

The Future of Work in Africa

Implications for Secondary Education and TVET Systems

**A Background Paper for Mastercard Foundation
Study on Secondary Education in Africa**

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List of Acronyms and Abbreviations

4IR	The Fourth Industrial Revolution
ACET	African Center for Economic Transformation
AfDB	African Development Bank
COTVET	Council for Technical, Vocational Education and Training
DfID	Department for International Development (UK)
EFA	Education for All
EMIS	Educational Management Information Systems
ICT	Information and Communication Technology
ILO	International Labour Organisation
ILOSTAT	International Labour Organisation Statistics
IMF	International Monetary Fund
JHS	Junior High School
LFS	Labour Force Survey
MoE	Ministry of Education
MGI	McKinsey Global Institute
NEET	Not in Education, Employment or Training
NQF	National Qualifications Framework
ODI	Overseas Development Institute
PPP	Public-Private Partnership
SE	Secondary Education
SHS	Senior High School
STEM	Science, Technology, Engineering and Mathematics
SSA	Sub-Saharan Africa
TVET	Technical and Vocational Education and Training
UN	United Nations



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The Future of Work in Africa

Executive Summary

Executive Summary

One-fifth of the global population under the age of 25 now resides in Sub-Saharan Africa (SSA), the world's youngest region, which is growing at a rapid rate. The region's working age population is expected to reach 600 million in 2030, with a youth share of 37 percent—bigger than that in China. With the right education and training, coupled with national economic strategies and policies that provide the right environment for rapid economic growth and creation of employment opportunities, Africa's large and fast-growing youth population could be a great asset for development and a comparative advantage in world markets. However, Africa already faces high and rising unemployment rates, with youth particularly vulnerable. Across Africa, youth unemployment (10.9 percent) is essentially double that of adults (5.6 percent).

Governments face significant challenges in realising the demographic dividend. In most African countries, over 80 percent of workers are in the informal sector, either in traditional agriculture or in urban, informal economic activities, where under-employment and low-earnings are pervasive. Increasingly, the face of the unemployed or informal sector worker in Africa is no longer the uneducated man or woman but a secondary or tertiary school graduate. In Ghana, for example, only 10 percent of the 200,000 who enter the labour force each year find formal sector jobs. Similar trends can be found across SSA.

There are two primary reasons for this trend. First, formal sector job creation has not kept pace with the increased number of secondary and tertiary school graduates—a rise fuelled by the population surge and rapidly improved access to education. And second, where job demand in the formal sector does exist, necessary skills and training do not, due either to the poor access and quality of education or to the specialisation of degrees in subject areas (e.g., arts and humanities) outside those that employers demand (e.g., science, technology and mathematics, or STEM). This latter factor is particularly problematic since technology is not staying the same.

Indeed, what is often called the 4th Industrial Revolution—encompassing the rapid evolution of robotics, artificial intelligence, 3-D printing (or additive manufacturing technology) and the “internet-of-things”—is fundamentally disrupting manufacturing technology, with significant implications for the nature and growth of jobs. For the last two decades, African countries have focused on reducing costs, improving investment climates and attracting labour-intensive manufacturing to capitalise on an abundance of labour, grow fast and provide productive jobs. Now, with the disruptive technological changes and its impacts on global production and trade, the way forward is not so clear.

Additionally, economic transformation has been slow, which has hampered growth in productive jobs. A large share of the growth, outside the dominant agricultural sector in the past few decades, has been in household enterprises—unincorporated, non-farm businesses owned by individuals—rather than the modern, industrial, or services enterprises that would be expected under transformation. The employment situation also has a disproportionately negative impact on women. Almost 90 percent of women work in informal employment. Gender differences tend to be more pronounced in countries with high levels of youth unemployment, as well.

Employment projections to 2030 suggest the overall picture is not going to change soon. Agriculture is expected to continue to dominate in the low and lower middle-income economies, providing about two-thirds of total jobs, while the services sector will continue to dominate in the upper middle-income economies. Perhaps most troubling, the manufacturing sector is projected to provide only 6.5 percent of total employment across all income categories, raising additional questions about manufacturing-led industrialisation in Africa. Therefore, across the continent, discussion of the future of work and employment must be grounded in current realities, which include “jobless growth”, deficits in infrastructure and skills and the application of modern technology. What preparation for the youth is needed for the new world order?

