Task Force 4
Refuelling Growth: Clean Energy and Green Transitions

TWIN TRANSITIONS FOR GLOBAL VALUE CHAINS: DIGITAL AND GREEN TRANSFORMATIONS

July 2023

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Abstract

Developing countries participate in global value chains (GVCs) mostly as suppliers of intermediary goods. To fully benefit from GVCs and advance their development process, these countries must upgrade their production and enter sectors with greater value added. The digital and green transitions open opportunities for developing countries to meet the demand for greater environmental sustainability and move towards more sophisticated manufacturing and service industries. The digital and green transformations are largely being developed in parallel, especially in developing countries, where the adoption of digital technologies faces several barriers. To overcome these barriers, policies should focus on aligning digital and environmental strategies, developing digital competencies, and strengthening financial support and international partnerships.

The Challenge

1

Developing economies typically participate in the GVCs by supplying raw materials and processed parts for the final products. To fully capitalise on the benefits of GVC participation, developing economies must adopt new technologies to boost their productivity and value-added shares, and eventually upgrade their productions. At the same time, they must address the increasing demand for eco-production from consumers, leading firms, and governments. The adoption of digital technologies can support both processes. However, developing countries face barriers to explore the synergies between the green and digital transitions.

The process of greening production can generally be achieved in two ways. Firstly, through the production of green goods, such as solar photovoltaic panels and wind turbines.[1] A second route is to green traditional manufacturing industries such as garments and textiles, which can be achieved through greener production processes.

The strategic adoption of digital technologies can support developing countries in their upgrade and greening of GVCs. Digitalisation and the adoption of Industry 4.0 technologies have wide-ranging positive effects on GVC participation.[2] For example, digital technologies such as artificial intelligence (AI) can help firms identify the fastest, cheapest, and most sustainable routes for shipping goods worldwide.[3]

The processes of greening production can be considered as a series of steps, from the initial demand to new designs and product improvements. Changes are transmitted along the value chain through new standards and specifications, often from the leading green market to the latecomer markets. New standards and demand for sustainability from the leading firms, while setting and enforcing the parameters for the latecomers, could create financial and capability barriers and discourage firms in developing economies to seize the twin opportunities.

Although the environmental and digital transformations have become more intertwined, developing economies and international communities must counter two main challenges with strong policy responses: (i) the threat of supplier

squeeze along the value chain; and (ii) the slow diffusion of digital technologies compared to developed countries.

GVC governance determines how different actors within the value chain, such as suppliers, buyers, and lead firms, coordinate with each other to produce and distribute goods or services across the globe. The types of GVC governance reveal who along the value chain takes the greening initiatives and how it happens.[a,4] In an example of captive GVC governance, in which the chain is controlled by lead firms, suppliers must comply with the environmental standards imposed by lead firms and bear the costs of sustainability compliance. Aggressively pushing or transferring compliance costs leads to supplier squeeze, eventually making it difficult for latecomers to switch to green smoothly.

For the spread of digital knowledge, the diffusion of digital technologies is barred by income, infrastructure, and labour skill levels. As of now, Industry 4.0 technologies are primarily used in industrialised nations. Many sectors of the low-income economies are at the stage of Industry 2.0.[b] They could hardly benefit from the diffusion of Industry 4.0 because they lack the required industrial capacity, such as infrastructure and labour skills. Most developing economies have limited access to internet, mobile networks, and even electricity. As of 2019, the average speed of fixed broadband connections in developed economies was nearly eight times faster than that of the least developed countries at around 15 megabits per second.[5] According to a 2021 United Nations Conference on Trade and Development (UNCTAD) survey, 16 percent of rural populations in the least developed countries lack access to mobile networks, while 35 percent cannot connect through mobile devices.[6] Moreover, the World Bank's Enterprise Survey found that over 20 percent of companies in South Asia and approximately 14 percent in Sub-

a The UNCTAD has categorised five types of GVC governance, including market governance, modular governance, relational governance, captive governance, and hierarchical governance,

b The Second Industrial Revolution began in the 1800s with the introduction of electricity and assembly line manufacturing. This period, also known as Industry 2.0, relied primarily on electricity and oil to power machines and industrial processes.

