

3. The Future of Work in Sub-Saharan Africa

The current wave of technological advances is set to shake up the landscape for jobs within countries and across the world. Previous periods of technological change have led to higher living standards, but transition periods were marked by fears over the future of work as existing jobs were made obsolete and it took time for new and different jobs to arise. Today again, there are fears that the Fourth Industrial Revolution will be disruptive, as technology replaces workers, possibly leading to lower income shares and rising inequality.¹ While most countries are facing this wave of technological change at a time of declining working populations—and are keen to embrace the opportunity to sustain or increase output levels with fewer workers—the challenge for sub-Saharan Africa, where working populations continue to grow rapidly, is very different.

How can sub-Saharan Africa create the 20 million jobs per year needed over the next two decades to absorb its growing workforce?² The future of work will be shaped by global forces and their interaction with national and regional developments, raising challenges but also providing opportunities for the region. The main focus of the chapter is the question of how the current wave of technological innovation—the Fourth Industrial Revolution—will impact sub-Saharan Africa’s comparative advantage and the nature of work within countries in the region? At the same time, the course of global economic integration and the impact of climate change will shape economic opportunities and the future of work in sub-Saharan Africa.

Making policy decisions in the face of these powerful but highly uncertain trends can be challenging, particularly since many investment decisions and structural reforms have a long-term pay-off. What will the jobs of the future look like in sub-Saharan Africa? What skills do workers in

the region need? What infrastructure is critical for sub-Saharan Africa to succeed in the Fourth Industrial Revolution? The complexity of these questions requires thinking in alternative scenarios: “What if...?”

In this chapter, we use economic modeling and scenario analysis to glimpse into the future of work in sub-Saharan Africa. Scenario analysis sketches plausible futures that could happen to provide a framework to think through policy implications: What policies today will steer economies toward desired outcomes? What policies can reinforce positive developments and mitigate adverse ones? What policy challenges are likely to emerge in the future? Scenario analysis is not a forecast that makes a prediction about what the future will be. Rather, it is a tool for making strategic decisions today in light of an uncertain future.

The main findings are as follows:

- The future of work has already begun and matters for policymakers today. The Fourth Industrial Revolution is redefining how and where goods are produced. Some of these new technologies are easier to adopt and adapt, enabling sub-Saharan Africa to leap-frog infrastructure and create new growth sectors, particularly in services.
- There is considerable uncertainty over the impact of technology. Sub-Saharan Africa may be less exposed than advanced economies to automation replacing existing jobs directly given the differences in the structures of the economies and wage levels. However, technological progress that substitutes for low-skilled workers can lead to “reshoring” of production to advanced economies, making the traditional manufacturing led growth model

This chapter was prepared by Aidar Abdychev, Cristian Alonso, Emre Alper, Dominique Desruelle, Siddharth Kothari, Yun Liu, Mathilde Perinet, Sidra Rehman, Axel Schimmelfennig, and Preya Sharma.

¹ The Fourth Industrial Revolution is characterized by breakthroughs in artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.

² The United Nations projects a net increase in the working-age population (15–64 years) in sub-Saharan Africa of 20 million people on average over the next 20 years.

less viable. This requires an openness to adapt development strategies to the demands and prospects of the Fourth Industrial Revolution.

- While there are many uncertainties over what the future of work will look like, today’s policy choices can shape outcomes. Governments can facilitate and support the adjustment of economies and workers to the opportunities that are opening up.
- Integration and connectivity are the key pillars of successful growth policies. This includes traditional and digital infrastructure, an education system that keeps pace with changing skill requirements, smart urbanization, safety nets for a volatile labor market, and trade integration.

THE IMPACT OF TECHNOLOGICAL CHANGE: WILL MACHINES REPLACE WORKERS?

The current wave of technological innovations, characterized as the Fourth Industrial Revolution, has raised an overarching existential question (or fear): Will machines replace workers? Automation and the falling prices of capital goods shifts the balance of production toward capital and away from labor, particularly for more routine tasks. Artificial intelligence may take over high-skilled nonroutine jobs. This has reignited fears that technology will adversely impact jobs and incomes in all countries. Sub-Saharan Africa can be affected directly if automation takes hold in the region or indirectly via exports if automation leads to a reshoring of production to advanced economies and mature emerging market economies.

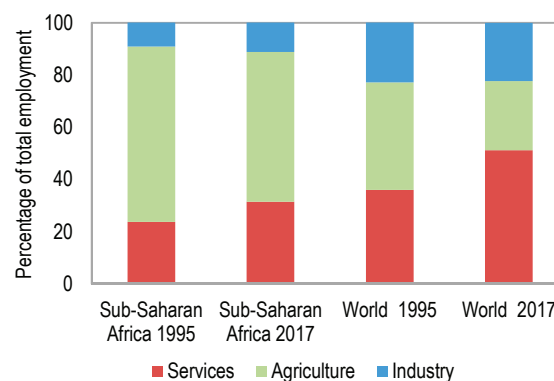
Historically, technological change yielded significant productivity gains and together with greater trade integration improved living conditions. In particular, the introduction of new “general-purpose technologies” has time and again fundamentally reshaped the way people work, and how goods and services are produced. The steam engine and electricity were the general-purpose technologies that fueled the first two Industrial Revolutions.³ These periods were marked by elevated uncertainty and fear about

dramatic changes in the type of jobs needed and skills required. As such, transition periods were marked by large-scale movements of the workforce across sectors and occupations, for example, from agriculture to manufacturing, and then to services in the case of advanced economies (IMF 2018a). However, once the transition was completed, economies had higher levels of productivity and income and the emergence of new activities created employment opportunities.

