POLICY BRIEF

DIGITAL ECONOMIC TRANSFORMATION

INTRODUCTION

Economic transformation is the joint process of increasing within-sector productivity growth and moving labor and other resources from lower- to higher-productivity sectors. The reallocation of resources from less productive traditional sectors to more productive modern industries that emerge in the transition process enable economies to progress and ensure that productivity gains diffuse to the rest of the economy[1,2]. Anecdotal and empirical evidence all suggest that countries that manage to pull themselves out of poverty and get richer are those that achieved within-sector productivity growth and diversified from traditional sectors such as agriculture[3,4,5,6]. Historically, most of the industrialized countries have undergone a structural transformation for achieving sustainable growth and development, creating more and better inclusive jobs, and reducing poverty and inequality. They also tend to follow similar paths to structural transformation. Hence, economic transformation is extremely important and should be a policy priority in any country.

One of the prominent drivers of economic transformation is technological change through its effect on production efficiency, returns on capital as well as infrastructure, and urbanization. Indeed, the dynamics of the world's economic development were static before the onset of the First Industrial Revolution in the 18th century that was characterized by waves of technological change, driven by surges of scientific discoveries[7,8]. The successive adoption of these inventions spurred the massive economic transformation that was observed at that time[9,10]. By the same token, attaining or sustaining economic transformation in the current industrial revolution era requires a successive adoption of newly emerging technologies. More than ever, these new technologies are ubiquitous and embody the nascent systemic shift in the global production system which uses technologies that simultaneously achieve higher productivity, greater efficiency, and less environmental footprint to meet the global goals of economic competitiveness and environmental sustainability.

Some ground-breaking digital technologies emerged from the latest wave of industrial revolution, also known as advanced digital production (ADP) technologies, of the current industrial revolution, include artificial intelligence, blockchain, big data analytics, cloud computing, Internet of Things (IoT), advanced robotics, and additive manufacturing—collectively known as the Fourth Industrial Revolution, "4IR", technologies. The process of adopting and applying these technologies to transform the economy is called "Digital Economic Transformation" or "Digitally-Enabled Economic Transformation"[11,12]. Historically, the digital revolution began after the introduction of the World Wide Web and during the past twenty years, the digital transformation of the global economy has scarcely been slow. The integration of digital technologies into every aspect of life changes the fundamental ways people study, work, and love.Today[13], live in what could best be described as a digital economy where almost all social and economic activities are either reliant on, or significantly enhanced by, the use of digital inputs, including digital technologies, digital infrastructure, digital services, and data[14]. The prominent role digital technologies play in today's global economy can never be overemphasized. Therefore, appropriate policies are needed across the board to leverage digitalization for inclusive and sustainable economic transformation through investing to build digital infrastructure, digital skills, and connectivity[15,16]. Furthermore, there are three main areas of policy actions to make ADP work for Inclusive and Sustainable Industrial Development, namely, building framework conditions, fostering demand and adoption, and strengthening capabilities (UNIDO, 2021: IDR 2020)[17].

DIGITALIZATION AND ECONOMIC TRANSFORMATION

Regardless of the name—whether ADP or 4IR or Industry 4.0 technologies—the main feature of these newly emerging technologies is that the associated technologies are exponential, digital, and combinatorial[18]. Their diffusion is radically changing the nature of manufacturing production, blurring the boundaries between physical and digital production systems. Other sectors such as agriculture, tourism, and business services (transportation, wholesale and retail trade, finance, insurance, business processing) have also not been left out in this effect[19]. To this end, the importance of digital technologies for these sectors is well established in the academic literature. For instance, in a comparative study of the productivity growth difference between the US and the EU in the mid-1990s, Jorgenson et al. (2008)[20] and Bloom et al. (2010)[21] find that the dramatic acceleration of U.S. productivity growth in the mid-1990s was largely driven by the massive ICTs investment boom[22,23]. More recently, Vu & Asongu (2020) show that internet adoption has a positive effect on economic growth and this effect is more beneficial for developing countries[24], Further to this, Ndubuisi et al. (2021) find that the rise of the services

sector in Sub-Saharan African countries is associated with the diffusion of digital infrastructures[25].

What then explains the relationship between digital technologies, productivity growth and economic transformation?

Focusing on how digital technologies enhance the productivity of non-farm enterprises, Danquah & Owusu (2021) discuss four channels that are relevant for the broader discussion on how digital technologies impact performance and transformation[26]. These include the efficiency channel, the market access channel, quality intermediate inputs and the learning channel, as well as the credit and risk reduction channel. Related to the efficiency channel the emergence of digital technologies significantly reduces asymmetric information and transaction costs in the marketplace through improved and timely access to and use of information, reduced search costs, and better coordination and management of supply chains. Before, economic agents relied on conventional search mechanisms such as personal travel and traditional media outlets to find information in various areas, including input and output prices, and potential buyers and sellers. These traditional search mechanisms are costly and limiting. Digital technologies have introduced a new search facility that is more encompassing, faster, and cheaper[27,28,29].

