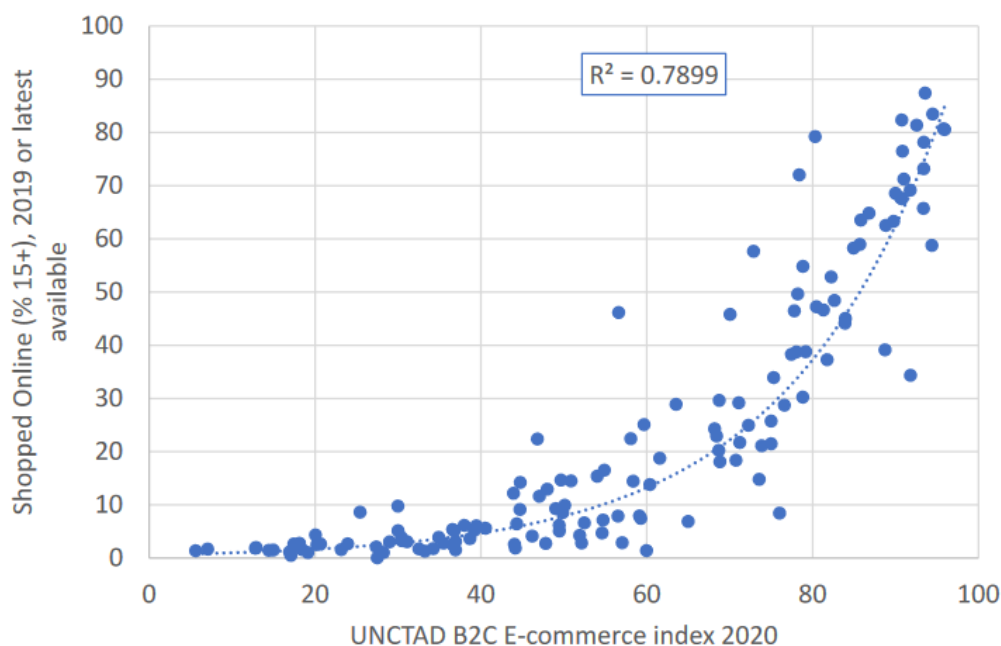


Source: Müller and Kutzbach, 2020

- The rapid worldwide deployment of **e-commerce** in various forms. E-commerce (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-take-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 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 diffusion and use 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 point is captured in Figure 3 which reveals a strong correlation between values in UNCTAD’s Business-to-Consumer (B2C) E-commerce Index and prevalence of online shopping (Figure 3).

¹ While reshoring is still fairly limited, Krenz et al (2021, p. 1) find that “on average, within manufacturing sectors, an increase by one robot per 1,000 workers is associated with a 3.5 percent increase of reshoring activity.”

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. Twenty-three percent of the global population shopped online in 2019. More specifically, however, the share was 53 percent among high-income and 16 percent among upper-middle income countries, but only 5 percent in lower-middle income and 2 percent 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 readily respond to new technologies and digital business models, online shopping is far ahead of other developing regions. The 2020 B2C E-Commerce Index values were 57 in South, East and South-East 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 e-commerce.

2.2 Global economic power shifts

Global economic power is shifting between countries and world regions. GDP growth and per capita income have substantially diverged in recent decades. The most striking change is the rise of East Asia and the Pacific and, to a lesser extent, South Asia, which actually grew much faster than all other regions. This has led to an increasing weight of Asian economies in the world economy (Table 2). According to Asian Development Bank predictions, Asia will double its

current share in global GDP by 2050, reaching 52 percent, whereas the share of all other world regions is declining. In particular, Latin America and the Middle East and North Africa –the richest developing regions in 2000—are lacking dynamism.

Table 2: GDP per capita growth 2000-2020, main developing regions, (PPP, constant \$ 2017)

| Region | GDP per capita 2000 | GDP per capita 2020 | Increase (%) |
|---------------------------------|--------------------------------|--------------------------------|-------------------------|
| East Asia and the Pacific | 7,268 | 17,682 | 143.3 |
| <i>China</i> | <i>3,452</i> | <i>16,411</i> | <i>375.4</i> |
| 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 the Caribbean | 12,676 | 15,169 | 19.7 |
| World | 11,080 | 16,194 | 46.2 |

Source: Authors' elaboration based on 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 annual GDP growth of mostly above 10 percent, although its annual growth rate has decreased in the last decade, to 6 percent in 2019 (World Bank, 2021b). At the same time, between 2000 and 2018, China's share in global GDP increased from 3.05 to 14.08 percent.²

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

² See World Bank data presented at TheGlobalEconomy.com, here: https://www.theglobaleconomy.com/rankings/gdp_share/Asia/.

This regionally unbalanced development has five 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 percent to 42 percent, largely driven by East Asia increasing its share from 19 to 26 percent. Sub-Saharan Africa's share has remained very small, increasing only slightly from 1.4 to 1.6 percent. In contrast, the share of Latin America and the Caribbean decreased from 6 percent to 5 percent, Europe's decreased from 42 to 38 percent, and North America's decreased from 16 to 10 percent.³ This is also reflected in a rapidly growing share of supplies for the pool of the largest 2000 public companies, where Asian suppliers' share rose from 13 percent to 36 percent in just seven years (2013–2020; Falk et al., forthcoming). 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.
- An enormous rise of consuming middle classes in dynamic, population-rich Asian economies, where the bulk of global middle-class growth is happening. Table 3 shows some remarkable trends of middle-class consumption: (1) an almost doubling of consumption spending within 15 years; (2) unprecedented increase of middle-class spending in Asia Pacific; and (3) very little growth and strong decline, in relative terms, in North America, Europe and Central and South America. Middle classes develop new and more diversified lifestyles, thereby creating new demands that may be harnessed to unleash a new dynamism of inward-oriented industrial development. As Asia Pacific becomes the centre of global middle-class consumption, the consequent industrial development effects can be expected to further accentuate the ongoing power shift.