A comparable pattern may play out in today’s advanced and emerging market economies wherein some existing occupations decline or may even become obsolete, while others spring up. Workers need to make this transition, and as in the past, it may not be easy. There remains considerable uncertainty about which sectors and jobs will be disrupted in advanced economies, with estimates of job losses arising from artificial intelligence, machine learning and robots ranging from 7 percent to 47 percent of the labor force (see McKinsey Global Institute 2017; Frey and Osborne 2017; Nedelkoska and Quintini 2018; Borland and Coelli 2017).

For sub-Saharan Africa, the starting point is different and varies significantly across the region. Most countries do not have a well-established manufacturing sector that provides job security and incomes (Figure 3.1). Most employment is in agriculture and consumer services, often in the informal sector and characterized by income volatility. Infrastructure typically falls short of the needs of its growing economies. And, importantly,

Figure 3.1. Sectoral Shares in Total Employment, 1995 and 2017



Source: World Bank, World Development Indicators.

³ The Third Industrial Revolution captured information and communication technologies, particularly the rise of the internet.

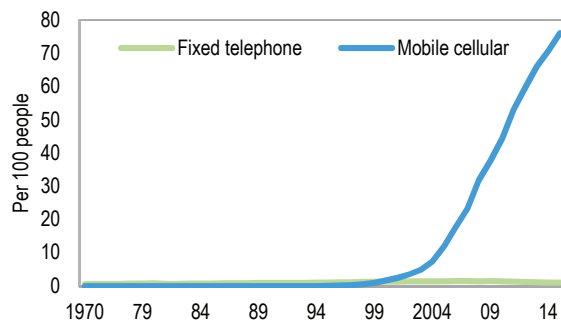
unlike advanced economies and some emerging market economies where the labor force is stabilizing or declining thus providing an incentive to automate, sub-Saharan Africa has a rapidly growing labor force.

Yet, even if the main impact is initially felt in the advanced and emerging market economies the proliferation of automation can also create strong headwinds for sub-Saharan Africa. It could lead to widespread reshoring of manufacturing activities to advanced economies, undermining traditional manufacturing-export led growth strategies. To integrate into global value chains, sub-Saharan African firms must meet global quality standards, and this may require increased automation.

While there is a strong focus on the risk of job losses to automation, some of the new technologies may be easier to adopt and adapt in sub-Saharan Africa. For example, the region has de facto leapfrogged fixed telephone lines and gone straight to mobile networks given their low fixed costs and limited infrastructure needs (Figure 3.2).

Examples of innovative technologies being used and improved across sub-Saharan Africa cut across sectors (Online Annex 3.1). In the agriculture sector, mobile phones and smartphones access timely information about the weather and market movements, advice on seeding, fertilizing and harvesting, or help identify and treat pest infestations. Drones overcome physical infrastructure gaps and deliver critical medical

Figure 3.2. Sub-Saharan Africa: Adoption of Connectivity Technologies, 1970–2014



Source: World Bank, World Development Indicators.

supplies to health centers in rural areas. A 3-D printer can “build” a house in a single day at low costs. Ghana is using GPS information to establish “addresses” where maps and street names or numbers are incomplete. South Africa uses biometric information and payment cards to deliver social grants. And, of course, mobile money, developed and introduced in Kenya, has provided access to financial services to millions of people who were previously excluded.⁴

Modeling the Impact of the Fourth Industrial Revolution

We turn to an economic model to illustrate the implications of the different possible natures of technological change for sub-Saharan Africa.⁵ The model divides the world into two regions that can trade with each other: an advanced economy region and a low-income region such as sub-Saharan Africa. In both regions, goods are produced using traditional capital, labor, and “robots,” with robots defined broadly to include the wide range of new technologies that constitute the Fourth Industrial Revolution, including automation, machine learning, and artificial intelligence. The two regions differ with respect to overall productivity, that is, how many goods can be produced with the same capital stock, workers, and robots. The advanced economy is more productive than sub-Saharan Africa which results in a gap in per capita incomes between the two regions.

In this setting, the nature of technological change determines whether sub-Saharan Africa achieves income convergence or is left behind. Specifically, the impact of the Fourth Industrial Revolution depends crucially on whether robots and labor are substitutes or complements. Robots would substitute for workers, for example, if an automobile factory introduces robots on its assembly line that install headlights, a task previously carried out manually by workers. On the other hand, the use of digital technology in agriculture, like an app that allows farmers to better treat pest infestation, is an example of robots (broadly defined) complementing workers. Of course, both developments can occur in parallel or sequentially.

⁴ Digitalization can also vastly improve fiscal policy by transforming the way governments design and implement policies (Gupta and others 2017).

⁵ The model is an extension of Berg, Buffie, and Zanna (2018) who study the impact of automation on an advanced economy. See Online Annex 3.2 for details.