Regarding the market access, and quality intermediate inputs and learning channels, the increased use of digital technology among firms has enabled these firms to expand their market reach by searching across bigger consumer and producer markets. Also, businesses can source inputs or sell output from more local and international markets. Through their contacts with more markets, they also learn about best practices and upgrade their workforce skills. As per the credit and risk reduction channel, digital technologies have enabled firms to engage in proper financial bookkeeping which bears profound implications on the extensive and intensive margins of loans they can access[30,31]. Akin to this, digital technologies also improve information flow between members of a network, both locally and across international boundaries. This has enabled firms to obtain credits from multiple sources including from networks outside the country and to respond better to shocks in the domestic financial market while obtaining information about alternative investment opportunities[32,33]. Other ways digital technologies have enabled firms' access to credit is through digital financial innovations, such as mobile money that is offering loans, savings, and transfer services to businesses without access to the formal banking network.

MSMEs participating in global value chains are more likely to benefit from technology transfer.

For manufacturing MSMEs in developing and emerging industrial economies, learning about more advanced technologies may also depend on their integration in international trade and production networks. International trade and production networks can be viable channels for knowledge transfer to customers downstream in a global value chain (GVC). Based on an international firm-level survey, the findings by UNIDO (2020, pp. 14)[34] confirmed that participation in GVCs positively affects the probability of adopting new technologies. This positive correlation holds when controlling other factors is likely to shape the adoption of new production technologies, such as size, sector, human capital and R&D, and machinery investments. Therefore, integration in manufacturing GVCs can represent an important opportunity for MSMEs in developing countries to climb the technological development ladder.

International collaboration among countries with different stages of technological advancement presents a prospect for MSMEs in developing countries to participate in technology transfer activities and build up their readiness to adopt new technologies.

In many national strategies of follower economies, for example, the 'Look East Policy' of Malaysia in the 1980s, some frontrunner economies were identified as a preferred partner to facilitate technology transfer, human resource development (sending students and trainees to universities and technology institutes in partner countries), and joint implementation of pilot projects, but also to explore joint business models. One of the significant results was the creation of the Malaysian national car industry[35] (Furuoka, 2007). Partnerships can also be done with other countries at similar levels of digitalization capacities that knowledge transfers can take place on a more equal footing and be closer to common realities (UNIDO, 2020, pp. 26)[36]. In another example, over the past decade, UNIDO, through its Centre for South-South Industrial Cooperation (UCSSIC), has successfully utilized its resources to support activities[37] in the fields of technology transfer; these have achieved noticeable results and played a catalytic role for industrial development in Southern countries and are already motivating joint research activities and innovation agendas on big data, ICTs, and other advanced technologies and their applications, as well as on ICT infrastructure and connectivity (UNIDO, 2021)[38].

Digital technologies are also powering economic transformation through creation of new business models.

While the foregoing discussions are suggestive of digital technologies serving more as factor input, digital technologies have also resulted in new business models that are also fundamental to digital economic transformation. In particular, the last couple of decades has witnessed an unprecedented rise in the platform economy powered by digital platforms. Digital platforms are value-creation systems that connect actors through activities or needs, enabling them to collaborate, allocate and use resources more efficiently to create value[39]. Examples of these innovative platforms include Airbnb in the hospitality

industry; Uber, Bolt, BlaBlaCar, and Lift in the transport sector; Uber Eats and Deliveroo in the food delivery industry; Facebook and WhatsApp in the communication industry; Netflix, YouTube, and Tiktok in the entertainment industry. Digital platforms create value based on their ability to generate network effects. These network effects also have the potential to generate market powers, further innovation, create new jobs that never existed before and simultaneously increase the productivity of workers in their current occupations[40,41]. Digital technologies have increasingly become ubiquitous which is revolutionizing how economic value is created and distributed between producers and consumers. For example, consumers can efficiently source labor from suppliers on a digital platform like TaskRabbit further underscoring the importance of digital technologies for economic transformation[42,43].

Digitalization of manufacturing fosters economic transformation and the COVID-19 has reinforced and accelerated the importance of digital transformation.