³ See United Nations Conference on Trade and Development (UNCTAD) *UNCTADStat* database: <https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx>.

Table 3: 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: Author's elaboration based on Kharas, 2017

- Along with middle-class growth, urbanization is accelerating across all developing regions, most notably in Sub-Saharan Africa as well as some still predominantly rural countries in other regions. 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 urbanization. Yet, the extent to which countries reap the industrial development potential of urbanization differs. Gollin et al. (2015) show that "in countries that are heavily dependent on resource exports, urbanization 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) These so-called consumption cities seem to perform worse in terms of enabling productive development and maintaining social welfare (Gollin et al., 2015). This suggests an important role for public policies to promote productive activities along with urbanization – for example through entrepreneurship development programmes.
- Export-led industrialization – the main driver of successful latecomer development, especially in South-East and East Asia – is likely to give way to domestic demand-led industrialization. This is due to a combination of five trends: (1) the relative decline of global outsourcing in the past few years; (2) rising tensions between major trading blocs; (3) increasing entry requirements to global value chains; (4) the increase of middle-class purchasing power; and (5) the concentration of demand in urban agglomerations. China,

where President Xi Jinping announced a greater reliance on “internal circulation”, is an outstanding example of this fifth trend, and we expect this to become a major shift in many developing regions (Yao, 2020). Greater reliance on domestic demand does not necessarily translate into less trade. While the importance of GVCs as stepping stones 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 research and development (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 economy creates opportunities for export-oriented industrialization in other low-labour-cost economies.

2.3 Greening of economies

Changing incentives are strengthening the global trend towards greener economies. For example, 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 \$70 trillion in assets have committed to net-zero emissions. At the same time, divestment initiatives and greener financial market regulations are facilitating a trend towards greener finance. Further, we are witnessing a growing trend towards carbon pricing (World Bank, 2021c). The share of global greenhouse gas (GHG) 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 European Union’s carbon price had surpassed the level of 50€ per tonne, up from 33€ at the beginning of the 2021 (Ember, 2021).

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, 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 multiple mechanisms:

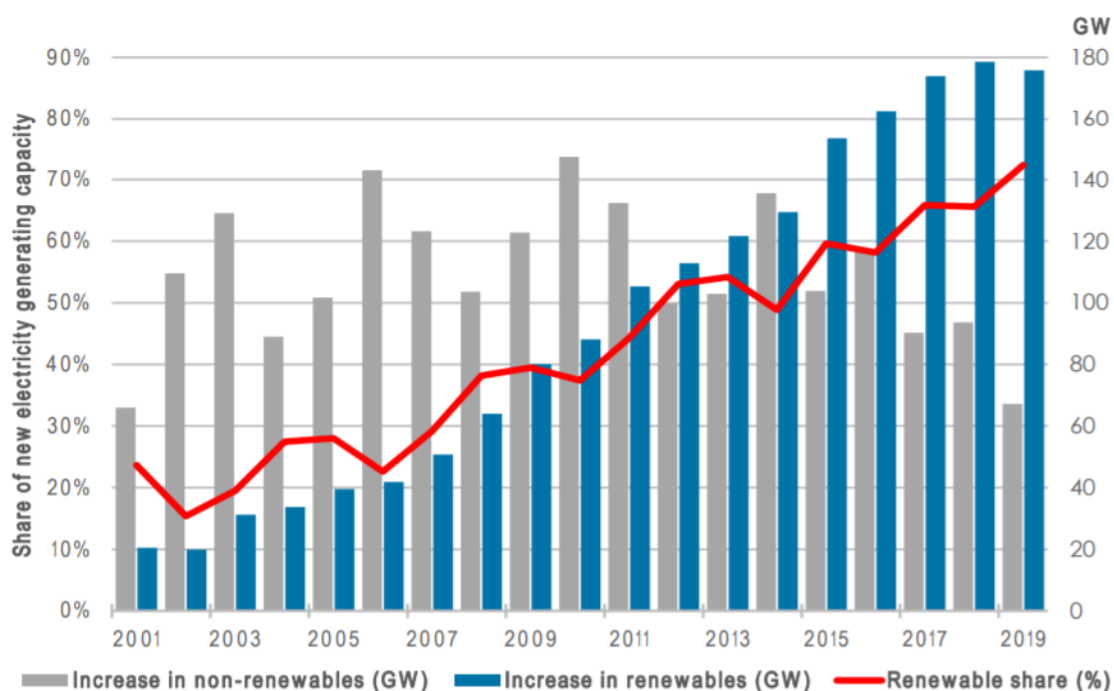
- Countries with more ambitious targets will ensure a level playing field by incorporating environmental provisions in trade agreements, a trend clearly shown by Brandi et al (2020), by adopting Carbon Border Adjustment Mechanisms, and by influencing international financial regulations.
- Large corporations, many of which are “lead firms” (Gereffi 1999) and thus by definition standard-setters in GVCs, use corporate standards to ensure suppliers comply with the standards required in their main markets (Prakash and Potoski, 2006; Cao and Prakash, 2011; Perkins and Neumayer, 2012).
- 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 and Abernathy, 1975); 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. We have identified three main **greening effects on industrialization**:

- 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—such as 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 percent lower than three decades ago (Koch Blank, 2020). EU steel production, which is committed to achieving climate neutrality by 2050, needs to reduce total emissions to zero, which in turn will drive up the commercialization of green steel production. In parallel, complementary market creation policies promote the global diffusion of low-emission primary steelmaking (Vogl et al., 2021). Organic foods and beverages make up a strongly expanding market share of the global food industry (Reganold and Wachter, 2016). Today, with 71.5 million hectares of agricultural land being managed organically by approximately 2.8 million farmers, global sales of organic food and drink have reached more than 96 billion euros (Willer et al., 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 4 for information on 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, continues to climb (IEA, 2019). Many countries are investing strongly into green hydrogen, and experts expect a substantial use of green hydrogen over the next five to 10 years. As an energy carrier, green hydrogen 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, 2020b). Likewise, sales of electric cars amounted to 2.1 million in 2019, exceeding those in the previous record-breaking year of 2018 (IEA, 2020a).