The impact of the Fourth Industrial Revolution can be viewed as an increase in robot productivity. What happens in the model if the productivity of robots is doubled? To take advantage of this productivity shock, firms invest in robots and physical capital and increase production. As a result, both regions see an increase in per capita GDP in the long run. However, there are important differences, depending on whether robots substitute for or complement labor (Figures 3.3 and 3.4).

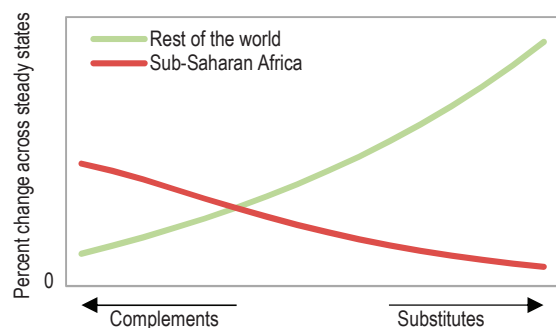
- If labor and robots are complements, the increase in per capita GDP is larger in sub-Saharan Africa than in the advanced economies, that is, there is convergence. Sub-Saharan Africa gains because it has lower wages and that makes it more profitable to invest in robots where they are combined with relatively cheap labor. As robots complement labor, the increase in wages is larger than the increase in the stock of capital, leading to a higher labor share in both regions, with the increase being larger for sub-Saharan Africa.
- If labor and robots are substitutes, the increase in per capita GDP is larger in the advanced economies than in sub-Saharan Africa, that is, the region falls further behind. In this case, introducing robots, and investing in complementary physical capital, is most profitable where wages are high because they save on the cost of employing workers. Given the stronger demand to invest in advanced economies, capital flows out of sub-Saharan Africa during the transition. Furthermore, as

robots easily replace workers, the capital and robot stock increases by more than wages, leading to a fall in labor share in both regions. However, the fall in labor share is larger in advanced economies (where it is more profitable to replace workers with robots), indicating that the higher growth in advanced economies is likely to be associated with higher inequality as well.

Historically, labor shares were broadly constant in advanced economies for decades despite large productivity gains, suggesting that technology complemented labor over the longer term. Labor shares in sub-Saharan Africa have also remained stable since the 1950s.⁶ However, many countries have seen labor shares decline since the 1980's, and part of the decrease has been associated with technological change (IMF 2017b).

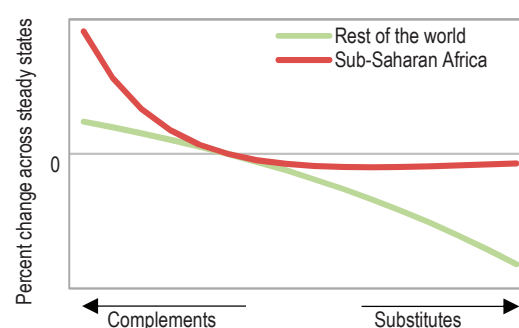
In addition to an increase in the productivity of robots, the model can also be used to investigate the impact of overall productivity increases. Introducing such overall productivity gains, the model suggests that the positive impact on incomes could be bigger than the impact of robots. Thus, even if automation holds back sub-Saharan Africa's convergence with the rest of the world, the region can more than offset this by realizing economy-wide productivity gains. The results highlight the importance of policies to improve infrastructure, education, access to finance, and the business environment which are all typically associated with increases in overall productivity.

Figure 3.3. Model Estimates for GDP per Capita



Source: IMF staff calculations.

Figure 3.4. Model Estimates for Labor Share



Source: IMF staff calculations.

⁶ Based on data available for 26 countries in sub-Saharan Africa from Penn World Tables 9.0.

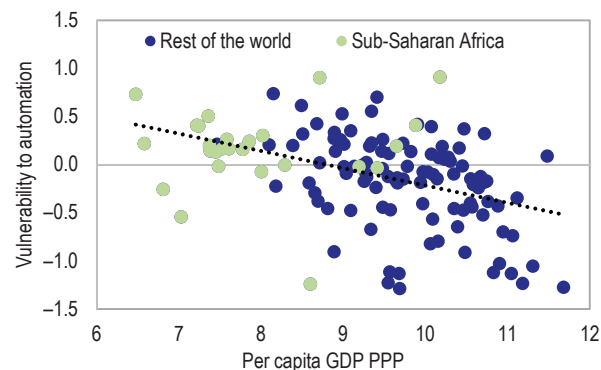
Impact of the Fourth Industrial Revolution on Exports from Sub-Saharan Africa

Assessing the region's vulnerability to automation in its export markets is an important channel through which sub-Saharan Africa could be impacted by the Fourth Industrial Revolution. Compared to advanced and emerging economies, sub-Saharan Africa may be less exposed to automation replacing existing jobs directly, given the differences in the structures of the economies, but also wage levels. Yet, the region may be affected indirectly via exports if automation replaces sub-Saharan Africa's position in value chains, makes it more difficult to enter value chains in the future, or shifts comparative advantage towards competitors.

Two indices are used to gauge the vulnerability of sub-Saharan Africa's exports to automation in advanced economies. The indices are based on different measures of the automatability of occupations that have been suggested in the literature by Frey and Osborne (2017) and Brynjolfsson, Mitchell, and Rock (2018). These indices are mapped to industries, and then to export goods to ascertain how vulnerable an export sector is to automation.