Compared to other regions of the world, educational attainment in Africa is low. Less than a third of adults have completed primary education

compared to nearly all adults in advanced economies. Access to primary education and completion rates in primary and lower secondary have improved substantially in recent years, yet rates remain low. Fewer than 60 percent of children in lower-income countries in SSA complete primary school, while the top 20 percent of countries have a completion rate of over 90 percent. UNESCO projects only eight percent of countries in SSA will achieve universal lower secondary education by 2030—even then, only if education progresses at the fastest rate the region has ever seen.

The challenge of low attainment is compounded by poor overall quality of education. Less than 7 percent of students in late primary school in SSA are proficient in reading, against 14 percent in mathematics. There is also a learning gap between students from poor and rich families, which widens as children move up through education grades. Such low levels of attainment at primary school affect future learning outcomes and preparedness for future jobs. For example, according to the World Bank, nearly 80 percent of Ghana's working age population cannot "integrate, evaluate and interpret information from a variety of text materials." Yet most productive jobs and training programmes require a high level of literacy—and increasingly so, as technological changes will necessitate a shift in focus towards more cognitive skills.

No other region has ever faced the magnitude of the education challenges most SSA countries will face over the next couple of decades. Strong institutions, including political will to make resource trade-offs between population groups and sectors, will be needed. Increasingly, African countries are recognising the urgent need for tailored strategies for the future of work, even as the unfolding technological revolution is speeding up the present. Key to this are: (1) transformative strategies that promote job creation and boost productivity in labour-intensive sectors and (2) ensuring young people have the skills for productive and fulfilling work.

Objectives of the study

The objective of this background paper is to try to determine, in light of the likely disruptive evolution of technology and global trade and urbanisation, what African countries should do to provide productive jobs for their large and fast-growing youth population.

The focus is on secondary education. By secondary education, we mean education that comes after primary education (i.e., the first six years of school), but before tertiary or university level education.

It includes both academic-oriented secondary schools (both lower and higher) and technical and vocational training institutes (TVETs). In terms of age, we are referring to education from year 13 to 21. Conventionally, the six years of secondary education should span the years from 13 to 18, but in Africa due to late starts in school and repetition, the wider age bracket may be more realistic.

Thus, this review aims to answer the following questions:

1. What are the jobs that are likely to be available or the jobs that African countries should target in the future—i.e., by 2030—in light of: (a) evolving disruptive technological changes and expected 4IR impacts and (b) countries' own natural comparative advantages?
2. What growth strategies should African countries adopt to pursue these job opportunities?
3. What changes should African countries make to their secondary level education systems to prepare graduates to successfully take advantage of the productive opportunities, including in the informal sector and agriculture, in the face of the evolving landscape?

The review stays at the macro level in terms of the types of jobs for which Africa should prepare its secondary school graduates to be able to acquire—the types of institutions and training programmes needed and the balance and linkages between them. The review does not discuss micro-level issues of how to run particular institutions and training programmes.

Conceptual framework and methodology

The conceptual framework of the review is rooted in a model of the 4IR ecosystem and the four interrelated domains that will unleash the dynamics of future work and achieve inclusive growth—and in turn, spur innovation, productivity, demand and, most importantly, jobs (see Figure 1.1). The first domain constitutes labour force, education and skills—interlocking components needed to create productive jobs. The second domain is the enabling infrastructure, such as internet penetration and its coverage, quality and cost. The third domain, innovation systems, refers to the type of technologies employed and deployed, as well as the supportive environment to facilitate 4IR uptake, scaling up and commercialisation. The regulatory and investment climates, the fourth domain, tie the first three domains together as the drivers to unleash the full potential of 4IR. The coordination and management of all four

domains determine the nature and scope of the impact of the 4IR on productivity, job creation and inclusive growth. This study focuses on the first and fourth domains of the 4IR ecosystem.

The study methodology is largely based on an extensive desk review of the literature. It also includes two case studies: Ghana and Senegal, which explore employment prospects in 3 key economic sectors (ICT, hospitality and agri-business) and the implications for the secondary education and TVET systems in each country.

Potential future employment impacts

Creating decent jobs in line with future 4IR expectations requires policies and strategies that increase productivity, labour absorption and enable the reallocation of labour from traditional to modern jobs and sectors. As such, five potential pathways with high-potential employment impacts can be identified: (1) agriculture-driven transformation, (2) exports-oriented manufacturing, (3) a modernised services sector, (4) tourism and (5) the creative industries. A brief overview of the capital-intensive construction and extractives sectors is also provided. Though with limited direct job creation potentials, their indirect potential is much greater given their links to other sectors and the potential to generate positive spillover effects on jobs.