Figure 4: Renewable share of annual power capacity expansion, 2001-2019



Source: © IRENA, 2020a

- Third, while the change in incentives is creating new competitive advantages in many parts of the economy, it is also eroding 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° scenario, energy producers would have to leave

more than 80 percent of their fossil fuel reserves in the ground. Even in a 2° scenario, around 50 percent of the reserves would be theoretically worthless (Livsey, 2020). Stranded assets are estimated to amount to a discounted global wealth loss of \$1-\$4 trillion. A considerable share of this loss is driven by ongoing changes in 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 crude oil sectors of the Middle East and Latin America 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 industrialization create new opportunities for competitive advantages (Pegels and Altenburg, 2020; Lema et al., 2020). Growing demand for low carbon energy, in particular, 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. Examples include 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 offer new competitive advantages to countries such as Bolivia and the Democratic Republic of Congo. The third option is to gain a competitive edge in relevant energy-technology innovations, such as batteries for electric vehicles. 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.⁴ New opportunities have also arisen in agro-industries, from labour-intensive organic farm products to bio-based substitutes of plastics and synthetic fibres.

Finally, the increasing shift towards circular economies might also create new opportunities for latecomer economies—even if these models are only gradually implemented in rich economies. The switch to circular economy models may affect raw material exports negatively. At the same time, however, reusing, repairing or recycling products from plastic, metal or paper and composting organic waste can generate new opportunities in labour-intensive sorting and additional investments in recycling-related industries. In Bangladesh, for example, the waste management and recycling sectors employ an estimated 400,000 workers, considering direct and indirect effects (GHK, 2010, p. 60). And a large share of these circular-economy-related jobs—such as those linked to material sorting and initial steps of processing—are especially suitable for low-skilled workers.

2.4 Interdependence between megatrends and their implications for ISID

The analysis thus far has shown how the three megatrends affect industrial development, creating risks and opportunities for countries at different stages of industrialization. Table 4 summarizes the main megatrends of pre-COVID-19 structural transformation and some of their implications for ISID.

⁴ See the compilation of case studies in two recent Special Issues of World Development (Altenburg and Pegels, 2021) and Industrial and Corporate Change (Lema et al., 2020).

Table 4: Megatrends from an industrial development perspective

| Megatrend | Worldwide implications for structural transformation and industrial development | Opportunities and threats for latecomer ISID |
|-------------------------------|---|---|
| Digitalization 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 and semi-skilled) labour | Fewer possibilities to industrialize (especially manufacturing) on the basis of labour cost advantages Opportunities for online work in the knowledge economy among select segments of highly-skilled workers |
| | Increasing entry barriers (skills, capital costs, winner-take-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 freelancers, partly informal jobs |
| Megatrend | Worldwide implications for structural transformation and industrial development | Opportunities and threats for latecomer ISID |
| Global economic power shifts | Restructuring of trade flows and GVCs, regional concentration in Asia | New GVC opportunities for Asia, risk of falling behind for other developing regions |
| | China's shift towards a knowledge-driven economy threatens industries in old industrialized regions and reduces China's competitiveness in labour-intensive export industries | New opportunities for labour-intensive export industries as China gradually moves out of this segment |

| Megatrend | Worldwide implications for structural transformation and industrial development | Opportunities and threats for latecomer ISID |
|------------------------------|---|---|
| Global economic power shifts | Rise of middle-class consumers and acceleration of urbanization | Domestic demand-led industrialization becomes more important relative to export-led industrialization Urbanization and middle-class consumption create new incentives for agro-industrial development and diversification |
| Greening of economies | Decarbonization 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, e.g. organic farming |
| | Greening of GVC 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 (e.g. minerals, oil for plastics production); 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' elaboration

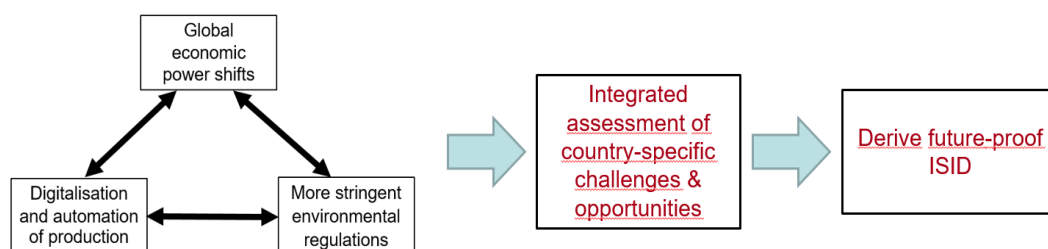
Importantly, **these changes** are highly interdependent and mutually reinforcing. Below are some examples of the interdependencies that are important from the perspective of ISID:

- 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 (e.g. smart lighting and heating), transport (e.g. avoidance of congestion), industry (e.g. increased accuracy and reduction of scrap), and energy production and transmission (e.g. smart grids). On the other hand, increased use of digital technologies will directly boost the use of energy necessary to run these technologies (e.g. 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 use of packaging material (Lange et al., 2020) and for vehicle fleets used for deliveries. While this creates environmental pressure, it also creates new opportunities for green businesses, such as Vietnam's emerging industry for e-scooters (Boudreau and Kieu Giang, 2020). Technological innovations will increasingly seek improved environmental performance, such as integrating various renewable energy sources through smart grids, optimizing resource flows through digital technologies or developing new smart mobility solutions.
- The current distribution of global economic power will likewise be affected by digitalization and automation. The uptake of digital innovations by firms and households depends on their 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 IoT, artificial intelligence and big data, for example, will clearly be dominated by corporations in high-income economies and China. This tends 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 middle-class consumers, increases environmental pressures—for example 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). In many cases, 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 critical in order 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 5 illustrates the link between megatrends and proactive industrial policies.