Interestingly, the two resulting export vulnerability indices provide starkly different results. While the Frey-Osborne based index indicates that sub-Saharan Africa's exports, and those of low-income and developing countries in general, are relatively more vulnerable to automation (Figure 3.5), the

Figure 3.5. Frey-Osborne-Based Index of Countries' Export Vulnerability to Automation



Sources: World Bank, World Development Indicators; Frey and Osborne (2017); and UN COMTRADE.

Note: PPP = purchasing power parity.

⁷ There are some industries where both indices agree on the vulnerability to automation. For example, apparel and textile manufacturing are deemed to be susceptible to automation while mining is not as vulnerable.

Brynjolfsson, Mitchell, and Rock-based export vulnerability index shows the opposite, wherein sub-Saharan Africa does not seem as vulnerable to automation (Figure 3.6).

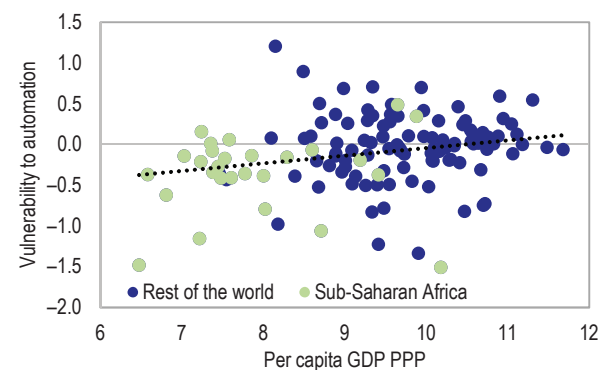
The contrasting findings reflect the different underlying assumptions on how technology impacts jobs. Frey and Osborne consider technologies that replace routine jobs widely found in low-end manufacturing, which constitutes the bulk of noncommodity exports from sub-Saharan Africa (e.g. food manufacturing). Brynjolfsson, Mitchell, and Rock (2018) emphasize machine learning, which is more likely to replace nonroutine cognitive tasks that are used more intensively in advanced economies' exports (for example, electronics and machinery).⁷

These results highlight the inherent uncertainty in assessing the impact of technology. In sub-Saharan Africa, the impact of the Fourth Industrial Revolution will depend on not only the pace of technological progress in general, but also the degree to which technology will complement or substitute different types of labor.

SCENARIO ANALYSIS: EXPLORING THE FUTURE OF WORK IN SUB-SAHARAN AFRICA

Economic models and measures of vulnerability help focus on specific aspects of the impact of technological change on the future of work.

Figure 3.6. Brynjolfsson, Mitchell, and Rock-Based Index of Countries' Export Vulnerability to Automation



Sources: World Bank, World Development Indicators; Brynjolfsson, Mitchell, and Rock (2018); and UN COMTRADE.

Note: PPP = purchasing power parity.

However, the forces at play are much more complex, closely intertwined, and highly unpredictable. Scenario analysis is a tool which provides a window to peek deep into the future without requiring firm causal relationships to hold.⁸ Instead of making a point prediction, scenario analysis develops alternative versions of the future that are told as plausible stories. They are particularly useful in cases of so-called “Knightian uncertainty” which captures situations where it is impossible to attach quantifiable risk probabilities to outcomes due to the unpredictability of events.⁹

The approach can be used for strategic, long-term planning under uncertainty. It is also regularly used by large global firms, national governments, and multilateral institutions. For example, the IMF has used scenario analysis to think about how to best serve its membership over the next 25 years (Behar, Kostial, and Ramírez forthcoming). Scenario analysis was also used during the end of the apartheid regime in South Africa to illustrate the benefits to all from a peaceful handover of power (Kahane 1992).

The value of scenario analysis lies not in one of the scenarios coming true, but in a set of alternative scenarios that together generate insights about the future in all its uncertainty. The approach does not rely on a baseline scenario. All scenario stories should be plausible. Scenarios familiarize us with the diverse ways in which uncertainties can play out and allow us to think through the consequences in a structured manner. This can help spot early warning signs of how uncertainties are unfolding and help design timely and appropriate policy responses. Furthermore, scenarios can help identify policies which are likely to work in most visions of the future (“future-proof” policies) while also highlighting risks associated with policies which are less robust to some future developments.

The starting point is to consider the main uncertainties that will shape the future, how they could play out, and how they interact. Thinking

about the future of work in sub-Saharan Africa over the next two decades, three such uncertainties and one underlying trend seem crucial.

- The impact of technological change, in particular automation, machine learning, and artificial intelligence. Will robots replace humans in some, many, or most jobs? Or will robots complement humans, for example, by allowing for reduced work hours and more leisure? Even if robot manufacturing will not come to sub-Saharan Africa for some time, what happens to exports if advanced economies and emerging market economies reshore manufacturing with the help of automation?
- The course of global economic integration. Will the globalization trend continue, allowing for deeper integration and interconnectedness? Or will a backlash take hold, with major economic centers turning inward, and an ensuing global economic disintegration. For sub-Saharan Africa, the question becomes whether global markets remain accessible and can be a source of export-driven growth.
- The speed and severity of climate change. What will the economic and social impact of climate change be? IMF estimates suggest higher temperatures in tropical low-income countries have a long-lasting impact, particularly through agricultural and manufacturing sectors, while services are impacted less (IMF 2017a). How fast will this adverse impact hit? Will certain regions even become uninhabitable, leading to large-scale migration? What mitigation policies will countries put into place?