Agricultural transformation

For many countries, agriculture presents the easiest path to industrialisation and economic transformation by leveraging their relative comparative advantage in abundant low-wage labour and land. Agriculture is the largest employment sector in SSA, employing around 205 million people in 2015, with forecasts of just over 2 percent growth, on average, each year through to 2030. Agricultural transformation incorporates two main processes: first, modernising farming by boosting productivity and running farms as businesses and, second, strengthening the links between farms and other economic sectors in a mutually beneficial process.

Rising incomes, urbanisation and growing food consumption in cities provide enormous opportunities for agribusiness—the World Bank projects that the value of the region’s food and beverage markets will reach \$1 trillion by 2030. Also, a more productive agriculture sector will become more attractive for young workers, which not only expands the agricultural job market but would rejuvenate a key sector dominated by aging farmers.

In agriculture, policies and regulations must create a conducive environment to enable the business of farming—and agribusiness in general—to be profitable and to support commercialisation. For example, countries should invest in transport infrastructure in the medium to long term, while increasing the availability of cheap “first mile” transport solutions in the short term. Measures to help farmers confront agricultural risks, including risk mitigation and management tools, are key to sustaining and growing the industry, as is access to land and finance.

Exports-oriented manufacturing

Not only can jobs in this sector be labour-intensive, they can also spur productivity gains throughout the economy as exporters compete with foreign firms and adopt foreign products, services, processes and technologies. Opportunities exist due to growing regional markets, an expanding middle class and potential relocation from other regions or countries, such as China, due to rising wages. However, those opportunities are rapidly being undermined by 4IR innovations, such as component assembly. Even though technology is changing the economics of manufacturing, African countries still are in position to focus on less automated sectors, where technology installation has been slow and where countries can leverage their abundant labour and land resources. Sub-sectors such as food processing, wood processing, garments and even agro-processing could provide short to medium term opportunities for growth and employment.

In manufacturing, prudent policies to reduce the cost of trade, streamline regulation and enforce the efficient and honest administration of customs and ports are among the most fundamental measures to enable export-oriented businesses to flourish and grow. Again, access to finance is needed to support productive growth, particularly for smaller and younger firms that often struggle to gain finance but are often a source of innovation and productivity growth. Domestic exporters also need access to reliable infrastructure at reasonable prices.

Modernising the services sector

This sector would perhaps benefit the most from 4IR. Services is already the fastest growing sector in terms of job creation and value-added to GDP in African economies. It employed around 111 million people across SSA in 2015 and is forecast to grow by 3.8 percent on average each year out to 2030. And although highly informal, most sought-after wage employment jobs are in this sector. Demand for services is increasing with rising incomes and

urbanisation; 4IR is creating opportunities for entrepreneurs and businesses to meet that increased demand.

While there are no reliable estimates of the job-creation potential of the sector, the key is to improve productivity, particularly in its large informal sub-sector. Other fast-growing service industries are those referred to as “industries without smokestacks”. These include ICT-based services, such as business process outsourcing, as well as transport and tourism. New technologies will make some jobs in this area vulnerable, but many—customer service, sales and human resources, for example—are at lower risk in the short to medium term, given their higher human component. This window should be used to build the skills and the supportive infrastructure needed to make the most of 4IR-induced job opportunities higher up the value chain, such as software programming, translation and interpretation.

In this sector, most workers operate as, or as part of, an informal household enterprise. They are commonly found in urban areas and often struggle to get access to secure spaces to trade and to credit and/or finance—both of which are particularly problematic for youth and women. As a result, they struggle to accumulate funds to set up or grow a business. Governments can help through better urban planning and policies to reduce the cost of access to formal financial services.

Harnessing tourism

Tourism is one of the assured pathways to economic transformation due to its capacity to create jobs (particularly for women and youth) and create linkages with other sub-sectors. For example, a 2014 study found that a US\$250,000 investment in the tourism sector in Zambia generated 182 full-time formal jobs, nearly 40 percent more than the same investment in agriculture.

Tourism is already an important source of jobs in countries such as South Africa, Kenya and Senegal, but very much under-developed in most African countries. In 2017, the sector directly supported just under 7 million jobs (around 2 percent of total employment) in SSA and is projected to add another 2.5 million by 2028. While the number of jobs created as a result of technological innovations—such as virtual reality, sharing platforms and social media that allow for micro-targeting—has yet to be assessed, anecdotal evidence suggests that these platforms are crowding micro and small entrepreneurs into the sector and creating jobs that hitherto did not exist.