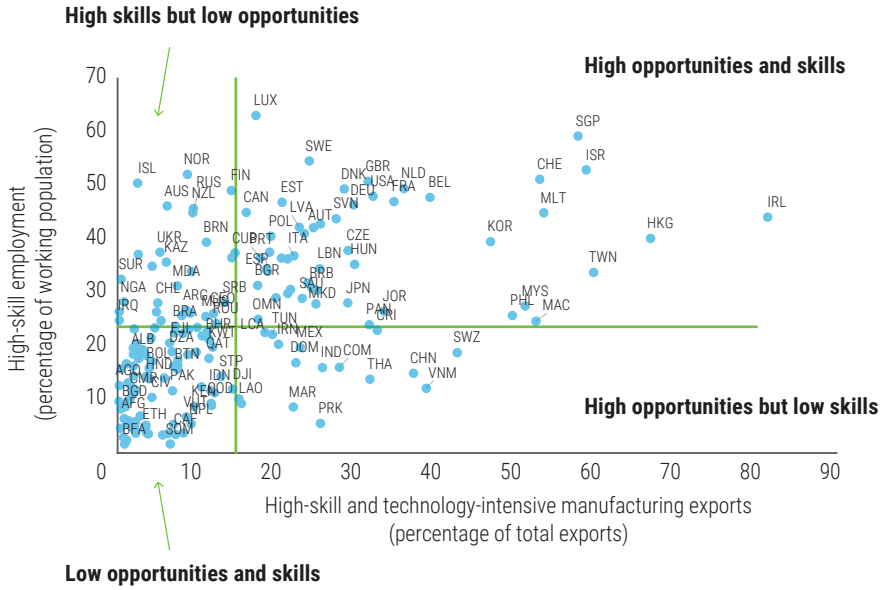
Saharan Africa cited lack of access to electricity as their primary obstacle, which in turn affects their ability to utilise the internet.[7]

Furthermore, high-income nations concentrate knowledge generation related to frontier technology patents and are better positioned to take advantage of digital technologies. Over 90 percent of technological patents are held by high-income nations.[8] They are also better prepared in terms of labour skills. While smart production takes place in countries and sectors featured with more skilled labour, the countries best placed to move to smart production are those with higher levels of skill and stronger manufacturing industries.

Figure 1 shows the readiness of countries to benefit from the diffusion of Industry 4.0, which is key to twin transitions for GVCs. The horizontal and vertical green lines represent the unweighted global averages of the two indicators on workforce skills and market opportunities, as defined by high-skill employment as a percentage of the working population, and high-skill and technology-intensive manufacturing exports as a percentage of total exports, respectively,[c] categorising countries into four groups. The countries that are in the top-right quadrant, are the most favourably positioned. It consists of high-income economies located in East and Southeast Asia, Europe, and the United States. Right below that are countries that can produce high-tech goods but have a lower share of skilled labour force, which could hinder the widespread diffusion of Industry 4.0. These include China, India, Mexico, Thailand, and Vietnam. To the upper left, countries such as Argentina, Brazil, and Chile possess the required workforce but lack the necessary companies to leverage their potential, thus posing a challenge to expand beyond isolated pockets of technology-intensive manufacturing. Lastly, the majority of developing countries are clustered in the bottom-left quadrant, lacking both high-tech sectors and skilled workforces.

c High-skill employment is defined by the ILO as the sum of managers, professionals and technicians and associate professionals following the International Standard Classification of Occupations. High-skill and technology-intensive manufacturing exports follow the Lall classification.