Figure 5: Turning global shifts into ISID strategies



Source: Authors

3 Is COVID-19 an accelerator or decelerator of these megatrends?

The COVID-19 pandemic has strongly affected the global economy. In 2020, global GDP contracted by 3.3 percent, and the decline was greater in advanced (-4.7 percent) than in emerging market and developing economies (-2.2 percent, IMF, 2021). Apart from its early and strong recovery, China also recorded a 4.3 percent contraction (World Bank, 2021). Globally, the recession was triggered by lockdowns, which negatively affected investment and trade. 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.⁵ Similarly, global trade fell by 8 percent 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 percent, relative to the same quarter of 2019. Trade reductions were largest in developed economies, and particularly in exports. Global foreign direct investment (FDI) fell by 42 percent to \$859 billion in 2020 (UNCTAD, 2021a). In terms of total volume, developed (-69 percent, to \$229 billion) and transition countries (-77 percent to \$13 billion) were more strongly affected than developing countries (-12 percent to \$616 billion). Overall, FDI in 2020 was 30 percent 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).

While the recession was severe, it was also relatively short. Recovery started in early 2021, long before the pandemic was defeated, and it remains strong. The World Bank (2021b) estimates global GDP growth of 5.6 percent in 2021 and 4.3 percent in 2022. The critical question we are asking in this section are whether and to what extent the crisis affects **the long-term prospects** for ISID, 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 discuss the reasons for and against new structural change dynamics. In addition, 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 that include certain intentional

⁵ Other documents, mostly for developed countries, show that firms most hit are those in non-essential sectors (Goolsbee and Syverson 2021), exposed to trade, particularly with China (Ramelli and Wagner, 2020), and limited capital intensity and leverage (Alfaro et al., 2020).

elements to drive structural transformation, with an emphasis on measures to increase digital readiness and, in some cases, accelerate the shift to greener industries.

Available evidence suggests that COVID-19 does not seem to have triggered a radical paradigm change in terms of structural transformation and international division of labour. Most trends seem to continue along the same lines as before the crisis. Yet, there are exceptions, in terms of shifting targets and sectoral priorities both in private and public spheres. These changes are for the most part not radical, but the crisis is accelerating some pre-crisis trends and decelerating others.

In this section, we reconsider the trends described in the first section. Sub-sections 3.1-3.3 reassess, one by one, the three megatrends through the lens of COVID-19-related changes, focusing on those trends where we expect more than a temporary recession.

3.1 Post-COVID digitalization and automation

The pandemic has accelerated the use of digital solutions in business. Many firms explored new online operations to remain in business, including many small and medium-sized enterprises (SMEs) – a size class that has traditionally lagged behind in digital technology adoption (OECD, 2021a). The 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 percent of medium-sized firms declared these changes to be permanent” (OECD, 2021a).

At the same time, digital activities have been severely affected by the pandemic, yet in very different ways than other economic activities. Some activities have severely suffered, whereas others have 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 have been projected to grow by 36 percent over the year (UNCTAD, 2020a, p. 31). Sectors in which the labour force already worked largely digitally or could shift a large amount of their activities towards telework were less affected by the pandemic. Eighteen percent of the global labour force could work remotely, yet proportions differ vastly—between 12 percent of workers in low-income countries (as low as 6 percent in Sub-Saharan Africa), 10 percent in lower-middle-income countries, 22 percent in upper-middle-income countries, and 27 percent in high income countries (ILO, 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 example, transport services such as Uber). A rapid assessment by Fairwork Foundation (2020a) estimated that 50 million platform workers globally had been adversely affected, criticizing 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 temporary suspension of services (Fairwork Foundation, 2020b). While in principle, online work may be expected to be less affected than analog services, online workers experienced income losses because of increased competition. The 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 et al., 2020).

Looking beyond the **temporary** effects of the crises, we discuss **two main aspects** where COVID-19 might change the course, or at least the speed, of digitalization and thereby affect **structural transformation** and the prospects for industrial development beyond the immediate effects of the crisis.

First, **the trend towards online shopping has accelerated**. As shown in the previous section, e-commerce had already started to replace traditional retailing before the pandemic. During lockdowns, e-commerce worldwide received a big boost. Leading global platforms increased their revenues significantly in 2020. E-commerce increased its share in global retail from 14 percent in 2019 to 17 percent in 2020 (UNCTAD, 2021c). Amazon’s year-to-year increase for the year 2020 was 37.62 percent, compared to an increase of 20.45 percent in 2019 (Macrotrends, 2021). The company’s stock price rose by 73 percent, from \$1,898 per share to \$3,284 per share over the course of 2020, and Ebay’s rose by almost 40 percent, from \$35.96 to \$50.25. For Chinese market leader Alibaba, revenue from its China commerce retail business for the six months ending 30 September 2020 was RMB196,791 million (\$28,984 million), an increase of 30 percent compared to RMB151,387 million for the same period of 2019. Revenue from Alibaba’s *international* commerce retail business for these six months was RMB14,801 million (\$2,180 million), an increase of 28 percent compared to RMB11,574 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: 73 percent between 2019 and 2020 (Statista, 2021b). The leading platform in Africa, Jumia, increased its volume of transactions

by over 50 percent, from 3.1 million to 4.7 million for a six-months-span in 2019 and 2020, respectively (UNCTAD, 2020a).