In tourism, strategies generally will need to be more localised, as SSA countries vary widely in their ability to develop a tourism industry due to varying levels of political stability and resources that can be developed into economically productive assets. However, there are several approaches that apply to all countries considering policy packages to promote tourism, including: ensuring easy and safe access for tourists, devising adequate and sufficient procedures for land allocation to develop tourism destinations, building supportive infrastructure and getting taxes right to maximise the economic benefit of tourism.

Creative economies

Only recently recognised as a bona fide economic sector, the creative industry is one of the more resilient and fastest growing sectors in Africa. The sector is huge, with a global value in 2012 of around US\$2.2 trillion, while world trade in creative goods and services was US\$624 billion. Overall, Africa’s share remains small—despite significant endowments in culture, arts and music—though some examples, such as Nigeria, show a prosperous way forward. The movie industry is now the second biggest employer in Nigeria after agriculture, employing close to 300,000 directly and more than 1 million indirectly. Developing Africa’s creative economy could trigger a value chain between artists, entrepreneurs, distributors and support services across multiple sectors to provide modern jobs, especially for the youth and women.

In this space, governments can support workers through measures to define and enforce property rights, investing in necessary infrastructure, including technology and supporting innovative and effective financial services, such as microcredit schemes in partnership with the private sector. Microfinance platforms, such as M-Changa in Kenya, are already helping to match investors to a range of individuals and projects in creative industries, thereby supporting growth.

Capital-intensive sectors

It should also be noted that both the construction and extractives sectors have high growth potential in the coming decades, but both sectors are capital-intensive and unlikely to create an expansive number of new jobs directly. Their indirect job creation potential is much greater given their links to other sectors and potential to generate positive spillovers. For example, construction is forecast to grow strongly, by 4.4 percent year on year to 2030, reflecting rapid growth in cities, housing markets and infrastructure. That will directly create some job opportunities, particularly for skilled workers in power generation, rail and roads, but the overall scale will be small—less than 4 percent of total employment in 2030.

Transformation and job creation strategies

To take positive advantage of future employment impacts and create productive jobs, African countries must transform the structure of their economies. At its core, economic transformation is a means to sustainable growth through more product diversification, increased export competitiveness, productivity increases, technology upgrades and improvements in overall human well-being, including better jobs and higher wages. To successfully pursue a transformation agenda, countries need to develop and implement integrated transformation strategies that are appropriate to their local circumstances.

If managed correctly, policies that promote transformation will lead to two positive—and necessary—outcomes in the context of African employment, particularly when considering the youth and 4IR impact.

1. They will create a supportive business environment for the private sector to flourish, fuel job creation and help enable the move of labour from the informal to the formal sector; and
2. They will develop people's skills for a modern economy, as well as networks for matching those skills to jobs.

Managing the economy to enable businesses to flourish and so create jobs and help raise incomes relies on policy action on many fronts. In general, it includes sound fiscal and monetary policies pursued in ways that ensure that their impacts on inflation, wages, interest rates and exchange rates are positive for promoting rapid growth in GDP, jobs and exports. It also means strengthening infrastructure investment and services, such as electricity access and transport, as well as streamlining and implementing appropriate regulation to encourage entrepreneurship, innovation and business expansion. For example, after Rwanda introduced procedural reforms, the number of new firms created more than quadrupled, from 700 in 2010 to 3,000 in 2016.

Better financial inclusion, particularly of young and female workers, can also support business creation and growth across all sectors. Innovative financial instruments to ease access for farmers and entrepreneurs are being tried and tested, such as matching grants and leasing, rather than a loan which requires some or more collateral and so can be prohibitive, especially for the young.

In addition to supporting the creation of more productive employment opportunities, governments may also need to design policies to help people find those opportunities, such as through online employment portals. Young people in particular may need such support as they often lack the networks and information to identify potential job opportunities.

While making it easier to do business and improving the investment climate are normal industrial policy pillars, they are even more crucial under 4IR. This is because the technologies are new and regulatory authorities, which tend to be conservative and understaffed, may not be nimble enough to develop needed regulations or may create stifling regulations based on poor understanding or unwarranted fears. For example, Kenya, which has otherwise been at the forefront of creating a conducive regulatory framework for 4IR that has seen the development of a dynamic mobile banking industry, has been fairly erratic in the development of drone regulations, largely driven by fear of drones being used by terrorists.

