Digital transformation, COVID-19, and the future of work

Schilirò, Daniele

Department of Economics, University of Messina

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Daniele Schilirò
Department of Economics
University of Messina
dschiliro@unime.it

ABSTRACT

The COVID-19 pandemic has caused an acceleration of digital transformation, forcing countries and organizations around the world to make big changes in people's lives. This paper analyses the diffusion of the digital economy and highlights the capabilities and readiness of economies to undertake the process of digital transformation. It also points out that the digital transformation is profoundly changing the global economy and society, not necessarily benefiting everyone. The challenge is to avoid the risk that the new digital system creates a more "restricted" economic and social environment, with the digital divide affecting many people across the world. The study also explores the implications of both digitization and digital technologies on the labor market and future jobs. COVID-19 and digital transformation have overturned assumptions about how individuals work by demanding new tasks and skills from employees. The paper emphasizes that any process of automation involves substituting machines for labor and leads to the displacement of workers, although there are counterbalancing forces. At the same time, digital transformation and its processes offer opportunities to create new tasks and new professional figures. However, the key to success for a fair and inclusive digital transformation lies in the joint efforts of state, business, and people.

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Keywords: digital transformation, digital technologies, COVID-19, digital divide, smart working, job displacement, future jobs

JEL Classification: O33, J2, J24, M53, M54

INTRODUCTION

The COVID-19 pandemic has caused a massive acceleration of the digital transformation process. Because of this accelerated digital transformation, economies around the world are experiencing a strong shift in businesses, consumers, investments, trade, and government activities. In the new digital environment, digital technologies (e.g., cloud computing, artificial intelligence, smartphones, mobile apps, etc.) are transforming the service sector, as in the emblematic case of fintech, as well as manufacturing. Industry 4.0 has become the most comprehensive change of the whole sphere of industrial production through the merging of digital technology and the Internet with conventional industry. Although digital transformation offers new opportunities, it poses many challenges, especially in the labor market, as digital technologies require new skills and competencies that also change how and where people work. Moreover, the implementation of digital technologies imposes business models that are unable to support equity and inclusion.

The implications of digital transformation and the COVID-19 pandemic on the quantity and quality of jobs is one of the central topics of this paper. The study first examines the impact of COVID-19 and the expansion of digital economy. Second, it analyzes the spread of digital economy. Third, the contribution focuses on the implications of digital transformation on work, considering the issues of the upsurge of remote working, job displacement, and related future jobs. Discussion and conclusions are presented at the end of the paper.

THE IMPACT OF COVID-19 AND THE EXPANSION OF THE DIGITAL ECONOMY

The COVID-19 pandemic has created health and economic shocks with severe economic and social consequences. The effects of the pandemic have been uneven among countries and across sectors. This crisis has a strong sector-shock connotation, unlike previous global crises. Thus,[1] some sectors, such as the emblematic case of tourism, have been affected regardless of the productivity of businesses. Simultaneously, the pandemic has accelerated the digital transformation of economies, which has caused a strong shift in businesses, consumers, investments, trade, and government activities. It has also changed the modalities of economic and trade relations between countries, strengthening the phenomenon of digital globalization (Schilirò, 2020, p. 1711).

The digital economy includes all of those economic processes, transactions, interactions, and activities that are based on digital technologies. As highlighted by Schwab and Zahidi (2020), "With the outbreak of the COVID-19 pandemic the expansion of the digital economy has further accelerated in both advanced and emerging economies" (p.14). Most of the current changes due to the pandemic are major transformations impacting the structure of the economy and the market. The positive interaction between digital innovation and digital transformation has become a fundamental driver of new business models and markets. The main drivers of this digital transformation can be identified in the digitization of processes enabling enhanced possibilities of processing, storage, and communication of information. Also, the adoption of digitally enabled machines using artificial intelligence (AI) and, the use of digital networks to coordinate economic transactions with algorithms through platforms are parts of these processes (Warhurst & Hunt, 2019).