For instance, 4IR/ADP technologies such as big data analytics and additive manufacturing now allow firms to efficiently design more customized products to meet up customers' personalized expectations, something that was not feasible in the past. With big data analytics and its predictive analytics power, manufactures can uncover latest and real-time information and recognize patterns which allow them to enhance processes, boost supply chain efficiency, and determine variables that impact production while reducing cost and modernizing operations. Specifically on supply chains, with the right analytics, manufacturing firms can monitor every detail of the production and supply chain process—identifying potential bottlenecks, underperforming components and processes while strengthening dependencies between components. IoT technology is helping manufacturing firms build connectivity between employees, machines and devices while supporting remote data acquisition in a cloud environment and process monitoring. Together with the other ADP technologies, the use of other human-machine interactions through virtual and augmented robotics and automation, and the resulting new business models is fostering digital economic transformation in manufacturing and across sectors, allowing to carry out processes easily adaptable to prevailing conditions (flexible), sustainable (ecological) and those that reduce costs (economical)[44].

As evidenced in UNIDO Industrial Development Report 2022[45], the experience of the COVID-19 pandemic has reinforced and accelerated the importance of digital transformation. In particular, the outbreak and associated lockdowns and quarantining measures implemented in most countries spurred the mainstreaming of digital technologies to respond to the demands of the market. As firms and people are forced to live and operate differently under these unprecedented circumstances, the far-reaching repercussions of the current pandemic have forced the world to consider the urgency of the structural shift towards 4IR, with Covid-19 becoming the unexpected accelerator of the digital transformation. Analysis of a new McKinsey survey on the role of industry 4.0 technologies in the pandemic response "suggests three outcomes: a win for companies that had already scaled digital technologies, a reality check for those that were still scaling, and a wake-up call for those that hadn't started on their Industry 4.0 journeys"[46].

Digitally advanced firms were more robust and responsive than others to the challenges posed by the pandemic crisis and external shocks.

A recent report (UNIDO, 2021[47]) found that firms respond and react to the pandemic crisis based on their capabilities; the results highlight the importance of firm-level capabilities and advanced digitalization in fostering readiness, strengthening resilience, and helping firms be better prepared for the post-pandemic future. A survey by the report shows that digitally advanced firms, on average, cope with and respond to the pandemic better in their ability to implement transformational change in response to the COVID-19 pandemic, such as organizational change, new equipment and product, repurposing, and online business activity. Therefore, narrowing the digital divide and gap across and within countries will be an important agenda for the global community and countries, as we strive to build back better and prepare for future pandemics.

DIGITAL ECONOMIC TRANSFORMATION: THE CRUCIAL ROLE OF MSMES IN DEVELOPING COUNTRIES

Micro, Small, and Medium Enterprises (MSMEs) are broadly classified into three categories: manufacturing, services, and agro-based sectors. These enterprises are widely recognized as important engines of economic growth and development: they comprise a major share of total private sector entities in both developed and developing countries, creating many jobs, and making a significant contribution to the GDP of most countries. For instance, while the World Bank reports that MSMEs represent about 90 per cent of businesses and more than 50 per cent of employment worldwide[48], recent research by OECD reports that MSMEs contributed to 53 per cent and 86 per cent of employment in OECD countries, such as the UK and Greece in 2017. In developing countries such as Peru, 98 per cent of private enterprises are MSMEs, contributing to 42 per cent of GDP and accounting for 60 per cent of employment. Likewise, MSMEs provide about 50 per cent and 80 per cent of employment in Cambodia and Kenya[49]. MSMEs are the backbone of any economy. Their development is critical to accelerating the achievement of wider socio-economic goals such as poverty alleviation[50,51]. Given the systemic shift of the global economy into the digital economy, where all economic activities are either reliant on or are significantly enhanced using digital

technologies, the digitalization of MSMEs is key to the digital economic transformation of any economy.

The digitalization of MSMEs begins with the use of digital technologies, products (goods and services), and processes in the day-to-day operations of MSMEs, along with adequate digital infrastructure and application of digital skills to deploy these digital technologies to improve business operations[52]. The technologies and platforms behind the digital economy hold great promise for increasing the productivity and global connectedness of consumers, workers, and firms operating on the margins and maybe providing new tools for accelerating innovation in the periphery as well[53]. For instance, digital technologies such as big data analytics and additive manufacturing allow the MSMEs to efficiently design more customized products to meet up customers' personalized expectations, which were not financially or technically feasible before. Also, the financial burden posed by conventional in-place consumption on MSMEs will be relieved. The transformation of consumption catalyzed by digital technologies diminishes the renting costs of brick-and-mortar stores since a lot of customers are inclined to shop online instead of in-store shopping. Finally, diversified digital marketing channels like social media renders the MSMEs accessible to a much bigger public, thanks to their economic, efficient, and far-reaching characteristics. With digital tools, MSMEs can mitigate limitations imposed by expensive marketing campaigns, allowing MSMEs to reach customers worldwide.