These uncertainties come on top of a certainty: sub-Saharan Africa’s growing population and labor force. The region’s population is projected to nearly double in the next two decades, from approximately 900 million in 2015 to 1.7 billion in 2040. As the labor force increases, there is a need to create 20 million jobs each year.

⁸ The methodology underlying this section is the Oxford Scenario Planning Approach (Ramírez and Wilkinson 2016). The approach involved interviews with experts from a range of disciplines as well as a facilitated workshop to generate the scenarios.

⁹ As scenario analysis explores different futures, it is especially well suited to analyze unquantifiable risks arising from true unknowns regarding key trends or the correct underlying model (Ramírez and Selin 2014).

Against this backdrop, we consider three possible scenarios that seek to span a reasonable range of development trajectories over the next two decades. Of course, sub-Saharan Africa is a diverse region, and the scenarios developed here cannot do justice to this diversity.

In the scenario called Africa Arisen, the impact of technological change is favorable. Technological innovations are to a large degree complementary to humans, including for many low-skilled workers. The global economy continues on its path of deeper integration. Lastly, while climate change has an adverse impact on growth, technological advances are used to mitigate this effect. Sub-Saharan African entrepreneurs seize these opportunities and integrate their firms into global value chains.

In the scenario called Africa for Africa, technological change leads to large-scale displacement of workers in advanced and emerging market economies, triggering inward-looking policies and a reversal of global economic integration. Sub-Saharan Africa is less affected as labor costs are low, but climate change is a drag on growth as changing weather patterns slow productivity gains, and countries are less successful at mitigating these effects. Faced with a less-supportive external environment, sub-Saharan African governments implement fully the Continental Free Trade Agreement and invest in regional infrastructure, creating a common market of more than 1.7 billion people by 2040.

In the scenario called Africa Adrift, the impact of technological change is even more dramatic for all countries. Advanced and emerging market economies become dominated by automated factories. Sub-Saharan African development strategies that invested heavily in infrastructure to support local manufacturing are thwarted, and countries end up with stranded assets and high debt. Climate change creates strong headwinds to growth, and countries do not pursue mitigating measures. Governments fail in countering these trends. Instead, sub-Saharan Africa's dependence

on commodities continues, and the region struggles to develop. This creates strong incentives to migrate abroad, although automation in advanced economies limits absorption of migrants.

The scenarios are elaborated further in three hypothetical speeches delivered in 2040 and described in more detail in Online Annex 3.3.¹⁰

WHAT POLICIES ARE NEEDED TO CREATE FUTURE-PROOF JOBS?

The impact of technology on the future of work is not clear-cut. The challenge for policymakers is to maintain an openness to alternative growth strategies and embrace the opportunities of the Fourth Industrial Revolution.¹¹ Looking across the scenarios there are contrasting developments depending on how key uncertainties play out, but some common themes emerge that point toward a few key policy areas.

Get Connected

Connectivity goes beyond the need for traditional physical infrastructure of roads, railways, and ports, which is currently the focus of most country investment plans. Experience within the region demonstrates that if there is adequate digital infrastructure and a supportive business environment, new forms of business spring up and increase the efficiency of existing sectors, particularly services which constitutes a growing share of economies. Facilitating a boost in agricultural productivity, not least in the face of climate change, is likely to also rely heavily on digital infrastructure, and broader investment in climate mitigation strategies. Given limited fiscal space, investments in the capability to store and exchange data through an accessible system will require partnership between the public and private sector.

However, for now, internet penetration in sub-Saharan Africa is the lowest in the world—less than half the global average—although a few countries like Kenya, Nigeria, and Seychelles have

¹⁰ The scenario analysis was facilitated by Shirin Elahi and Alberto Behar and benefited from interviews with experts (see online annex 3.4).

¹¹ For example, new evidence shows that a shift in employment from manufacturing to services need not hinder prospects to gain ground toward advanced-economy income levels (IMF 2018a).

Scenario 1: Africa Arisen

This is a world where technology has increased productivity, the global system has remained on a path of integration, and innovations in agriculture have offset the effects of climate change. The opportunities of technological change and global integration have been successfully leveraged by sub-Saharan Africa, creating an emerging vibrant middle class. However, in a gig economy, job volatility is the norm.

Thank you for logging into the 2040 Virtual Conference on Global Growth Markets for African Entrepreneurs. I would like to especially welcome those of you joining from one of our innovation hubs and thank our global wireless technology providers for their support. As the opening speaker, I was asked to reflect on the last 20 years of breathtaking changes on our continent.

What a journey we have taken, helped by technological advances that were increasingly developed right here at home. These advances have helped us integrate into global value chains, as services trade became the new goods trade.

The transition from agricultural to urban living was down to the ingenuity of a new generation which grew up in a world bursting with creativity. Many of you here today were the young entrepreneurs who saw not just their country, but the world as their potential market. One day a music app from West Africa broke global records. The next day, a southern African print was picked up by one of the global retailers, giving income to a young design student, if only for one season as global fashions shifted quickly.