Digital transformation and innovation in digitization are made possible by digital technologies and are boosted by consumers' and investors' expectations, as well as by prospects of greater economic and social benefits. Successful digital transformation comes not only from implementing new technologies but also from transforming organizations to take advantage of the possibilities that new technologies provide, and requires digital resources. Major digital transformation initiatives are centered on re-envisioning customer experience, operational processes, and business models (Kohli & Melville, 2019; Verhoef, Broekhuizen, et al., 2021). Moreover, digital technologies hold the potential to strengthen the science and research systems that are proving critical to countries' COVID-19 responses and recoveries (Organisation for Economic Co-operation and Development [OECD], 2020). The pandemic has affected some sectors more than others and led to strong asymmetries that last over time, accelerating a series of transformations. These transformations concern technologies and new lifestyle behaviors rather than short-term trends. Smart working and automation of production processes are important and obvious examples of these changes that will last over time. However, the new digital economy requires significant infrastructure upgrades and appropriate regulatory frameworks.

Furthermore, the impact of COVID-19 influences the development and competitiveness of countries and businesses. The competitiveness of a country depends, according to Porter et al. (2000), on its economic structure and institutions and by the policy that promotes long-term growth within the context of the global economy. Porter's concept of competitiveness focuses on prosperity created from economic activity, where productivity is the linchpin of Porter's idea of competitiveness (Porter, 2004). Then, competitiveness depends on innovation and the ability to harness advanced technologies, managing the resources and developing the proper competencies. Yet, the real key to the digital transformation is people. The COVID-19 pandemic, with its economic challenges—the evolution of technology, the digital transformation, and the climate change issue—has highlighted what is relevant: people, community, and society. Today, the focus has shifted from resources to people. Human health and well-being, justice and fairness, skills and jobs, easy access to digital technology, and the digital divide are the most discussed and felt current issues among the leaders of companies, private and public institutions, governments, and among citizens.

Digital technologies enhance connectivity, financial inclusion, and access to trade and public services. They also impact manufacturing processes. Mobile, blockchain, AI/machine learning, cloud computing, big data, Internet of Things (IoT), robotics, digital twin, and advanced reality are among the most significant digital technologies. Such technologies are changing how business is conducted, how the public sector provides services, and how people are communicating. Thus, operational efficiency and information gathering are improved.

[1] However, the digital economy can also be defined as the part of economic output derived solely or primarily from digital technologies with a business model based on digital goods or services. Thus, it consists of the digital sector plus emerging digital and platform services.