Furthermore, the nature of new technologies may lead to the emergence of a few dominant players, bringing market distortions that could harm consumers as well as smaller firms [54]. MSMEs that rely on digital technologies, therefore, have a great scope to catch up with, compete with, and even leapfrog large/established firms, given often more flexible managerial environment and ample opportunities for firm-level innovation that MSMEs have. MSMEs in the manufacturing and service sector have more potential for leapfrogging as per the productive escalation and data-based customized solutions enabled by digital technologies. Before the emergence of digital technologies, the daunting obstacle for most MSMEs was the lack of skilled labor for repetitive and quantity production. With the fruit of digital technology reaped, the challenge could be overcome. Countries like Indonesia seem to have realized as MSMEs owners and managers are encouraged to wield the digital tools to boost their businesses by developing strategies to improve efficiency, reducing costs, getting new customers, building websites, and utilizing digital technology to conduct market expansion and increased sales through the Digital Economy Era[55]. In line with the foregoing, if MSMEs fail to digitalize, the benefits of digital economic transformation will not be shared broadly across the population. There is, therefore, the urgent need to address fundamental challenges related to digital technology adoption and assimilation into existing production systems that most MSMEs face, especially in developing countries.

LEVERAGING DIGITAL TECHNOLOGIES FOR ECONOMIC TRANSFORMATION: THE FUNDAMENTALS MATTER

Leveraging digital technologies for inclusive economic transformation requires addressing fundamental challenges, providing a supportive environment for economic agents, such as MSMEs, to leverage the benefits of digital technologies, products, and processes. Supportive environments entail building digital skills, digital infrastructures, productive capacity, and good contracting institutions that enable businesses to thrive among others. Any successful digital economic transformation would depend on the extent to which a country meets both conditions.

Many developing countries lack the capacity and supportive environment essential for harnessing digital technologies.

The low adoption of newly emerging technologies and digital connectivity further widens the technological gap and keeps LDCs lagging in a digital economy. For example, in manufacturing, many LDCs still use analog technology in nearly 70 per cent of the manufacturing process[56,57]. Also, only one in five people in LDCs use the internet in comparison with four out of five in developed countries[58]. As per ITU statistics, 17 per cent of the rural population in LDCs has no mobile phone coverage at all, and 19 per cent of the rural population is only covered by a 2G network[59]. Moreover, in most LDCs, less than 5 per cent of the population shop online, compared with 60-80 per cent in many advanced economies[60]. In Africa, only about 1.1 per cent of GDP is spent on digital transformation (internet infrastructure and networks), while developed countries spend 3.2 per cent of their GDP on average. Moreover, Africa and Latin America together constitute less than 5 per cent of the world's 4,422 colocation data centers, while 80 per cent are in developed countries[61].

In the digital economy, the rest of the world is trailing considerably far behind China and the United States. These two countries have economically dominated the digital space. For example, both countries are responsible for 75 per cent of all patents related to blockchain technologies, 50 per cent of global spending on IoT, and more than 75 per cent of the world market for public cloud computing. They also account for 90 per cent of the market capitalization value of the world's largest digital platforms such as Microsoft, Apple, Amazon, Google, Facebook, Tencent, and Alibaba. These seven technological giants comprise two-thirds of the total digital market value, Europe's share is 4 per cent, Africa and Latin America jointly account for only 1 per cent. Universal adoption and diffusion of digital technology, especially in LDCs, is key to the success of the digital economic transformation[62].

Digitalization will impact all countries and their sectors in diverse ways depending on their readiness and respective capacities to leverage the benefits of digital technologies, products, and processes.

Regarding a supportive environment for digitalization, the UNCTAD-led eTrade found that low-income countries face significant weaknesses in all seven areas of readiness assessments for e-commerce and the digital economy including digital infrastructure and services, payment solutions, trade logistics, legal and regulatory frameworks, skills, and access to finance[63]. As per the WEF's 2018 readiness for the future of production report, a significant proportion of low- and middle-income countries are grouped as "nascent" countries, that is, countries with a limited production base which potentially face the most severe challenges[64]. With a limited production base, the diffusion of advanced digital production technologies is a difficult process. Addressing the aforementioned challenges are crucial for any inclusive digital economic transformation. They range from fundamental challenges related to access to advanced digital production technologies, to their assimilation into existing production systems and adequate availability of basic production capabilities and enabling infrastructural capabilities[65]. LDCs would require the most investment in digital connectivity, digital skills, and infrastructure, to enhance their innovative capabilities and the use of ADP technology.

LDCs have the opportunity to leapfrog[66] legacy technologies through advanced digital technologies but pre-conditions for leapfrogging need to be corrected.