There is a clear need for more exposure of policy makers to 4IR technologies and what they mean. Results of a study on the future of work prepared for the African Development Bank point to a low level of awareness among policy makers of 4IR technologies and their potential applications. Prolonged inaction has been a bane rather than a blessing, as manifested by the widening digital divide. Thus, governments must invest in building the capacity of the regulatory agencies to increase awareness and understanding so that future policies are aligned with practical strategies to build businesses and create jobs.

Along similar lines, governments can support the transition of jobs from the informal to the formal sector, which will increase productivity and promote growth, through strategies that address the deeply-rooted informal economy in most SSA countries. In general, such strategies should enable the formal sector to expand and reduce the costs and increase the relative benefits for workers and firms in joining the formal sector. For example, measures to allow skills acquired in the informal sector to be validated through certification, such as in Benin, Ethiopia, Mali and Senegal. Other examples include establishing cost effective and simplified registration procedures, increasing access to microfinance, supporting business advisory services and providing legal protection, namely stronger property, business and labour rights.

Skills needed for future work—and current challenges

Economic transformation demands a workforce equipped with the knowledge and skills to be highly productive on farms, in firms and in government offices—and to generate innovations in technologies, processes, products and services.

At a minimum, that means ensuring young people have solid foundational skills: good basic cognitive, basic STEM and digital and non-cognitive skills, including interpersonal and socio-emotional skills, such as resilience and curiosity. These foundational skills are essential building blocks from which young people can develop higher-order cognitive and technical skills and they affect future labour market outcomes and key sectors in multiple ways. For example, as agriculture will continue to employ a large share of the workforce in many SSA countries, future jobs and growth in the sector will be reliant on meeting its various skills needs—from basic business and technical skills to enhance productivity to more advanced technical skills throughout the value chain, including marketing, logistics and agribusiness.

Thus, a more skilled workforce is needed for accelerating transformation and meeting the demands of 4IR, particularly as countries face high economic competition, new technologies and a rapidly changing world of work. According to the World Bank, higher-order cognitive skills, which include unstructured problem solving, learning and reasoning, are increasingly in demand by firms as workplaces become more complex.

However, as previously described, a large share of students who enrol in secondary education fail to gain the good foundational skills that are needed for eventual skills progression. As a result, they struggle to progress through the education system and gain productive employment. The optimal period for acquiring foundational skills is through early childhood (and into adolescence for non-cognitive skills, although they can also be acquired throughout early adulthood). However, many children, especially from disadvantaged households, arrive at school with learning deficits. As skills beget skills, they often struggle to learn as a result and initial learning gaps widen over time. Compounding the problem in Africa are the significant problems countries face in recruiting and training enough high-quality teachers to meet increasing enrolment demands and ensuring a stable and effective learning environment. Excessive closures compromise adequate schooling in many countries, while education cycles dominated by heavy examination testing has been shown to result in students being taught to memorise rather than process understanding.

In many African countries, curricula are often “overloaded”, rigid and lack a focus on non-cognitive as well as basic cognitive skills. Multiple ministries and institutions are involved in curricula decision making, leading to heavy bureaucracy that can slow modernisation and adaptability to better standards. The curricula design process and content should be streamlined and include both the cognitive and non-cognitive skills that are sought after in modern labour markets. And at the lower secondary level, a well-designed curriculum should include some practical elements linked to key economic sectors, such as agriculture, to reflect the reality that many young students will move directly into the labour force after lower secondary or, possibly, some TVET.

Indeed, many African countries are integrating more general vocational and technical skills into secondary curriculum (lower and upper) to help maximise the potential for young people to become employed. Yet the aforementioned institutional deficiencies have hampered a shift towards competency-based curricula. In general, the quality and relevance of most TVET in the region is low. Across Africa, systems need urgent reform after years of under-investment and accumulating problems, such as a lack of structured TVET teacher training to ensure their skills are modern and aligned with industry needs.

A key lesson from more advanced TVET systems is that private sector engagement, in both the design and delivery of TVET, is crucial for quality and relevance. First, TVET is relatively expensive for governments to deliver, but a quality system provides an obvious benefit for firms. Second, TVET systems need to be demand-driven and dynamic so they can respond to the changing needs of the labour market, which in turn depends on private sector input in the design of curricula, setting of standards and quality assurance. Third, the private sector also has a key role to play in providing essential work experience or practical training opportunities for students. For example, in Singapore, TVET students often work on projects commissioned by private industry in their final year which also helps promote their employment chances.