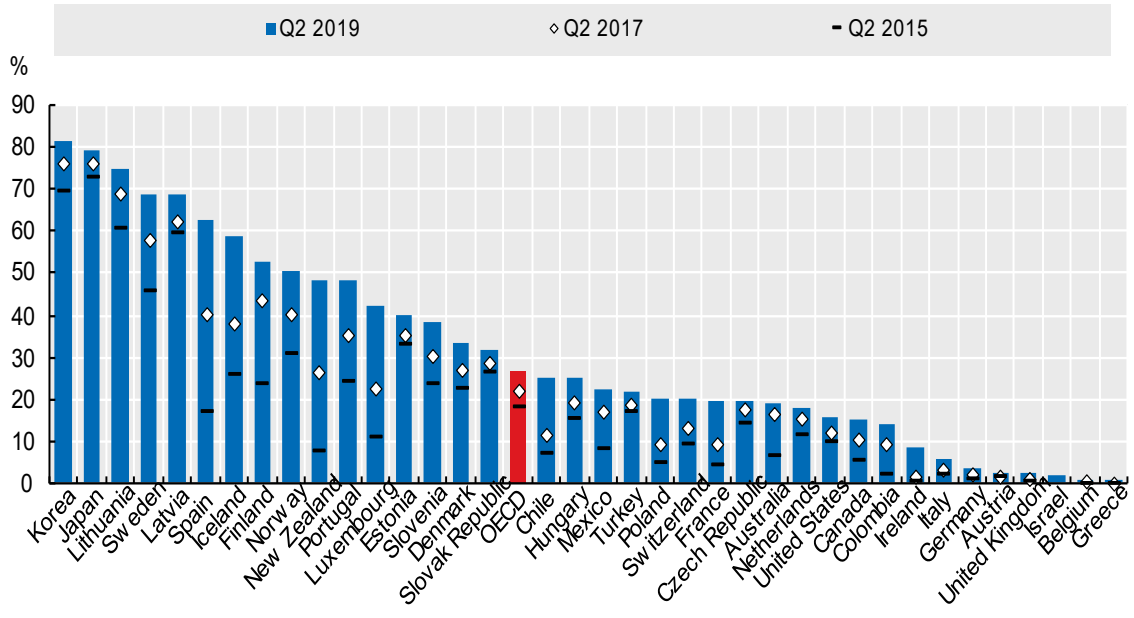
As highlighted in Schilirò (2020), digitization, with AI and the use of IoT, characterizes the fourth industrial revolution. This, in turn, involves the affirmation of Industry 4.0, namely, a paradigm shift from a centralized production model to a decentralized, intelligent, and connected production model. Industry 4.0, through the merging of digital technology and the Internet with conventional industry, alters how companies operate, as well as the relationship between suppliers, customers, and other third parties. Fitzgerald et al. (2013) warned that, particularly in the private sector, the digital transformation is no longer an option, but it is imperative for every company—large, medium, or small. Companies should be able to radically transform their models and processes in a path that involves making substantial changes in terms of technology, culture, operations, and value generation. A business environment that is changing so dramatically and rapidly requires innovation, speed, and the ability to scale. Today the digital transformation will be more important than ever for any organization. In particular, businesses should implement strategies for digital initiatives. A culture change is needed, but it represents the hardest part of digital transformation. Furthermore, in the public sector, the digital revolution creates significant opportunities for all levels of government to improve the delivery of public goods and services and to raise more and better revenue (Schilirò, 2020).

THE SPREAD OF THE DIGITAL ECONOMY

The COVID-19 pandemic has boosted the diffusion of the digital economy across countries. Students and employees started attending virtual classes and working remotely from home, respectively, while companies have adopted digital business models to maintain operations. However, as the report by UNCTAD (2019) observes, measuring the digital economy and related value creation is difficult. First, there is no widely accepted definition of the digital economy. Second, there is a lack of reliable statistics, especially in developing countries. Thus, depending on the definition, estimates of the size of the digital economy range from 4.5% to 15.5% of world GDP. Additionally, the report highlights that, geographically, the digital economy is highly concentrated in two countries: the United States and China. For instance, these two countries control 75% of all patents related to blockchain technologies, more than 75% of the cloud-computing market, and 90% of the market capitalization value of the world's 70 largest digital platforms (UNCTAD, 2019, p. 2).

The OECD (2020) highlights that COVID-19 has raised the stakes around digital access and engagement, reinforcing the fact that connectivity and the use of digital technologies are becoming basic needs. Accordingly, connectivity has continued to improve in recent years (OECD, 2020). Thus, during the pandemic, the high level of connectivity enabled many businesses and households to transition online. This is illustrated in Figure 1, which shows the fiber broadband connections as a percentage of total fixed broadband subscriptions in OECD countries through June 2019.

Figure 1. Fiber broadband connections as a percentage of total fixed broadband subscriptions, through June 2019



Source: OECD (2020).

As shown in Figure 1, fiber connections accounted for an average of 27% of all fixed broadband connections in OECD countries (red bar) and no less than 50% in nine OECD countries.[2] In addition, the average share of daily Internet users aged 16–24 was close to 95%, while among those aged 50–74, it was 58%. The report by OECD (2020) also highlights the uneven digital diffusion among businesses, sectors, and countries. The use of big data is an example of these differences among firms and countries and has important implications for their productivity and performance. Furthermore, an important factor in this divide is the skills gaps among workers that may inhibit a wider range of firms from fully leveraging the potential of digital technologies.