While LDCs are still resistant and struggling to effectively engage with the third industrial revolution's technological, organizational, and institutional innovations, the deployment of ADPs offers the opportunity to leapfrog these legacy technologies. For instance, since the 1960s, landline subscriptions grew in developed countries, such as the US, and steadily declined post-2000. This decline coincided with the increase in the adoption of mobile cellular subscriptions since the 1990s. In developing countries such as Kenya, there has been very little adoption of landline subscriptions. However, mobile phone subscriptions in Kenya show a steady increase since 2000, which is often referred to as the 'leapfrogging effect': developing economies have effectively leapfrogged the earlier landline phone technology and have embraced the modern mobile technology instead.

While possible, investing to build appropriate foundational capabilities and production systems are key[67]. Accordingly, Lee (2019) notes that the "pre-condition for leapfrogging is to correct the capability failure by providing latecomers with learning opportunities so they can enhance their innovation capabilities"[68]. Many LDCs lack the awareness, digital culture, human resources, infrastructure, and capital to leverage these new and emerging ADPs and modes of production to leapfrog legacy technologies.

Deploying advanced digital technologies optimally and strategically creates a potent mix of resources and infrastructure that can yield better quality, more sustainable industrial development. If LDCs are to leapfrog, they must develop sector-specific production and technological capabilities that require a combination of factors and processes that include skills upgrading, funding, access to foreign technology that can be adapted to local needs, incentives from the government and exposure to regulated competition[69]. Provision of basic infrastructure to take advantage of 4IR/ADPs is also crucial. Issues relating to poor digital infrastructure and poor energy supply, pose a barrier to LDC's uptake of digital technologies, or in appropriating their full benefits. The need to address the basic infrastructure deficit for effective and inclusive digital economic transformation cannot be overemphasized—their absence or limited supply disincentivize firms and businesses from adopting digital technologies, or from evolving into new digital business models.

WELFARE EFFECTS OF DIGITAL ECONOMIC TRANSFORMATION: NEW TECHNOLOGIES AND EMPLOYMENT

There are growing concerns that the development of digital technologies for economic transformation will result in job losses. Frey and Osborn[70], for example, predict that 47 per cent of occupations in the United States will eventually be replaced by robots or intelligent computers. The World Bank[71] also claims that 1.8 billion jobs in developing countries are susceptible to automation. Other studies also address the potential risk automation poses to the labor market: labor costs are on the rise, the power and capabilities of machines continue to increase, the original business model is transforming and the structure of companies is changing in order to stay competitive in the global market, and the workforce, which played the leading role in the production process of goods or services is gradually becoming redundant due to the growing autonomy of machines[72]. Other international studies warn about the potential threats the labor market faces due to automation, resulting in an overwhelmingly pessimistic consensus that automation and robotics will gradually and inevitably replace workers[73].

How true are the skepticisms about the negative employment effects of new technologies?

Whether digital technologies yield better or worse employment outcomes could be gauged by what we know so far from the literature about the effect of automation on labor. A thorough review of the existing literature suggests that whilst the nexus between automation and labor remains at best mixed, in general, in more recent studies, where rigorous methods are applied, less negative, and perhaps even positive conclusions about the impact of automation on labor, result. Accordingly, UNIDO's Industrial Development

Report[74] concludes that growth in the stocks of robots has a surprisingly small and positive effect on employment growth. Employment growth occurs mostly in emerging industrial economies, not industrialized ones. Furthermore, manufacturing accounts for around two-thirds of world employment growth, attributable to robotization. The highest contributions of robotization to employment came from computers, machinery and basic metals. Some evidence from Germany and Spain[75] also suggests that robotization did not increase workers' risk of displacement; it reduced the labor cost share but increased the number of jobs. Output growth is another positive side effect of robotization[76].

Certain jobs that are difficult or impossible to perform using offshore labor markets are at a lower risk of being replaced by automation. Jobs involving repetitive and routine tasks that can be offshored, such as those in the skilled agricultural and service sectors, are likely to be affected most by job losses due to automation[77]. Major destinations for outsourced operations experiencing ongoing technological restructurings, such as Thailand and Vietnam in Southeast Asia, face the highest risk of job displacement due to automation. Certain conditions must be met for automation to replace tasks that are performed by workers, for example, task suitability, task-technology fit, implementation problems and resulting performance outcomes. In cases of negative employment effects, not all types of jobs will be affected, and the job-displacing effects will vary depending on the characteristics of the labor market and effects can be mitigated by public policies[78,79].