Even in agriculture, technology had a transformational impact. It happened slowly at first, new varieties of seeds were introduced, text message updates provided irrigation tips, while access to credit helped finance additional inputs. Despite the impact of climate change, yields and acreage under cultivation improved drastically, and, today, we are exporting not just basic commodities but processed food.

However, daily life is still a struggle, especially for those without access to quality education. Large technology-intensive farms dominate agriculture, employing only a few workers. Many families rely on remittances from relatives who moved to the city to better paying jobs. But even these jobs do not always provide a steady stream of income. This volatility is unsettling.

Most governments recognized the need to support the services sector. Maybe they were responding to the pressure of so many people moving to the cities and demanding better services. Or maybe, it just became easier to deliver with the help of technology. Providing internet access to connect people was a fraction of the cost of building railways and roads although our critical digital infrastructure is concentrated in the hands of a few global private companies. Fortunately, we could continue to access financing from abroad.

Education still starts in traditional government-run schools, but the quality is much improved, aided by online materials. Many successful students have degrees in science, technology, engineering or math, but we also see a growing demand in the care economy. Governments strive to provide means-tested unemployment assistance which a rapidly emerging middle class increasingly expects, but this requires continued improvements in tax collection.

So, the onus is on us to keep pushing forward. To remain competitive in the global economy we need to continue to invest in our skills and digital infrastructure but also seek out new growth markets and sectors as the world will not wait for us.

Scenario 2: Africa for Africa

This is a world where inward-looking policies have been dominant in advanced economies, fueled by technology displacing workers. Sub-Saharan Africa has had to chart its own course in a volatile global economic and political environment. Regional integration has spurred growth, partly offsetting the effects of reduced trade with the rest of the world. However, with limited tax revenue, governments struggle to keep up with the continent's growing needs.

Welcome to the 20th Annual Summit of the Africa Youth Leadership Forum. As the opening speaker, I was asked to reflect on the last 20 years of daunting challenges, but also on the opportunities and advances that our continent has seen.

The first summit in 2020 was set against an uncertain environment and what is now referred to as the end of globalization as we knew it. Inward-looking policies in advanced economies and some emerging markets, fueled in part by rising inequality, led to a dramatic unwinding of the global trading system. Unfortunately, our countries suffered, too, as about 80 percent of our exports, mostly natural resources, went outside Africa. We also saw our access to financing shrink dramatically, as our development partners had to increasingly focus on challenges at home.

As many predicted, automation transformed manufacturing in advanced economies. It also made it more difficult for manufacturing to set up on the continent. With constrained access to global markets and technologies, we had to find our own home-grown solutions.

Despite difficult discussions, governments established the Continental Free Trade Agreement in 2023 to promote interregional trade. It was supported by the African Infrastructure Investment Fund tasked with improving regional physical and digital infrastructure. Governments had to dig deep for the seed capital, and continued progress on revenue mobilization was unavoidable. Social media and information technologies helped the youth transcend physical and virtual barriers between our countries, which played a catalytic role in deepening integration.

Regional integration and improved connectivity sparked the growth of entrepreneurship. Our diaspora migrated back and brought skills, ideas, and some savings. The new era gave access to technology that did not require large capital investments, given limited financing. This opportunity was seized by young entrepreneurs. Their can-do/must-do attitude became the driving force behind grassroots innovations that proved quite effective in addressing local needs and conditions. Our people rose to the occasion. Innovative technologies improved productivity in agriculture, and the continent is becoming self-sufficient in food. In industry, 3-D printing enabled the emergence of small-scale and customizable manufacturing and construction. We saw similar changes across the services sectors. In tourism and entertainment, augmented reality now provides amazing experiences. In education and healthcare, artificial intelligence and virtual reality tools facilitate knowledge exchange and learning.

But we cannot rest on our laurels. Our communities are still afflicted with poverty and high unemployment, especially among the youth. Limitations of local and regional markets, infrastructure bottlenecks, and insufficient financing constrain the growth of our companies. The demographic boom and high competition puts too much pressure on the labor market. People continue to move from rural to urban areas, adding demands on an already strained urban infrastructure, and face unstable jobs and low wages. Given the high degree of informality and low level of job security, people are highly vulnerable to economic shocks. I am looking forward to our discussions on how we can start addressing these problems.

Scenario 3: Africa Adrift

This is a world where rapid automation has resulted in reshoring of manufacturing to advanced economies, and climate change has hit harder and faster than expected. In sub-Saharan Africa, development policies have been thwarted by the impact of these global developments, leaving most economies stagnant and indebted. Informal jobs in subsistence agriculture and low productivity services remain dominant.

Good morning. I am honored to deliver the opening speech of the 2040 conference of the African Civil Society Network. Our meeting takes place following two lackluster decades in Africa. I was asked to reflect on the last 20 years of our continent as automation in many of our trading partners pulled the rug from under our own industries and development strategies, and we faced the dramatic effects of climate change as global cooperation faltered and failed to bring emissions down.

The deployment of robots and artificial intelligence in Asia, Europe, and North America changed the nature of global trade. Even with a shrinking labor force due to an aging population, our former trading partners became increasingly self-sufficient as they battled with unemployment and declining wages. The impact on Africa was even more severe. Government policies to attract jobs through tax exemptions and public infrastructure investments were undermined. This left countries with stranded assets, high debt, low domestic revenues, and no fiscal space. With development partners increasingly focused on their own problems, we saw a painful decline in external financing.