The IMD World Digital Competitiveness Ranking[3] assesses the capabilities and readiness of economies to undertake the process of digital transformation and encompasses organizational, institutional, and structural elements (technological innovation and sector changes). Table 1 shows the world ranking of digital competitiveness of the top ten countries in 2020, as reported by the IMD World Competitiveness Center (2020). The countries ranking from 11 to 15 are: Taiwan (China), Canada, the United Kingdom, the UAE, and Australia, respectively.

Table 1. Digital competitiveness ranking 2020 Top 10. Overall and factors ranking

Overall Rank		**Knowledge**	**Technology**	**Future Readiness**
1	**USA**	**1**	**7**	**2**
2	**Singapore**	**2**	**1**	**12**
3	**Denmark**	**6**	**9**	**1**
4	**Sweden**	**4**	**6**	**7**
5	**Hong Kong SAR**	**7**	**2**	**10**
6	**Switzerland**	**3**	**11**	**5**
7	**Netherlands**	**14**	**8**	**4**
8	**Korea Rep.**	**10**	**12**	**3**
9	**Norway**	**16**	**3**	**6**
10	**Finland**	**15**	**10**	**9**

Source: IMD World Competitiveness Center, 2020

[2] Fiber subscription data include fiber-to-the-home, fiber-to-the-premises, and fiber-to-the-building, and exclude fiber-to-the-cabinet and fiber-to-the-node.

[3] Digital competitiveness is defined as the capacity of an economy to adopt and explore digital technologies leading to the transformation in government practices, business models, and society in general.

The IMD ranking captures the process of digital transformation through three factors: knowledge, technology, and future readiness. Knowledge refers to the necessary infrastructure, which underlies the process of digital transformation through the discovery, understanding, and learning of new technologies. Technology assesses the overall context through which the development of digital technologies is enabled. Future readiness examines the level of preparedness of an economy to assume its digital transformation.

The 2020 report (IMD World Competitiveness Center, 2020) highlights that, in 2020, the US ranked first, Singapore ranked second, and Denmark was third. These countries excel in one or more of the three factors, or in some of the sub-factors listed by the IMD World Competitiveness Center (2020). The US held the top spot for three years, and their performance is largely driven by the knowledge and future readiness factors. It is sustained by factors related to scientific concentration (e.g., percentage of scientific and technical employment and the use of robots in education and R&D), capital (e.g., availability of venture capital), adaptive attitudes (e.g., e-participation), and business agility (e.g., the percentage share of world robots). Singapore's strength depends on its performance in the knowledge and technology factors. In particular, the nation tops the rankings in talent and in the regulatory and technological frameworks. Denmark exceeds in the future readiness factor. In the latter, it ranks first in IT integration, second in adaptive attitudes, and fifth in business agility. It is also first in attitudes toward globalization and e-government, and third in knowledge transfer between companies and universities.

The main indication of the IMD classification is that digital technologies remain at the core of strengthening the competitiveness of an economy. The role of knowledge generation and talent development in combination with effective regulation and infrastructure, in particular, continue to drive digital competitiveness. In addition, the flexibility and adaptability of organizations and individuals are key in sustaining the digital progress of countries, especially in the current pandemic context.

Among the industries that perform better in digital customer interaction, telecommunications has always been the industry that leads the digital transformation process of a country, providing other industries with infrastructure and services. Of course, large online retailers, such as Amazon and Mercado Libre (the latter especially in Latin America), play a major role, as they set new standards, facilitate customer interaction, and increase customer expectations. Retail banking is another big industry that is quickly evolving to digital since customers are asking for access to information at any time and in any place.