NEW ECONOMICS FOR SUSTAINABLE DEVELOPMENT (NESD)

Relationship between NESD Concepts and Digital Economic Transformation

Assessing economic performance using the extent of globalization and strong GDP has not been favorable for humans and the planet. Therefore, there is a growing global demand for a new direction of economic development and progress that will be people and earth-centered[80]. Central in this increasing global advocacy for more sustainable patterns of development is the NESD. The NESD acknowledges that the world today faces profound economic challenges—ranging from climate change, rapid technological changes, evolving new patterns of globalization (trade and investment), and demographic changes that bear profound implications for humans and the earth. For instance, while the widespread neoliberal model has influenced thinking patterns, the model and the financialization of the economy is linked to widespread inequalities and worsening environmental outcomes—arising largely from skewed systems where a larger share of income generated by production factors accrue to capital and a greater focus on profit maximization at all costs by businesses [81]. While not excluding ideas coming from neoliberal models, the NESD stresses the need to test other new economic and financial models and perspectives that focus on sustainable patterns of economic development, particularly, when the neoliberal model has failed in relation to issues relating to sustainability[82] long this line, the UN Member States in 2015 adopted the SDGs and the Addis Ababa Action for Financing for Development (FfD), which provided the roadmap to channel funds rolled out by governments and international organizations to support and advance the transition to economic models compatible with the SDGs. While the UNCTAD has called for the Global Green deal, (GGND), the NESD concepts are favored to have a better chance to rebuild resilient, inclusive, and more equitable economies[83].

The NESD concepts: circular economy, social and solidarity economy (SSE), frugal economies, as well as green, yellow, blue, purple, and orange economies provide a framework for alternative economic growth beyond the current restrictive focus on GDP. Ultimately, the NESD concepts aim to mitigate climate change and promote digital economic transformation for more sustainable and inclusive industrial development. Whiles most NESD concepts have direct links to climate change and inclusive industrial development (e.g., circular, blue, purple, yellow, and SSE economy)[84], only the orange and frugal economy have direct link and interaction with digital technologies for economic transformation[85]. Given the theme of the paper, the focus is on the latter two. The extent of these interactions depend on countries' distinct levels of development and specific geopolitical situations. For instance, the orange or creative economy focuses on leveraging ICTs to support entrepreneurship and job creation in the creative industries, such as advertising, design, publishing, software, Film/TV/Radio. Particularly targeting young people, the creative economy supports sustainable entrepreneurship and empowers innovators, especially the generation that grew up in the digital era. A dynamic creative economy supported by digitalization can have transformative opportunities in the economy by playing a key role in promoting other alternative economic models that boost productivity growth levels, promote knowledge-intensive business services, and generate more high-skilled and higher-paying jobs in services and across other sectors that power economic transformation in developing countries[86]. The most recent available data shows that in Europe, the cultural and creative industries, which are the core of the creative economy, accounted for 7.5 per cent of all people employed in the economy and 5.3 per cent of EU gross value added (GVA)[87].The frugal innovation economy recognizes social and environmental issues such as inequalities and climate change as business opportunities. Through repurposing existing technology and innovation, the frugal innovation economy aims to provide affordable but quality solutions to these global challenges, particularly among marginalized populations while fostering

rural MSMEs and job creation in LDCs. Indeed, the COVID-19 pandemic has further accelerated the digitalization of the economy and the use of ADPs across countries. In this regard policies and fiscal stimulus that promote frugal innovations could accelerate the deployment of ADPs to power the digital economic transformation[88].

Integration of NESD Concepts into Mainstream Economic Policy: Emerging Arguments

The NESD concepts aim to deliver a more sustainable and inclusive industrial development and economic transformation. Traditionally, unrestricted use of pollutants like coal in manufacturing powered economic growth. However, certain patterns of industrialization are unsustainable. For industrialization, trade, and sustained growth to occur within a green economy, the use of renewable energy, ADPs and circular production techniques, (all embedded in the NESD concepts), need to become the norm, as they present promising options for sustainable industrialization. Indeed, the transformative nature of these ADPs means that their use help achieve decarbonization, curb climate change, and have profound impacts on all countries, regardless of their economic status[89].

Currently some countries, especially LDCs, are unable to do so, due to a low initial digital capacity and limited fiscal space to finance such transition. However, for many LDCs, the urgency for shifting to more sustainable digitally-enabled modes of production is important for several reasons. Productive capacity in LDCs is increasingly tied to climate change and changing consumer demand for more sustainable products in key consumer markets[90]. The adoption and diffusion of green industrial technologies depends on the success of the digital economic transformation in LDCs. These technologies are, however, expensive and require global policy coordination, financing, and multilateralism to bridge the digital divide. Significant progress has been made in countries like South Africa. With support from the UN, South Africa is rapidly transitioning to a green economy by implementing initiatives like waste recycling and the issuance of bonds to finance green infrastructure projects in the agriculture, transport, and energy sectors. In addition to these efforts, it is necessary to have clear job creation strategies to protect people like coal workers, who risk being unemployed in a green economy. It has been difficult to assess the risks and returns on green projects due to inadequate data. Governments must play a catalytic role by championing large-scale green initiatives to enable a rapid digital economic transformation that leaves no one behind.