The trend is towards greater flexibility between TVET and general education. Comparative studies conclude that secondary education and TVET should be complementary and flexible. TVET should begin after lower secondary education as students need good foundational skills to engage in technical and vocational education and training effectively. TVET (and general education) should align with local labour market needs, but the degree of specialisation will depend on country-specific circumstances.

This flexibility makes TVET more appealing and is particularly important as rapid technology change and constantly changing labour market demands will affect the skills needed by students and entail life-long learning.

Not to be overlooked, a substantial increase in STEM participation is also needed if countries are to make the most of the opportunities—and confront the changing labour market needs—presented by 4IR. For example, the African Union, Africa 2063 framework document sets a target of 70 percent of all high-school graduates going to tertiary education, with 70 percent of those graduating in science and technology related subjects. That target is twice the global average enrolment of 32 percent—and more than eight times the SSA average of 8 percent. Low STEM participation at upper secondary is driven, in part, by low attainment in STEM related subjects at lower secondary. So, increasing STEM uptake and performance will require large improvements in the quality of STEM education in the primary and secondary phases.

Secondary education and TVET policy recommendations

African countries face a daunting challenge of designing skills strategies that support transformation and inclusive growth (and so increase earnings of workers in current employment, especially the poor) as well as deliver an adaptable and resilient workforce that can cope with the rapidly changing nature and location of work caused by global trends, such as 4IR. That means developing skills strategies that underpin a wider economic strategy, cover all education and training phases and support employment in the informal and formal sectors. Limited budgets mean difficult trade-offs will need to be made between different groups, such as investing in the skills needed for transformation—largely secondary and tertiary education to support work in dynamic sectors—and those needed for inclusivity. Another trade-off is between today's workers, a large proportion of which lack basic skills and tomorrow's workers, for whom early years investments should be a priority given their relatively high returns. The relative weight placed on different trade-offs and education policy priorities will depend on a country's cultural, political and geographic context.

In general, there is a package of interrelated policy measures for the secondary education/TVET phase that countries should consider, to prepare young

Africans for productive employment under global trends, including 4IR. That package includes **two core strategic aims:**

- **Prioritise improving access, efficiency and quality of outcomes for lower-secondary education by ensuring wide coverage and the completion of good quality and relevant primary as well as lower-secondary education; and**
- **After lower secondary, prioritise the quality and relevance of upper secondary and TVET, before gradually expanding uptake to meet labour demand.**

Specific policy goals and measures to support these strategic aims are listed below. They should not be seen as an either/or, but as a package of complementary reforms needed to drive better outcomes, where the relative weight placed on different policies will depend on a country's specific circumstances.

1: Improve the quality and relevance of general secondary education

Improving the quality and relevance of secondary education and TVET is crucial to ensure young people stay in school and obtain the skills they need for productive work. Key policy actions include:

- **Improving the availability and quality of learning materials.** Countries can lower the costs and increase the availability of textbooks through, for example, better procurement practices and predictable and sustainable financing for timely book procurement and delivery. Electronic learning materials also offer an opportunity to support learning. In the near term at least, a cost-effective approach is likely to be a combination of textbooks in certain subjects and an increasing use of electronic materials and technology in science lessons in secondary schools.
- **Ensuring there are enough effective teachers.** Good teacher management is also important to ensure there are enough effective teachers in schools. That means recruiting high-potential teachers, deploying them in schools and TVET institutions where there is demand, ensuring they are in the classroom and that they have the support, environment and training to teach effectively, progress and stay in the profession.

- **Devising flexible and relevant National Qualification Frameworks (NQF).** These should be underpinned by curriculum that reflect cognitive development and the needs of the labour market. Also, the NQF and curricula should also address gender equality, link to clear career pathways and encompass both the TVET and general education system.
- **Improving STEM uptake.** A significant shift in STEM uptake at upper secondary will require clear targets, matched by necessary resources and incentives for providers and students. Examples include addressing the shortage of qualified STEM teachers, ensuring STEM curricula is relevant and engaging and ensuring resources align with STEM targets alongside accountability systems.