As if that was not enough, climate change hit the continent harder and faster than anticipated. You will remember all too well some of our big cities literally running out of water in the 2020s. Or how declining humidity rendered cocoa cultivation unfeasible by 2030. Farmers were forced to switch to subsistence crops. As water reservoirs depleted, rapid migration put pressure on cities, further straining the poor infrastructure. With limited financing, few governments had sufficient resources to adequately invest in climate change mitigation. Many wanted to migrate to Europe and beyond, but these countries as well did not have enough job opportunities to let anybody in.

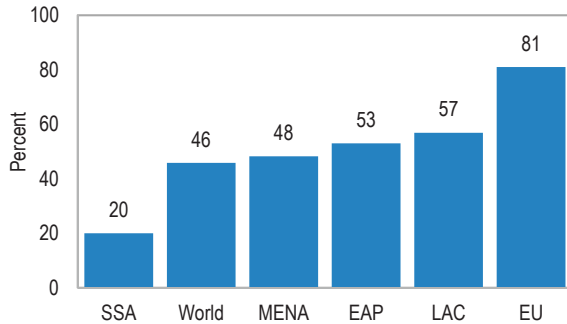
Today's economic realities are sobering. Too many live in extreme poverty. In rural areas, weather dependency and subsistence farming coupled with poor access to water, electricity, and roads contribute to the poverty trap. In the cities, the lack of affordable housing and transportation and perennial high food prices contribute to the urban poverty trap. Those with access to informal networks or remittances are the lucky ones.

One of the main challenges is to fix our education system and adapt it to the demands of this technology-driven world. Those who go abroad for their education or are enrolled in an international online university, are doing well, finding good jobs in the civil service or in large mining companies. But these opportunities are only open to the affluent minority.

Most people are involved in providing low-pay services for these elites, earning wages that are not enough to lift households out of poverty. The lack of formal jobs in cities is proving a fertile ground for crime and terrorism. And we see all too often local or regional conflicts springing up over access to commodities and water. As the crime rate continues to climb, people in extreme poverty are pushed to give up their little savings to illegal human trafficking organizations for the promise of a better life elsewhere. It is a sad reality that private security is the largest employer on our continent.

Where do we go from here? This is the topic of our summit. Better access to the internet and free online learning centers have started to provide opportunities to a growing number of youngsters.

Figure 3.7. Proportion of Individuals Using the Internet, 2016



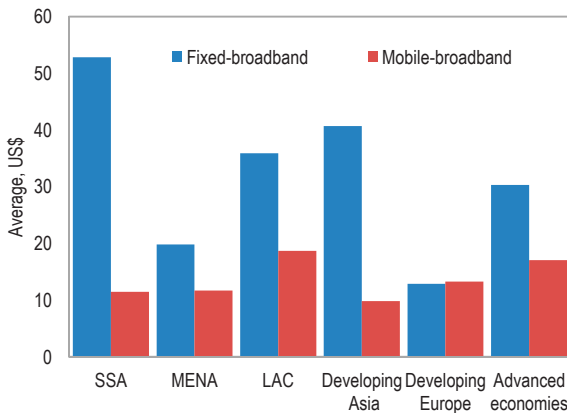
Source: World Bank, World Development Indicators.
 Note: EAP = East Asia and Pacific; EU = European Union; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SSA = sub-Saharan Africa.

made substantial progress and have penetration levels of close to 50 percent, slightly above the world average (Figure 3.7). The cost of a fixed broadband connection is highest in sub-Saharan Africa compared to other regions. Only for mobile broadband are costs comparable to other regions in US dollar terms (Figure 3.8). However, once costs are scaled by gross national income, sub-Saharan Africa has the least affordable mobile broadband.

Invest in Flexible Education Systems

Whether technology becomes a substitute for or a complement to labor is not necessarily a force beyond our control. Turning the question around, we should ask: What skills will be complementary to technology? What skills are needed to develop and/or use technology? This puts a high premium on education to empower the youth to succeed in the changing world of work. Digital literacy, adaptability, and lifelong learning will likely be skills for success, and secondary education will become more important.

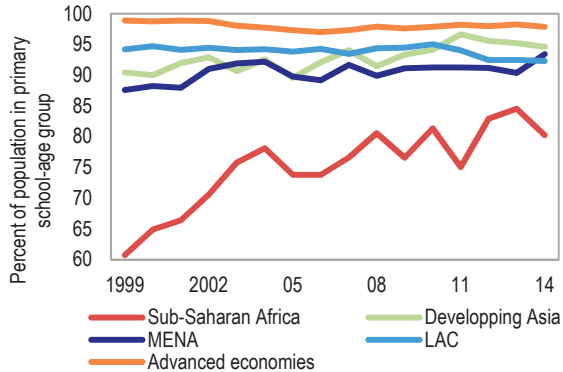
Figure 3.8. Monthly Cost of Fixed- and Mobile-Broadband Internet Connection, 2016



Source: ITU-ICT database.
 Note: ITU-ICT= International Telecommunication Union-Information and Communications Technologies; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SSA = sub-Saharan Africa.