IMPLICATIONS OF DIGITAL TRANSFORMATION FOR WORK

Digitization and related digital technologies have a strong impact on the quantity, nature, and quality of jobs around the world. COVID-19 has further transformed the approach to the concept of work and pushed society and businesses into a whole new reality. An important aspect of digitization that disruptively emerged during the pandemic is remote working. This and other issues related to the impact of digitization and digital technologies on work and employment are analyzed in this section.

The interplay of digitization and digital technologies has accelerated many changes in manufacturing and service processes, offering a response to the health emergency during the COVID-19 pandemic while also creating new professionals. In turn, the pandemic has forced a new virtual work reality on businesses and people. With the rise of numerous virtual markets due to the emergence of huge online platforms, a large gap has been created between the real and the digital economy, and the pandemic has widened it. Indeed, digital transformation can offer opportunity and inclusion, but there are many challenges since digital technologies often determine business models that have proven incapable of supporting equity and inclusion. The digital transformation, which facilitates the creation of wealth, is shaping the new industrial complex that is profoundly changing the economy and society, not necessarily benefiting everyone. The new digital system risks creating a more "restricted" economic and social environment, with the digital divide affecting many people across the world who are excluded by the use of digital technologies (Schilirò, 2020). Moreover, such an environment is changing the face of the labor market with the request for new skills and the updating of existing ones and the danger of technological unemployment. In this sense, there is a growing gap between workers with the highest qualifications who increase their employability and income conditions relative to those employed in jobs with a low level of technological knowledge. Moreover, we are witnessing the emergence of new professions and new markets characterized by the absence of regulation capable of guaranteeing adequate rights and protections, and the proper enhancement of work. Furthermore, the new digital system tends to impose rents on real-economy actors whose day-to-day operations depend on technology, undermining the very efficiency of the market. Therefore, the digital technological system is not inherently inclusive, and the market alone will not fix the problem. Yet, institutions can make the difference (Acemoglu et al., 2005; Schilirò, 2012). They can be shaped to promote economic inclusion, ensuring that virtually everyone has access to digital infrastructure,

balancing the risk of economic and social disparities. It follows that the active role of governments and economic and social policies can make opportunities outweigh the risks and are central in this new environment.

The Upsurge of Remote Working

The COVID-19 pandemic has accelerated the levels of digitization to help reduce avoidable physical interactions. As the World Economic Forum (2020) highlights, the day-to-day digitization with a surge in work-from-home arrangements and a new marketplace for remote work was gaining ground before the crisis due to the growth of digital technologies and the related forces of the Fourth Industrial Revolution. However, the pandemic has shown that working remotely is here to stay (Agrawal et al., 2020). Thus, a large-scale shift to remote work, e-commerce, and other forms of social digital connection has been established.

Furthermore, beyond the health emergency imposed by COVID-19, several large groups, following the example of Microsoft, have planned to adopt a "hybrid" system, allowing employees to combine remote work and face-to-face work. Of course, there are companies, such as Twitter, that required their employees to work from home. On the other hand, companies, as in the cases of JP Morgan and Goldman Sachs, are trying to return to in-person work for all employees, or at least to make it more prevalent, limiting the use of remote work.

The World Economic Forum (2020) reveals that, among 15 industry sectors across 26 advanced and emerging countries, 84% of employers aim to rapidly digitalize working processes, including a significant expansion of remote work, with the potential to move more than 40% of their workforce to operating remotely. Lund et al. (2020) find that the potential for remote work is concentrated among highly skilled, highly educated workers in a handful of industries, occupations, and locations. They estimate that

> more than 20 percent of the workforce could work remotely three to five days a week as effectively as they could if working from an office. If remote work took hold at that level, that would mean three to four times as many people working from home than before the pandemic and would have a profound impact on urban economies, transportation, and consumer spending, among other things. (Lund et al., 2020, p. 1)

Furthermore, the US Bureau of Labor Statistics (2021) estimates that, in a possible "moderate"-impact scenario in the United States, the increased smart working is a primary force of economic change and has both direct and spillover effects. With more employees working remotely, the need for office space will decline, and so will nonresidential construction. In addition, there will be lower spending for employee trips to offices, including commuting costs, business travel, and lunchtime restaurant spending. Lund et al. (2020) find that sectors such as finance and insurance, management, professional, scientific and technical services, and IT and telecommunications have the highest potential for remote work, while education, wholesale trade, real estate, government and administrative support, and utilities have lower but significant potential.