SUMMARY AND POLICY IMPLICATIONS

Across the globe, countries are leveraging the opportunities of digitization and digital technologies for economic transformation. The COVID-19 pandemic has further added more urgency to the need for countries to accelerate structural shifts to 4IR technologies. The digital economic transformation which thrives on well-functioning digital infrastructure, digital skills, and digital connectivity, has contributed to digital entrepreneurship, job creation, and growth-enhancing structural transformation across countries[91]. If accompanied by the right policies, digital economic transformation can lead to inclusive growth, sustainable manufacturing, resource efficiency and better quality of life in all economies[92].

Strategic responses of developing countries to develop digitalization capacities are mixed across and within countries.

A report by UNIDO (2020, pp. 26)[93] documented that the extent of a country to develop its digitalization capacities will depend on its responses and readiness through active industrial policy, digital literacy, skills, and education— and not just wage rates, domestic markets, and positions in global value chains (Lee et al. 2019[94], Mayer 2018[95]). However, the responses are highly contextual as they reflect the extent of industrialization, the penetration of digital infrastructure, the accumulation of technological and productive capabilities, the tradition of intervention in economic matters of national governments, and national priorities and capacities to mobilize public-private partnerships UNIDO (2020, pp. 22)[96].

The digitalization of MSMEs and developing countries is key for any inclusive digital economic transformation strategy.

Despite the substantial contribution of MSMEs to employment creation and economic output, digitalization is also the lowest among this already marginalized group. Generally, the economic geography of the digital economy landscape portrays a picture of global dominance of frontier countries over the rest of the world in frontier technologies. Around 70 per cent of the manufacturing sector in "lagging economies" still uses analog technologies in its manufacturing production. Speeding up digitalization among MSMEs and developing countries is crucial for inclusive growth and to ensure the dividend of the digital economic transformation leaves no one behind. This starts with identifying the challenges for digitalization among MSMEs and in developing countries. Many firms in developing countries, especially MSMEs, face challenges ranging from "access" to digital technologies, their "assimilation into existing production systems and adequate availability of basic production capabilities and enabling infrastructural capabilities" [97]. There are also significant national differences and a lack of readiness among low-income countries to leverage the opportunities of digitalization for economic transformation[98,99].

Despite there is no one-size-fits-all solution and it is still difficult to identify ready-made models, there are a few policy areas for developing countries to develop their digitalization capacities.

Developing digitalization capacities require important efforts in developing (i) framework conditions related to regulations and digital infrastructure, (ii) the institutional setting for policy formulation, and (iii) the channels for international collaboration and technology transfer (UNIDO, 2020, pp. 23)[100]. Framework conditions include the institutionalization of multistakeholder approaches to industrial policy formulation. These relate to the broader ecosystem in which firms operate and to other frameworks and systemic conditions, including digital infrastructure[101]. The institutional setting for policy formulation should stem from close collaboration between private and public sectors, while learning, experimentation, coordination, and monitoring should be key guiding principles (Rodrik 2007[102], 2018[103]). Furthermore, international collaboration should be the basis of strategies for developing countries to build their digitalization capabilities. Closer international collaboration enables organizations and countries to share knowledge and experiences on how to identify and address the opportunities and challenges stemming from the advanced technologies—and ensure that no one is left behind. However, in some developing countries, consensus on the challenges and opportunities is still largely out of reach, and domestic politics are likely to stall major international collaborations.

The inequality in digitalization across countries and MSMEs suggests that the impact of the digital economic transformation on the economy will depend on the alignment of policies, regulations, and incentives to reinforce the transformation induced by digital technologies.

Among others, this requires appropriate policies that on one side help to overcome the fundamental digitalization challenges faced by developing countries and MSMEs, and on another side, provide instruments to support the use of opportunities offered by digitalization for successful shifts of the workforce to more productive sectors and industries in these economies. Such policies should address demand-side limitations by targeting capacity development programs aimed at workforce digital skill upgrades/technical enhancement linked to industrial policy strategies, addressing issues related to high digital tariff and costly regulation. Additional policies are needed to address supply-side barriers to access through investment in digital infrastructure, and electricity to decrease the digital connectivity gap. A battery of additional policies is also needed to address micro and macroeconomic policy constraints and labor market arrangements that run counter to the leveraging digitalization goals for economic transformation.