There are three main reasons why the pandemic may have shifted buyer behaviour from brick-and-mortar shops and malls to online, related to the demand and the supply side, as well as market intermediators:

- On the demand side, consumers were confronted, over shorter or longer periods of time, with closed physical points of sale in many countries, except for goods for daily needs, such as food, drink and hygiene products. Many of them made their first-ever experience with online shopping and/or acquired the technical pre-conditions to go online for the first time. Once they experienced the advantages in terms of price and variety, they may not return—or only practically return—to pre-pandemic buying behaviour.
- On the supply side, traditional retailers have learned that without an online presence and 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 their online channels during the pandemic.
- Intermediaries during the pandemic opened their platforms to 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 expanded also in terms of customer segments (elderly people) and goods traded – groceries and other everyday essentials experienced rising market share as consumers shifted online to avoid contagion (UNCTAD, 2021c; OECD, 2020b). Online shopping became a new routine that is expected to remain in post-pandemic times. Surveys show that over half of consumers believe they will continue to shop online more often than pre-pandemic, and over 40 percent 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, which organizes payments for over 60,000 African merchants, recorded a brief slump of transactions when lockdowns first went into effect, but then sprang to a level five times higher than before the pandemic (UNCTAD, 2020a). However, challenges remain—especially with regard to internet and payment mechanism access for certain populations, digital skills and concerns about costs and security of payments, among others.

E-commerce platforms are typically characterized by winner-take-all markets, where one or a few firms manage to capture extraordinary market share even though their product offering is only marginally superior. This is 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 an 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" – villages with 100 or more active online shops on Taobao operated by local residents generating at least RMB10 million (\$1.5 million) in e-commerce sales annually – were operative supporting community-driven entrepreneurship in rural areas (Wang, 2019). Similarly, Kenyan platform GoBEBA connects local medium and small-sized enterprises (MSMEs) with their customers, even allowing customers without a smartphone to place orders via SMS or phone call (Owino, 2019). GoBEBA tripled gross merchandise value within weeks following the COVID-19-outbreak in Kenya. Kenya's Association of Manufacturers contributed to this growth by providing customers with a digital directory for online shopping opportunities from local manufacturers (Banga, 2020).

The global surge of e-commerce boosted the role of delivery services. Preliminary evidence suggests that new jobs in delivery and warehousing were created. For instance, Deliveroo, Britain's largest food delivery platform, 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 and large numbers of contracted labour. Necessary investments—in, for example, cars or 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, just in Indonesia. Business valuation of both companies exceeds \$10 billion (Budiman, 2021). In Asia Pacific, the market is increasing from \$47 billion in 2016 to around

\$124 billion forecasted for 2024 (Statista, 2021c). In addition to delivery services, COVID-19 is boosting two-wheeler demand as consumers prefer these vehicles over public transport to avoid contagion. There is also a trend towards electric motorcycle, scooter and bike manufacturing to avoid a further increase of air and noise pollution stemming from combustion engines (Boudreau and 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 GVCs** (Seric and 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 semiconductors, 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, for example, 160,000 containers were stuck in Yantian, the port of Shenzhen, due to a COVID-19 outbreak among port workers (Mayer-Kuckuk, 2021). Similarly, there is anecdotal evidence from several industries, for example fish processing, where fishing fleets could not leave ports due to infected crews (NDR, 2021). However, supply disruptions in semiconductors are *indirectly* related to the pandemic, as producers underestimated the speed of post-COVID-19 economic recovery, and lead times for increasing production volumes are considerable. Yet it is important to note that supply disruptions also happen for other reasons, such as the recent trade war between the United States and China, natural disasters or the recent shipwreck in the Suez Canal.

Two recent surveys conducted by McKinsey (2020) and Euler Hermes Global (2020) explored how managers of globally operating firms are trying to cope with the vulnerability of global supply chains. The McKinsey survey shows that 93 percent of respondents indicated 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 percent), “increased inventory of critical products” (47 percent), “near-shoring and increased supplier base” (40 percent) and “regionalized supplier chains” (38 percent). The Euler Hermes survey also reveals a variety of responses, including hedging through insurance, stockpiling, digitalization, increasing due diligence on suppliers and searching for new suppliers. Interestingly, “less than 15 percent of companies consider reshoring” (Euler Hermes Global, 2020). In most cases, cost advantages in outsourced locations still outweigh the related supply risks. “Nearshoring”, that is,

producing closer to the home market, is favoured by approximately 30 percent of the surveyed companies. Survey results should be read with caveats as they are based on general perceptions rather than concrete investment plans.

Overall, then, there are indications that firms are diversifying their sources. For example, Wistron Corp., one of Apple's main suppliers, is planning to become less dependent on China by expanding production in Viet Nam, Mexico and India and sourcing from nearby countries. In addition, nearshoring is expected to increase, as reflected not only in survey results described in the previous paragraph, 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 is little actual evidence of firms relocating at a major scale.

While some authors argue that the supply chain disruptions following the pandemic will change global production organization (Barbieri et al., 2020; Pla-Barber et al., 2021; Enderwick and Buckley, 2020; Gereffi, 2021; Shih, 2020; and Zhan, 2021), others have argued that large initial fixed costs of global sourcing and production as well as 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 of sectors. Some reshoring is expected among multinationals, but such relocations are largely driven by pre-COVID-19 developments—such as increasing wage rates in China and trade disputes—rather than shock from the pandemic (ASME, 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 light of the difficult economic and social post-pandemic processes that lie ahead in the most important markets, cost considerations might play an even more crucial role as they relate to basic consumer goods. This may be different in sectors considered strategic for the competitiveness of advanced economies. Diversification of the supplier base 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 for integration into GVCs.

3.2 Post-COVID global economic power shifts

As demonstrated earlier in this paper, the pandemic's immediate effects on production, investment and trade have been severe. However, effects were unequal across sectors, countries, labour markets and income levels.