2: Increase access and internal efficiency across formal secondary education

Access is negatively affected by numerous factors, including excessive travel distances, particularly in rural areas where children often travel further than students in urban areas. For example, in Ethiopia 27 percent of students in rural areas must travel more than three kilometers to their nearest school compared to 3 percent in urban areas. Financial costs, such as uniforms or the opportunity cost of helping at home, also increase the likelihood that students, especially from poor households, do not attend school. In some countries, early marriage or pregnancy also prevents young girls from attending school. In addition to access, internal efficiency must be a priority. Ensuring that students progress from primary and complete at least lower secondary is still a major challenge in SSA, as is keeping young girls in school. Key policy actions include:

- **Addressing supply-side constraints.** The most obvious measure is to increase the opportunity for access by building new schools nearer pupil populations, particularly in rural areas, that offer at least a minimum package of facilities.
- **Addressing demand-side constraints.** For existing facilities, ensuring a safe and healthy learning environment is essential for attracting and retaining children, particularly girls. Removing high stakes exams in favour of improved classroom assessments for certification purposes can improve transition rates between primary and lower secondary. And stackable, or modular courses—where students don't have to complete modules straight after one another—could encourage completion rates for TVET students who are working or have additional responsibilities outside school.

3: Improve the quality and relevance of formal secondary TVET

Countries should prioritise and focus on improving the quality of TVET provision for key growth sectors, including the informal sector, with explicit industry linkages first. The temptation to rapidly scale up provision while implementing large system scale reform should be avoided because TVET is relatively expensive to deliver, reforms are often complex, take time to implement and the evidence on what works in a particular country is not that clear. Key policy actions include:

- **Tracking TVET from upper secondary.** Students need a good set of foundational skills before they start learning more advanced, technical skills. That means tracking TVET from upper secondary, so students start only after they have developed necessary skills through basic education.
- **Ensuring enough effective TVET trainers.** High-quality TVET trainers are in short supply. Several policy measures can be enacted to help attract and retain qualified trainers, including: creating clear and flexible pathways for becoming a TVET trainer (with commensurate salaries); developing progression routes within the profession for career growth; implementing a consistent training protocol to ensure skills are current and relevant; and enacting minimum competence standards.
- **Ensuring TVET is relevant and demand-driven.** Close and continuous engagement between policy makers and industry is necessary to jointly agree on standards and curricula that meet the needs of the formal sector—and as much as possible, the informal sector as well. In particular, curricula should include entrepreneurship and business skills training, focus on supporting non-cognitive skills and not force students into narrow specialisations so they are able to adapt in the labour market.

4: Improve value for money and implementation across formal secondary education

On average, African countries spend around five to eight percent of GDP on education, which is above the internationally recommended level. However, in most countries, education spending will need to increase just to keep current primary and secondary enrolment rates constant, let alone achieve universal access, improve lower secondary completion rates and improve the overall quality of education. Countries will need to look towards greater domestic resource

mobilisation and ways to achieve better value for money from education budgets. Key policy actions include:

- **Seeking smart ways to lower costs.** Building new infrastructure is particularly expensive, but alternative measures such as adding new classrooms to existing primary or secondary schools or double-shifting, if accompanied by monitoring and evaluation plans to ensure quality, can help lower costs in the face of increased demand. Other potential measures include establishing virtual science labs in schools, replacing boarding schools with less costly day schools closer to student populations, relying on multi-skilled teachers to teach several subjects while streamlining the curriculum and, in certain cases, engaging the private sector to help provide capacity.
- **Establishing effective accountability systems.** These are critical for education systems of good quality and can, if designed and implemented effectively, deliver efficiencies as well, such as reducing teacher absenteeism and improving payroll and expenditure oversight. Credible education plans, transparent budgets with clear responsibilities and independent auditing procedures, help hold governments to account, while clear and sensible regulations with monitoring mechanisms are needed to support quality improvement measures. Successful implementation of accountability systems requires information to be transparent, timely, relevant and available to decision makers.
- **Ensuring capacity and political commitment.** Stronger institutional capacity, including political capacity to realise the scale of the reforms as well as prioritise and make difficult decisions between different population groups and sectors are needed. Governments also need to build capacity for evidence-based policies that consider cost effectiveness and create incentives to align behaviour of stakeholders towards achieving skills development objectives. Finally, better coordination of responsibilities and accountabilities within and between government ministries and agencies is key.