Figure 1: Readiness to benefit from the diffusion of Industry 4.0



Source: UNCTAD data[9]

Note: *The solid lines represent the unweighted global averages under these two indicators. Data labels use International Organization for Standardization economy codes.*

Addressing the above issues requires international cooperation to achieve greater financial access to promote greening GVCs and spread digital technology knowledge from advanced to less developed economies. It is imperative for the G20 to continuously play an active role in supporting the developing economies to overcome the challenges and achieve progress in the twin transitions.

The G20's Role

2

To take advantage of the opportunities created by new technologies and innovations, there is a growing need for greener production along the value chain and to promote knowledge diffusion across all nations. However, many developing economies continue to face challenges in adopting greener practices and incorporating green technologies into their production. In light of these challenges for better GVC coordination and technology diffusion, policymakers must align their digital and green strategies, develop necessary digital competencies, and deepen international cooperation to overcome the ongoing and future transition challenges.[10]

The strategic responses vary from country to country due to the highly contextual nature of factors such as industrialisation levels, digital infrastructure, technological and productive capacities, and involvement in GVCs. This makes it more important for the G20 to take a proactive stance in supporting and forging partnerships with the latecomers to enable them to capitalise on the transition opportunities. This will ensure that these countries are not left behind, while also promoting global development as a whole.

Recommendations to the G20

3

Aligning digital and green strategies

Many developing economies have national strategies in place for frontier technologies, but those strategies often do not coordinate with interventions in the environmental and energy sectors. For example, footwear manufacturers in Bangladesh have shown little motivation to adopt green technologies due to the absence of environmental regulations and a general lack of environmental awareness.[11] Without such coordination, firms often see environmental upgrading mainly as an additional cost and are less motivated to adopt green technologies. If the coordination on costs and awareness-raising are not well-managed, firms in latecomer markets may eventually be squeezed out due to their reluctance to pay for these expenses.

Twin transitions for GVCs depend on the conditions on which trade takes place. To promote environmental awareness and encourage the adoption of greener production processes with the help of digital technologies, trade and industrial policies of the G20 and its trading partners should be integrated into the regulations governing the energy–environmental, industrial, and foreign investment spheres, thereby ensuring consistent incentive systems for twin transitions.

Developing digital competencies

Industry 4.0 technologies have the potential to revolutionise production processes. For example, sensors in harvesting equipment reduce illegal logging and fishing by collecting and transmitting real-time biodiversity data for monitoring.[12] Global positioning system (GPS) data improves vessel speed tracking and ensures low carbon emissions.[13] 3D-printing has been shown to reduce the weight of aircraft parts and with an estimated six percent drop in fuel consumption.[14] AI aids in energy optimisation[15] and blockchain technology can provide authentic product information while reducing product recalls.[16] This reiterates the intertwined relationship of digital and green transitions.

As noted earlier, the widespread presence of weak preconditions or capacities in developing economies may hinder the technological benefits and twin transitions mentioned above. Weak preconditions include technological inequalities and divide, inadequate

information and communication technology (ICT) infrastructures, and limited digital skills.

Building stronger ICT infrastructure to provide access to high-speed internet connection and stable electricity at an affordable cost is crucial to meet the requirements of Industry 4.0. Meanwhile, investment in grid infrastructure could promote the connectiveness of renewable energy systems. Governments should also work to bridge the connectivity gap between small and large firms, as well as between urban and rural regions.

Along with the ICT infrastructure building, standards and regulations should be implemented as soon as possible. International standards foster interoperability, enhance productivity, and stimulate innovation. For instance, international standards published by the International Telecommunication Union offer free guidelines to address the environmental efficiency of Industry 4.0 technologies.[17] Drafting domestic regulations based on international standards assists firms in better integrating into the international trade network and reduces potential political concerns regarding security and privacy issues.