Interestingly, advanced economies have seen higher mortality rates from COVID-19 than the rest of the world (Deaton, 2021). As Velasco puts 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):

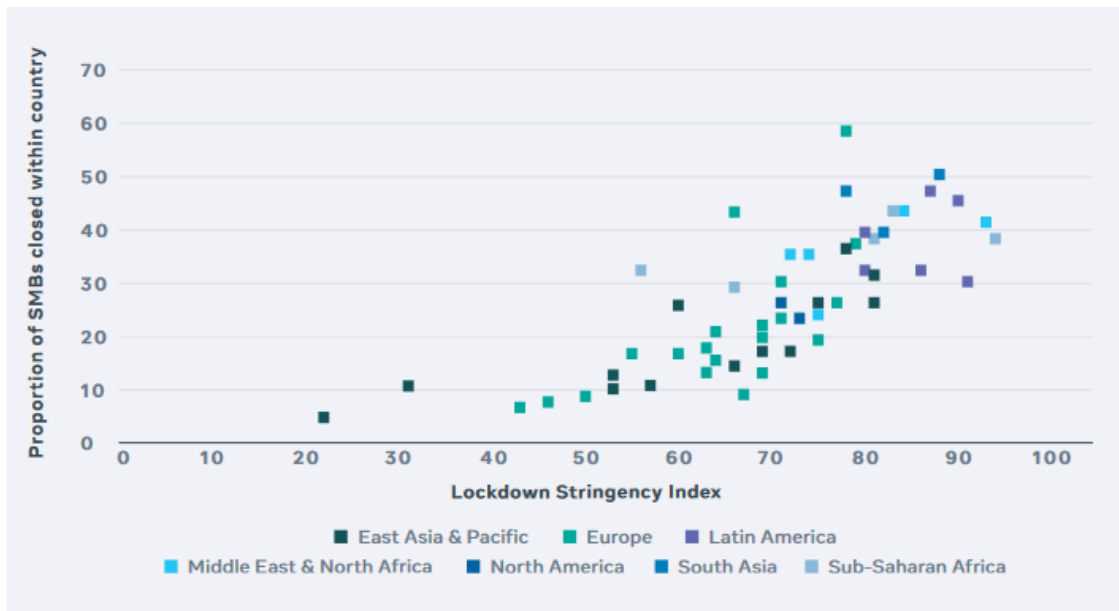
- **Access to vaccines is very unequal** (Stamm et al., 2021). Rich economies will therefore contain COVID-19 within their territories better than poor economies, with the effect that lockdowns and economic restrictions can be lifted earlier.
- Developed countries have invested more in **fiscal stimulus packages** following the pandemic than developing countries (IMF, 2021). While high-income countries spent an average of 10 percent of their GDP on stimulus packages, emerging economies spent just 3 percent and least developed countries only 1 percent (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 low-income economies (176 percent of GDP in 2019), with private debt rising to 123 percent of GDP and government debt also rising, although to lesser extent in lower-income than in emerging economies (World Bank, 2021b). According to Misereor (2021), the number of critically indebted countries in the Global South rose to 132 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, it could lessen the economic shift towards emerging economies.

At the same time, considerable differences have emerged between developing regions. In terms of GDP in 2020, Latin America and the Caribbean experienced the largest reduction (-6.9 percent), Sub-Saharan Africa experienced a moderate reduction (-3.7 percent) and East Asia even grew (0.9 percent), driven by growth in China (2.0 percent). The same patterns appear when

looking at FDI. In Latin America and the Caribbean FDI contracted by 37 percent, in Africa by 18 percent and in Asia by a modest 4 percent (UNCTAD, 2020b). COVID-19 thus seems to deepen the shift of economic power towards Asia, leaving Latin America and the Caribbean and Africa even further behind.

Within countries, workers in lower-skilled occupations, informal employment and small and micro firms, and female workers have been impacted most in terms of reductions in hours-worked and wages (ILO, 2020b).⁶ A survey of more than 30,000 small and micro enterprises in over 50 countries confirmed a strong correlation between stringency of lockdowns and closure of small firms (Figure 6).

Figure 6: 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 percent of tourism agencies and 47 percent of SMBs operating in the hospitality and event management sector reported that they were closed at the time of the survey. Microbusinesses, defined here as SMBs owned and operated by one individual, have closed to a greater extent than those with multiple employees. Approximately 30 percent of microbusinesses reported that they were closed at the time of the survey” (Facebook, et al., 2021). Similarly, a study by Balde et al.

⁶ For addition information on labour markets, mainly from developed economies, see Adams-Prassl et al. (2020), Yassenov (2020) and Campello et al. (2020).

(2020) reveals that informal workers in Burkina Faso, Mali and Senegal have been 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-19 shock, 30 percent of households in Côte d'Ivoire and 20 percent in Ethiopia lost their employment. Many depend on daily labour, and the negative effects were more pronounced in urban areas (45 percent in Côte d'Ivoire and 33 percent in Ethiopia) compared to rural areas (23 percent and 19 percent, respectively). This loss in employment resulted in a reduction of income for 60 percent of households in Côte d'Ivoire and 56 percent in Ethiopia—and increased the number of households living below the international poverty line, from 28 percent pre-pandemic to 47 percent post-pandemic in Côte d'Ivoire and 45 percent to 67 percent in Ethiopia. The significant effects of the pandemic on the informal sector can in part be explained by limited government support. In Côte d'Ivoire only 7 percent of households in the informal sector received some type of government support, while just 4 percent did in Ethiopia.

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 since late 2020 and early 2021 in all world regions, compensating for much 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 levels. GDP growth globally was 3.2 percent in 2018 and is expected to increase to 5.6 percent in 2021, while world trade volume grew 4.2 percent in 2018 and is expected to grow 8.3 percent in 2021 (World Bank, 2021a). Aggregate portfolio flows, too, have recovered from their March lows, although about half of emerging market economies 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 has also been observed in previous recessions, such as 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 (for example, Bricongne et al. 2012).