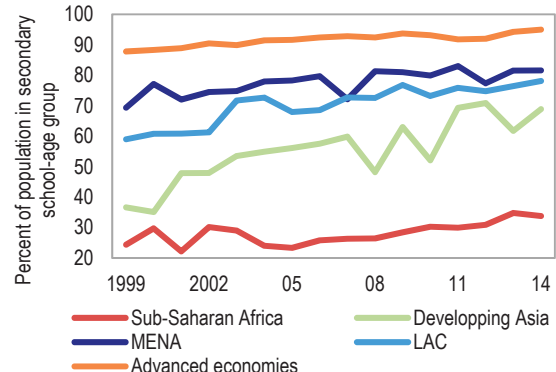
There is considerable uncertainty over what specific skills will be needed. As such, education systems will need to be flexible, while ensuring full enrollment and introducing technology in every classroom. Sub-Saharan Africa has made important gains in increasing primary completion rates (Figure 3.9) but has not kept up with other regions on secondary education. Secondary enrollment rates, a more forward-looking indicator of likely education outcomes for the next generation, remain well below other regions (Figure 3.10).

Figure 3.9. Primary Net Enrollment Rate, 1999–2014



Source: World Bank, World Development Indicators.
 Note: LAC = Latin America and the Caribbean; MENA = Middle East and North Africa.

Figure 3.10. Secondary Net Enrollment Rate, 1999–2014



Source: World Bank, World Development Indicators.
 Note: LAC = Latin America and the Caribbean; MENA = Middle East and North Africa.

Smart Urbanization

Looking at the hotbeds of the Fourth Industrial Revolution, these are all situated in cities or urban centers. At present, too many sub-Saharan African cities have insufficient infrastructure, and are oriented more toward local consumer services. This compares with cities in faster growing economies where urban centers are drivers of growth (Gollin, Jedwab, and Vollrat 2015). To create an environment in which entrepreneurs can become drivers of technological adaptation and innovation, sub-Saharan Africa needs a strong focus on urban planning and development. Population pressures put an additional premium on having functioning cities.

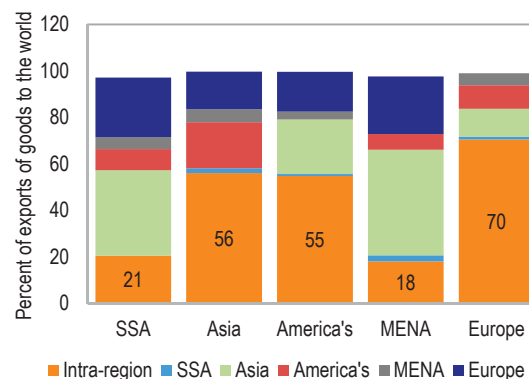
Develop Safety Nets for a Volatile Labor Market

Extrapolating current trends, frequent job transitions may be a key characteristic of a “gig-style” world of work. This will be a change for advanced economies. However, many in sub-Saharan Africa, in particular in the subsistence and informal sector, are already living in such a world and struggle to manage the resulting income volatility. Family and social networks provide some backup, but a major challenge is to expand safety nets that provide some income security. Technology, such as biometric identification and fintech can help with targeting and administration, but revenue mobilization will be key to create the necessary fiscal space.

Deepen Trade Integration

Lastly, further regional trade integration would be a driver of development, not least if the global environment were to become less conducive. The recently agreed Continental Free Trade Agreement is a notable step in this direction and now requires regionwide implementation. Sub-Saharan Africa forms a sizable domestic market if countries move swiftly on trade facilitation and regional infrastructure. This market can provide scale for local firms and make the continent more attractive for foreign direct investment. Trade integration in sub-Saharan Africa has almost tripled since the 1980s but remains at low levels compared to other regions (Figure 3.11). Physical distances and socioeconomic differences—including language and colonial history—constitute barriers to trade in sub-Saharan Africa that seem more important than in other regions (Arizala and others 2018).

Figure 3.11. Exports of Goods to Different Regions, 2017



Source: Direction of Trade Statistics (DOTS).

Note: MENA = Middle East and North Africa; SSA = sub-Saharan Africa.

CONCLUSION

Technological disruptions throughout history have yielded dramatic improvements in living conditions. However, transition periods were often difficult, in particular for those in the declining sectors and occupations. The overarching policy challenge is to support the new and emerging sectors that drive growth. If successful, sub-Saharan Africa can create the required 20 million good-quality jobs per year for its young and growing population and make progress toward meeting the Sustainable Development Goals.

While there are many uncertainties as to what the future of work will look like, today’s policy choices shape outcomes. Development strategies must adapt to the demands and prospects of the Fourth Industrial Revolution. Integration and connectivity are the key pillars of successful growth policies. This includes traditional and digital infrastructure, an education system that keeps pace with changing skill requirements, smart urbanization, safety nets for a volatile labor market, and trade integration.

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Note: Annex with additional figures and results for this chapter is available online. International Monetary Fund (IMF). 2018. Chapter 3, Background Paper, *Regional Economic Outlook: Sub-Saharan Africa*. Washington, DC, October. <https://www.imf.org/en/Publications/REO/SSA/Issues/2018/09/20/sreo1018>