During the pandemic, organizations have realized that the physical presence of employees on the employer's premises does not necessarily have a direct link with their productivity. On the contrary, digitization and automation have the potential to raise productivity, and remote working is part of this transformative process. Warhurst and Hunt (2019) argue that the digital transformation enabled by rapid technological innovation has the potential of enhancing human productivity, making the production of goods and services more efficient and more productive, also underlining that the productivity gains will vary across sectors. However, to achieve productivity gains, companies are required to engage more in the dissemination of digital skills, hire the right talents, and create a collaborative environment that involves people more. Essentially, companies must commit to improving their solutions regarding smart working.

Although, remote working and smart working are not synonymous,[4] these methods of working require a change of processes, tools, and people's mentality. Culture change is the hardest part of digital transformation. Relying on smart working is a matter of shaping people and systems. The new working style that characterizes an increasingly digital economy requires new tasks and skills. In this "distance economy," science, technology, engineering, and mathematics skills and knowledge are very important. The transition of a company into smart working must be created specifically with internal resources that are compatible and have a specific approach.

[4] Working remotely means doing exactly the work done in the office but away from the premises; smart working, on the other hand, requires a transformation of the company's structure and organization.

Engagement, well-being, and flexibility become the three keywords to reflect on to redesign the new models of work organization, putting people at the center.

The COVID-19 pandemic has sharpened the rift between insiders and outsiders in the labor market, as many individuals do not have adequate digital skills. By moving to smart working, those who already had a well-defined network and digital skills were given an advantage. There has been a polarization that, in many cases, has disadvantaged some categories of people. In particular, individuals with lower education levels, women, and people who are economically fragile have been heavily penalized, deepening existing inequalities. These digital skills gaps affect not only companies, causing low productivity and hindering their ability to penetrate markets, but also society in exploiting the potential of digitization and in providing digital services. Smart working and the underlying digital issue will no longer be just a theme of work–life balance, but require a necessary rethinking of the relationship between people and work, and between the state, businesses, and people.

businesses, and people.

Job Displacement and Future Jobs

The impact of the COVID-19 pandemic coupled with the ongoing digital technologies and automation processes is transforming tasks, jobs, and skills in economic systems for years to come. The OECD (2019) highlights that digitization is driving the next decade of workplace transformation, with 32% of jobs potentially being radically transformed as a result of automation and the development of AI.

The first implication of digitization concerns job displacement. The technology that enables digitization can substitute work so that there will be some jobs lost. Muro, Maxim, and Whiton (2019) argue that, in general, all occupations will be affected, though routine jobs are most at risk. In their view, apart from some job losses, the most realistic and scenario in the future is that some jobs will be saved, many will be reconfigured, and new jobs will be created. The World Economic Forum (2020), in its survey across 15 industry sectors, indicates that 43% of businesses aim to reduce their workforce by 2025 due to technology integration, while 34% plan to expand their workforce for the same reason. At the same time, the report shows that companies' workforce strategies aim to internally redeploy the workers displaced by technological evolution up to nearly 50%, since an employee is a resource that is not easily replaceable, instead of making wider use of layoffs. The report also estimates that, by 2025, in the 26 advanced and emerging countries considered, 85 million jobs may be displaced by a shift in the division of labor between humans and machines, while 97 million new roles may emerge that are more adapted to the new division of labor between humans, machines, and algorithms.