In addition, it is important to support human capital accumulation on relevant topics because it requires the current worker to know, adapt, and create new technologies.[18] As previously noted, new technologies, including Industry 4.0 and green technologies, are often originated in advanced economies, making it essential for developing countries to possess the capacity to modify and tailor these technologies for domestic use. To facilitate this, governments must offer support to businesses, including small and medium-sized enterprises (SMEs), to aid them in building their digital skills in areas such as market research, product development, sourcing, production, sales, and after-sales services. One potential area of focus for labour upgrading efforts could be women employed in informal and artisanal small and micro-enterprises, particularly those who are entrepreneurs. Building skill development centres and providing scholarships could be viable strategies for upgrading labour skill levels without causing displacement of low-skilled workers and brain drain.

Enabling greater financial access and more international partnerships

UNCTAD has also highlighted limited funding and insufficient international cooperation directed to the twin transitions as major obstacles to adopting digital technology.[19]

Financial resources from local and multilateral development banks and international donors should be directed to support research and development (R&D) programmes in Industry 4.0 and green technologies to accelerate twin transitions. Developing economies such as Malaysia, Peru, and Türkiye, in partnership with global donors or multinational development banks, have created funds dedicated to innovation and technology.[20] Nonetheless, small companies might find it difficult to obtain sufficient funds for necessary technology adoption. SMEs in India have struggled to invest in essential technologies in the automotive, metals and machinery, food, textile, and electrical equipment industries.[21]

The provision of financial support is crucial not only to alleviate concerns regarding additional investments required for transitioning to green practices, but also for infrastructure development and knowledge dissemination. As evidenced above, it is imperative for the G20 to take a proactive role in establishing and engaging in international collaborations, not only to enhance financial access, but also to address the challenge of slow adoption in the latecomer economies. The gaps in current technology adoption and R&D investments are widening between developed and developing economies. In the high-income economies, R&D expenditure as a percentage of GDP has been increasing in the past decade, reaching at around 3 percent in 2020. In contrast, R&D expenditure in developing countries is far lower, with an average of around 0.5 percent for the lower middle-income countries[22].

Given the widening North–South divide in technology and innovations, stronger efforts are needed to support the development of local innovation capabilities and the acquisition of necessary technologies through equitable partnerships. Incumbents and latecomers will mutually benefit from better participation in international projects and cooperation. Collaborative efforts can improve access to green technologies for climate change

mitigation and adaptation, as well as human resource development, leading to the growth of local capacity.

Prospecta Americas is an ongoing instance of a regional initiative designed to advance members' understanding and implementation of cutting-edge technologies such as big data, AI, the Internet of Things, robotics, and blockchain. It seeks to evaluate the potential impact of these technologies on the economic, social, and environmental development of the region, as well as to provide training and capacity building to ensure that these technologies are used effectively and responsibly in member states of the Organization of American States.[23] The UN Development Programme also supports projects aimed at building cross-sectoral ecosystems of partnerships across governments, companies, and non-governmental organisations. In collaboration with the Enterprise Incubator Foundation and the Innovative Solutions and Technologies Center Foundation, the ImpactAim Venture Accelerator project in Armenia is currently supporting 33 startups in Armenia, two in Belarus, and one in the Philippines.[24] These projects offer successful models of multilateral cooperation for twin transitions at the regional and international levels. By participating in international projects, latecomers receive external support, while the developed economies help achieve the sustainable development goals for the entire globe in the long term.

The twin transitions of green and digital transformation present a significant opportunity for developing economies to upgrade production and for the world to achieve sustainable development. These two transitions are becoming more and more interconnected and should be treated in tandem at both domestic and international levels to achieve optimal benefits. To ensure the transitions are effective, equitable and inclusive, policymakers around the world must align the digital and green strategies, provide support to improve digital competencies, as well as strengthen financial support and international cooperation.

Attribution: Shamika N. Sirimanne, "Twin Transitions for Global Value Chains: The Digital and Green Transformations," *T20 Policy Brief*, July 2023.

Endnotes

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