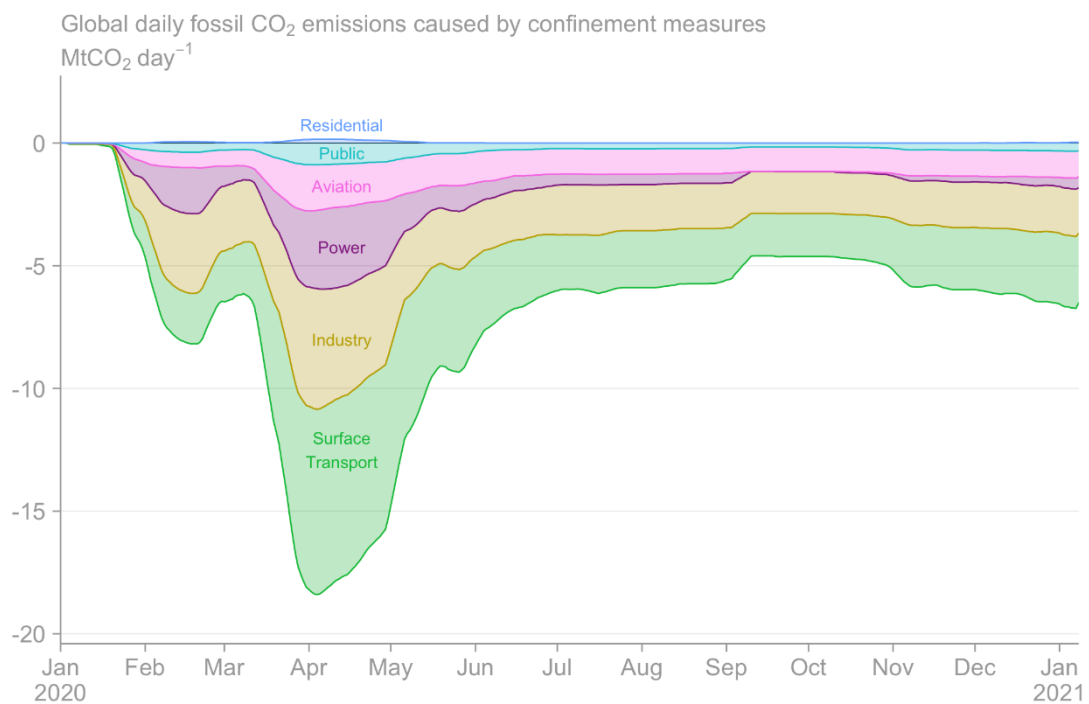
However, the economic revival is clearly uneven across regions. Growth predictions for low-income countries (2.9 percent in 2021 and 4.7 percent in 2022) are less optimistic than for the global economy (5.6 percent and 4.3 percent, respectively), and growth is expected to resume later (World Bank, 2021a). In low-income countries, GDP decline during the pandemic had been less severe, and lesser access to vaccines is delaying their economic recovery. Moreover, the pandemic has significantly boosted public and private debt, which may jeopardize the recovery in the medium

term. On the other end of the spectrum, China is predicted to experience one of the world’s highest post-pandemic growth rates and it has 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 be reinforced by the crisis.

3.3 Post-COVID-19 greening of economies

The pandemic has resulted in a reduction of economic activity, and thereby reduced material consumption and carbon and other emissions (Figure 7). 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, 2020).

Figure 7: CO₂ emission reductions across different sectors in 2020



© Updated from Le Quéré et al. Nature Climate Change (2020); Global Carbon Project

Figure: @Jones_MattW

Source: Global Carbon Project

COVID-19 has had positive impacts on air quality, biodiversity and other indicators of environmental sustainability. For example, lockdowns in the wake of the pandemic have led to biodiversity records in certain areas (Sánchez-Clavijo et al., 2021), improved the water quality in lakes (Yunus et al., 2020) and decreased the population-weighted concentration of nitrogen dioxide and particulate matter levels in the air by about 60 percent and 31 percent, respectively, in 34 countries in 2020 (Venter et al. 2020). CO₂ emissions are estimated to have decreased by about 7 percent in 2020 compared to 2019.⁷ These effects are mostly due to mobility restrictions of ground transport: the decline in CO₂ emissions from oil use in the transport sector accounted for over 50 percent of the global drop in CO₂ emissions in 2020, emphasizing 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 emissions in this sector. Twenty-nine percent of global electricity generation now stems from renewables, compared to 27 percent in 2019 (IEA, 2021). Nevertheless, monthly estimates suggest that global overall CO₂ emissions in December 2020 were about 2 percent higher than in December 2019 (IEA, 2021). Moreover, despite this temporary decrease in emissions, the concentration of greenhouse gases in the atmosphere continued to increase (UNEP, 2020).

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 are likely to drive the greening of economies in the wake of the pandemic.

First, several big economies are using fiscal stimulus packages in the wake of the COVID-19 pandemic to accelerate the shift to green industries, which can promote green markets around the world. High-income countries, particularly the EU and the United States (in light of new legislation in the new presidential administration and the Biden Climate Plan) but also Republic of 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; multiple stimulus packages are "brown" rather than "green". In fact, stimulus packages of 15 of the G20 countries might have a net negative environmental impact (VividEconomics, 2021). For instance,

⁷The drop in overall GHG emissions is expected to be smaller as non-CO₂ gases are likely to be less affected.

China, India and Mexico have proposed stimulus measures that will cause damage to the environment by backing fossil fuels, especially coal. Further, OECD data suggests that green fiscal stimulus in OECD countries and key partner economies might even be outweighed by stimulus targeted to sectors with mixed and negative environmental implications, by 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 feedstock such as ammonia and methanol would increase, and developing countries that offer green hydrogen and secondary feedstock might attract foreign investments in energy-intensive industries that need to meet decarbonisation targets (ESMAP, 2020; IRENA, 2019b). Moreover, green hydrogen could allow developing countries to locally produce an extremely versatile fuel, thereby increasing energy security as countries would be less exposed to oil price volatilities, helping to lower high energy costs due to energy imports, and creating 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 and Engerer, 2020; Tröster et al., 2020; UNESCAP, 2020; World Bank, 2020a). Some Persian Gulf countries have demonstrated in the past good intentions, via their economic development plans, to diversify their economies but have struggled to make good progress towards this objective (Callen et al., 2014; Albassam, 2015). Economic diversification has now gained renewed urgency in light of the COVID-19 crisis in the Arab states of the Persian Gulf (Kabbani and 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 mobilize needed domestic resources and drive the greening of economies (World Bank, 2020a, for example). Yet, in 2020 G20 countries maintained or even increased their fossil fuel subsidies in 2020, in comparison to slight reductions in previous years (Geddes et al., 2020).