Acemoglu and Restrepo (2019) suggest a theoretical framework with an approach based on tasks, where the central unit of production is a single job. They conceptualize automation as "an expansion in the set of tasks that can be produced with capital" (p. 202). Their framework starts from the idea that technologies, such as AI and robotics, replace workers in tasks that the employees previously performed by creating a powerful *displacement effect*. This effect could reduce the demand for labor, wages, and employment. However, these authors recognize the existence of some countervailing forces that push against the displacement effect. The first is the *productivity effect*, where automated tasks are determined by the substitution of cheaper machines for human labor that tends to increase the demand for labor in non-automated tasks.[5] The second is the *capital accumulation effect*, triggered by increased automation, which raises the demand for capital and also raises the demand for labor. The third is the *deepening of the automation effect* that tends to create a productivity effect but no displacement, increasing labor demand. This last effect happens because automation operates at the intensive margin, "increasing the productivity of machines in tasks that have already been automated" (Acemoglu & Restrepo, 2019, p. 198).

In their view, while important, these first-order countervailing effects are generally insufficient to increase employment and create new jobs. Thus, Acemoglu and Restrepo (2019) argue that a more powerful countervailing force that increases the demand for labor and possibly employment is the creation of new tasks, functions, and activities in which labor has a comparative advantage relative to machines. The creation of new tasks generates a *reinstatement effect*, directly counterbalancing the displacement effect. The speed and nature of the creation of new tasks depend on the decisions of firms, workers, and other actors in society, and might be fueled by new automation technologies. According to Acemoglu and Restrepo (2019, p. 206),

[5] Acemoglu and Restrepo (2019, p. 199) also consider that drag on productivity growth comes from excessive automation, which would explain why productivity growth has been disappointing over the last several decades.

automation would be able to create new tasks endogenously, as in the case of AI. In fact, AI can serve as a platform to create new tasks, in particular, the creation of new labor-intensive tasks in many service industries. Yet, they warn that the adjustment of an economy prone to rapidly developing automation technologies could be slow and painful. Apart from the problems caused by the costly process of reallocating workers to new sectors and tasks, the time-consuming search, and the need to retrain some of the workers, Acemoglu and Restrepo underline that the more critical factor is a potential mismatch between the new skills, required by the new tasks, and new technologies. This is especially true when the education sector does not keep up with the demand for the new skills. They also show that such a mismatch slows the adjustment of labor demand, contributes to inequality, and reduces the productivity gains from both automation and the introduction of new tasks. According to Acemoglu and Restrepo (2019, p. 228), the choice of empowering AI in the uses in which it may complement labor more and generate opportunities for new tasks is the right one. Therefore, support for academic and applied research and social factors on the path of developing AI is critical. However, it is also necessary to design new and improved institutions for creating more broadly shared gains from the new technologies.

The second implication of digitization concerns the occupational composition and the skill profiles of the occupations. Warhurst and Hunt (2019) point out that occupation composition and skill profiles tend to change as humans interact with new technologies. Moreover, in their view, the presence of a large supply of unskilled labor acts as a transmission channel for the impact of technology on inequality. Therefore, the issue of digital skills represents a major emergency and is one of the high-priority challenges for increasing the competitiveness of economies and firms and tackling inequalities. PWC (2020) underlines the importance of skills and talent for organizations. Upskilling—ranging from digital literacy to critical thinking—will be of the essence. It requires both an individual and an organizational commitment to creating a culture of learning in the workforce. Thus, learning is also key, as digital and human skills will be in high demand even more in the future. Furthermore, PWC (2020) suggests a flexible business strategy for organizations, as flexibility and agile work help to increase productivity and work–life balance. Organizations have an urgent need to reconfigure the traditional office and strengthen remote working skills.