Implementing these policy strategies requires the active role of governments, private and the global policy coordination of the international development community. At the policy environment and financial level governments are expected to implement policies that foster a digital business-friendly environment to attract and mobilize the needed investment to provide financial support. For example, governments could develop innovative funding mechanisms and support instruments or expand public funding for ecosystem enablers. Furthermore, governments should mobilize feasible and accessible loans to support and promote innovation among firms while rolling policies that protect vulnerable groups, such as MSMEs from unfair competition and abuse of market power by dominant counterparts. With more financing at their disposal, MSMEs can wield the power of innovation to improve their products and services to win more customers and obtain higher market shares. In India, the government through the MSMEs Act of 2006 and the digital India campaign, aims to bring digitalization into every aspect of business. By enabling cashless payments and e-commerce, the policy is expected to benefit small businesses, especially firms in rural areas. Once connected to the digital grid, these firms in the rural areas are expected to benefit effectively from governments subsidies[104]. While largely a policy to promote trade facilitation, competitiveness and increase revenue collection for the government, the policy is also expected to advance and strengthen governance and formalization of the informal sector[105]. Also embedded in the policy are anti-trust laws and competition laws to facilitate trading and development of MSMEs in the country. Additionally, stimulus packages can be extended by the government to businesses facing difficulties due to the pandemic, particularly focusing on MSMEs, and assisting them by boosting liquidity, ensuring availability of funds, and relaxing compliance requirements. Ultimately, the policy aims to use digitalization as a conduit for inclusive economic transformation.

On the technical level, investments that provide technical training and support to help developing countries and MSMEs which in turn cultivate the skilled workforce and develop business strategies, should be prioritized by governments. In this strategy, policymakers must rethink ways to design digital skills training programs, taking into account the initial skill capacities of all beneficiaries of the program, including, the youth and women. Strong collaboration is also needed between governments, the private sector, academia, businesses, particularly in leading foreign entities and industry associations to facilitate knowledge transfer. Venture capital support from investors for funding can foster quicker adoption and diffusion of digital technologies in developing countries and MSMEs, thus providing them opportunities to catch-up and leapfrog. Policies need to go beyond simply providing skills to include revamping the business curriculum to suit the demands of the digital age. Integrating digital skills development and upgrading to general business management training for MSMEs can help build employee skills in deploying basic digital technologies. Specialized training can be provided to MSMEs on advanced digital production technologies through Centres of Excellence (CoE), startup incubators and accelerators. Indeed, digital economic transformation

is a complex process. Against the backdrop of complexity and novelty of the issues at stake, and the continued rapid pace of technological change, policy experimentation will be necessary to assess the benefits and disadvantages of different options for technical training and support.

International development community support is needed to complement national efforts. Development partners urgently need to integrate the digital dimension into their aid policies and strategies, and these proposals need to be prioritized by donors. Assistance should aim to reduce the digital divides, strengthening the enabling environment for value creation, building capacities in the private and public sectors, and enhance trust by supporting the adoption and enforcement of relevant laws and regulations, promoting value creation and capturing the data-driven digital economy. Important examples include, but are not limited to, the United Nations Economic Commission for Europe (UNECE) and other partners implementing the UNDA project, "Global Initiative towards post-COVID-19 resurgence of the MSME sector". As part of its task under the project, UNECE is developing Guidelines and Best Practices for MSMEs in delivering energy-efficient products and in providing renewable energy equipment ("Clean Energy MSMEs") after the COVID-19 crisis[106]. International policy coordination is also needed to support efforts to facilitate technology transfer through proven channels, such as international trade and FDI. Examples of such international efforts towards technology cooperation include the establishment of the Technology Bank[107] and the launching of the Technology Facilitation Mechanism, in the 2030 Agenda for Sustainable Development[108]. Both ongoing efforts by the WTO and international attempts to ease IPR regulations at the international and revisit existing IPR regimes associated with technology transfer between countries and firms are crucial to leveraging digital technologies for economic transformation[109]. Finally, the COVID-19 crisis has reinforced the importance of digital transformation, particularly for developing countries and MSMEs. If gaps in coverage, access and use of digital technologies are properly addressed, digital transformation will play an essential role in the economic recovery from the pandemic, holding the potential to help overcome the persistent challenges, and enable more sustainable and inclusive industrial development. Narrowing the digital divide and gap across and within countries will be an important agenda for the global community and countries, striving to build back better, and enhance resilience of MSMEs in dealing with future pandemics and external shocks. In this transformation, the concern of capital-labor substitution is indisputable. Indeed, in the short- and medium term, job displacement may intensify for certain types of tasks, workers (age group), places, populations and country- and firm-specific conditions. However, various compensating effects are at work simultaneously, which might mitigate the negative effects. Digitalization also changes the competencies required to perform certain tasks, and as a result, new tasks for workers could emerge, resulting in a comparative advantage for labor. Investment in skills to equip workers with these newly emerging competencies are key in attenuating potential negative consequences of the digital economic transformation.

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