Third, telework has been widely applied during the pandemic and led to new routines that are expected to remain. These include 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 percent of all respondents stated their companies' workforce were in home office prior to the pandemic, and as of December 2020, 35 percent of respondents expected the workforce to be teleworking from a remote location permanently (Statista, 2021a). These trends could 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-19 pandemic, affecting the prospects ISID of latecomer economies. The pandemic itself has had severe temporary effects, but only minor repercussions in terms of structural change. Table 5 summarizes those exceptional trends that might significantly change the long-term course of structural transformation.

This concluding section discusses the implications for strategies to build back better, shaping industrial development to be inclusive and environmentally sustainable. The analysis takes into account the structural transformations and the influence of the COVID-19 crisis analysed in the previous sections, and derives recommended policy actions from them. 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 (World Economic Forum, 2020). Similarly, 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 5: Tangible COVID-19 effects on structural change and their implications for latecomer development

| Megatrend | Tangible COVID-19 effects on structural change (beyond temporary recession) | Opportunities and threats for latecomer ISID |
|-------------------------------|---|---|
| Digitalization and automation | Trend acceleration towards online trading and telework Firms considering automation and reshoring | ‘Winner-take-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 and high-income countries with healthy finances and strong fiscal stimulus packages are also likely to emerge stronger High indebtedness (in low-income countries) may jeopardize 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 mobilization can create opportunity for fiscal reforms that encourage inclusive and green transformation |
| Greening of economies | Some countries deployed green fiscal stimulus packages such as green hydrogen initiatives Crisis unveiled risk of mono-structures, especially a 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’ elaboration

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; protecting the vulnerable as well as strategic industries; and accelerating research and production of critical health products, among other requirements. The realization 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 remain, including targeted support for health industries, new legislation to protect the vulnerable from unfair contracts, perhaps 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 previous sections: (1) fostering economic resilience, (2) developing pharmaceutical and medical supply industries, (3) investing in digital capabilities, (4) generating revenue for the expected structural transformation, and (5) globally harmonizing industrial policies to manage global public goods and prevent future global crises.

4.1 Fostering economic resilience through economic diversification

The COVID-19 crisis has shown how much economic resilience matters for safeguarding human development and ISID in particular. This holds for small and large firms, and for workers as well as for entire economies. A lack of diversification has reinforced the economic effects of the crisis on countries dependent on oil exports, tourism and FDI. 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 the focus of policymakers.

The megatrends described in previous sections offer new avenues, although their potential for success depends on numerous country-specific conditions. Some emerging opportunities include:

- 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.
- Urbanization is accelerating across all the world's developing regions and is projected to remain strong until 2050. At the same time, middle-class consumers are increasing rapidly, creating new opportunities for firms tapping into the rapidly growing demand for 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 et al. (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 channeled 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 could 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, etc., as well as the exploitation of millions of tons of biological waste and residual materials. Urbanization will boost demand for building materials; yet, given the need for decarbonization, we expect increased use of materials such as wood, straw and clay which have a lower carbon footprint than concrete, steel and aluminum. 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 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 investment 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 many developing countries’ health markets, combined with aging populations in industrialized 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: 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 that the pandemic has most significantly accelerated is the increased use of digital solutions. Across the board, digital capabilities have become more important, resulting in the need for countries to invest in digital infrastructure and the digital 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 high 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 emerging opportunities. Crucially, skills and capabilities also need to encompass specialized know-how on data security and protection against cybercrime, a by-product of accelerating digitalization that has become more pervasive and potentially disruptive.

To counteract an unhealthy market concentration, digital capabilities need to be developed in an inclusive way, improving 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 as large international e-commerce firms have gained market power and can use their economies of scale and experience in last-mile logistics to gain shares in markets which were previously served locally.

Supporting firms specializing 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 towards services such as DoorDash or Uber Eats to bridge the last mile to their clients.

Finally, 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 towards combating the pandemic and its economic effects has exceeded \$21 trillion globally (Cornish, 2021). Analyses based on the COVID-19 economic stimulus index developed by Elgin et al. (2020) show that the capacity to mobilize these funds is largely concentrated in industrialized countries. Countries such as the United States, Canada, and Germany were able to mobilize 20-25 percent of their annual GDPs to cushion the economic effects of the crisis and initiate an economic recovery. China mobilized around 6 percent, while developing countries largely rely on external funds by bilateral and multilateral donors.

Proactively making use of the opportunities discussed in the previous 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 brought on by the requirements 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 \$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, must play a key role in safeguarding short-term financial viability (Berensmann et al., 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 affected countries. 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 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 a value-added tax. Such horizontal policy measures thus follow a Pigouvian logic by incentivizing 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 harmonized industrial policies as an emerging field of policy action

The role of industrial policy has changed in the last 10-15 years. Traditionally, the aim has been to increase productivity, competitiveness and employment. Increasingly, however, industrial policies are also used to cope with wider societal challenges (Altenburg and Lütkenhorst, 2015)—overcoming regional imbalances, decarbonizing the economy, avoiding 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 distributed production capacities for vaccines in regions all over the world. 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 that are essential for containing global warming but due to various market failures do not attract sufficient private investments.

Traditionally, industrial policies were designed to strengthen *national* industries in global competition and thereby accelerate *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 and Stamm, 2012). Moreover, lessons can be drawn from the (typically national) technology missions of the past to design effective *global* missions (Mazzucato, 2021). UNIDO in particular may find avenues to strengthen its role, adding a new position as moderator of global agreements to its traditional function as the ISID knowledge hub for national governments.

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