While it is difficult to predict what new jobs will emerge in the future, it is almost certain that new skill profiles will be in demand. Several empirical studies document that a high percentage of key skills required to carry out existing jobs will change by 2022 and, in the next 20 years, 90% of jobs will require digital skills. Furthermore, technological changes are usually associated with a higher demand for skilled workers since mastering new and more complex technologies requires a higher level of training and education. The World Economic Forum (2020) also agrees on this aspect and highlights that the employers expect a significant (13.5%) growth in emerging professions by 2025.

Regarding how different jobs are affected, the most accredited hypothesis in the literature (e.g., Warhurst & Hunt, 2019) is that jobs of a routine nature are the ones most likely to be replaced with new digital technologies. Instead, non-routine jobs that require complex tasks serve as complements to these technologies. The World Economic Forum (2020) detects that the top skills that employers see as emerging through 2025 include problem-solving, critical thinking, and analysis. The study also points out that the diffusion of remote working requires skills in self-management, such as active learning, resilience, stress tolerance, and flexibility. In addition, for those workers remaining in their roles, the share of core skills that will change by 2025 is 40%, while 50% of all employees will need reskilling.

Although digital technologies will tend to create new jobs, at least in the long run, their uneven distribution among people is almost certain. The problematic aspect is that there will be significant variation across demographic and geographic lines (e.g., areas, regions, and countries). The labor market is becoming increasingly dual and polarized. On the one hand, there exist high-education, specialized, and high-wage jobs (e.g., data scientists, app developers, IT security specialists, engineers, marketing managers, doctors, etc.). On the other hand, there are many low-skill, low-education jobs (e.g., cleaning, home health work, food service, etc.). However, employment is shrinking in many middle-education, middle-wage jobs (e.g., blue-collar production, white-collar clerical with routine tasks, etc.). All of these changes that are underway will fuel further severe economic and social problems unless they are managed proactively by governments and cooperatively at the international level.

DISCUSSION AND CONCLUSIONS

COVID-19 has accelerated the digital transition, and the use of digital technologies has become indispensable to guarantee the continuity of work, private, and social life. The pandemic has influenced labor demand, occupations, and workforce-skill needs. However, not everyone has been affected in the same way across the

economies by these disruptive causes. Thus, the digital transformation poses challenges. The most evident are the creation of a digital divide and the lack of inclusion. Currently, almost half of the world's population has no access to the Internet, which causes numerous young people, in particular, to miss out on opportunities. However, to tackle the challenges of digital transformation and harness the potential of digital technologies, governments must be able to formulate a comprehensive digital strategy concerning people, companies, and society. The goal is to ensure that the digital revolution benefits the many, not just a few. Then, public intervention from the government must necessarily develop digital skills, and make available adequate infrastructures and targeted solutions. Thus, governments must find solutions for those who are displaced or negatively affected by the new disrupting technologies. For instance, they could use grants and subsidies to promote the access and diffusion of digital technologies. Public authorities can provide or incentivize digital education for disadvantaged people and less-well-off citizens. At the same time, companies should collaborate with governments to both build up skills needed by the market and provide opportunities and new kinds of jobs for people displaced or negatively affected by digital technologies. More generally, governments should invest more in education, build up the necessary digital skills required by companies, and implement policies to improve the quality of human capital. After all, digitization produces tangible benefits for people first, but also for companies. Yet, skilled jobs can only be created through a dialogue between governments and businesses—which represent the demand side—and higher-education institutions—that deliver education. In addition, governments should consider introducing tax incentives for digital initiatives that demonstrably narrow the opportunity gap. They should adopt measures to close the technology gap between platforms and companies, particularly small and medium-sized enterprises. Another possible policy is to adopt digital tariffs to foster local innovation ecosystems, although this has limited applicability.

Ultimately, public policy and digital technology should complement each other. For the digital space to remain open, competitive, and affordable, governments should issue appropriate laws and regulations, and enforce them. The key to success for an inclusive and effective digital transformation after the COVID-19 pandemic lies in the worldwide cooperation and joint efforts of governments, businesses, and people.

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