CHAPTER 1

Africa's Evolving Labour Force Landscape

Background and context

Sub-Saharan Africa (SSA) has the world's youngest population with more than three-fifths of its population in 2015 under the age of 25.¹ This constitutes 20 percent of the world's under-25 population. Africa² is yet to experience the demographic transition, so its young population is still growing at a fast rate. The region's working age population is estimated to rise from 522 million in 2015 to 600 million in 2030. The share of the youth (defined for the purpose of this study as those in the age bracket of 15 to 24) in the working age population, was 35.2 percent in 2015 (184 million) and is expected to rise to 36.9 percent in 2030 (260 million), which will be bigger than that in China.

With the right education and training, coupled with national transformation strategies and policies that provide the right environment for rapid economic growth and creation of employment opportunities, Africa's large and fast-growing youth population could be a great asset for development and a source of comparative advantage on world markets. However, Africa already faces high unemployment—which continues to be on the rise—and vulnerable employment among its youth. For 2015, using ILO's conventional definition, youth unemployment in Africa was 10.9 percent compared to that of adults (i.e. 25+ years) of 5.6 percent and an overall unemployment rate of 7.0 percent. However, using a broader definition of unemployment such as "Not in Employment Education and Training (NEET)" that is more reflective of actual conditions, the figure doubles. For instance, estimates from the labour force survey of Ghana in 2015 shows youth unemployment rate of 14.4 percent compared with 27.1 percent when the NEET concept is used.³

1: U.N. (2017) "World Population Prospects: The 2017 Revision", The United Nations

2: All references to "Africa" in this proposal should be interpreted as Sub-Saharan Africa (SSA), except where the contrary (i.e. continental Africa) is explicitly indicated.

3: Not in Employment Education and Training (NEET) refers to the proportion of the working age population that is neither working or in school or any kind of training. This includes the unemployed (based on the ILO strict definition) and those who fail to make effort to seek work for various reasons, referred to as discouraged workers.

In most African countries, over 80 percent of workers are in the informal sector, either in traditional agriculture or in urban informal economic activities, where under-employment and low-earnings are pervasive. Whereas in the past the unemployed and those in the informal sector in Africa were mainly the uneducated, now the face of unemployment and the urban informal sector is changing to become that of the secondary or tertiary school graduate. In countries like Ghana, of the 200,000 that enter the labour force each year, only 20,000 (i.e., 10 percent) find formal sector jobs. Indeed, the unemployment rate among secondary and tertiary school graduates are 24.4 and 15.4 percent respectively. Ghana is not unique in SSA. Similar trends can be found in countries such as Ethiopia, Kenya, Nigeria, Rwanda and Senegal.

The reasons for the growing educated unemployment in Africa stem from both the supply and demand sides. On the supply side, the numbers graduating from the secondary level in Africa have been rising due to the growing population, the rapid increase in access to primary school⁴ and the improving access to secondary and tertiary schools. Unfortunately, the pace of expansion in job demand in Africa's formal sectors have not matched the pace of graduation from secondary and tertiary institutions. To make matters worse, part of the job demand in the formal sector cannot be met by the secondary and tertiary graduates due either to the poor quality of their education or to specialisation in subject areas (e.g. arts and humanities) outside those that employers demand (e.g. in the science, technology and mathematics—STEM).

Projecting the recent economic and (formal) employment growth trends into the future, together with population estimates and even assuming the same secondary and tertiary school enrolment ratios and no fundamental changes in technological and global trade trends, presents a bleak picture of rising educated youth unemployment in Africa. But secondary enrolment ratios are not likely to stay the same. They will rise as political and social pressure mount in African countries to provide secondary school spaces for all the young children coming out of

4: Helped, in part, by the United Nation Educational, Scientific and Cultural Organisation's "Education for All" programmes.

the expanded and nearly universal primary education system. Already, several countries (including Ghana, Kenya and Uganda) have introduced free secondary education for all. Secondly, technology is not staying the same.

Indeed, what is often called the 4th Industrial Revolution—encompassing the rapid evolution of robotics, artificial intelligence, 3-D printing (or additive manufacturing technology) and the “internet-of-things” (IoT)—is fundamentally disrupting manufacturing technology, with significant implications for the nature and growth of jobs. One important implication is the diminished importance of labour as a factor in manufacturing production. Consequently, the need to reduce labour costs is becoming less important in the location decisions of global manufacturing companies and lead firms in global value chains. This is already causing a re-arrangement of the global constellation of manufacturing production, with some companies that had outsourced production bringing them back to their home or at least to neighboring countries.

This trend—“re-shoring”—is already shortening global value chains, affecting international trade and raising questions about appropriate economic development strategies for countries around the world, those in Africa included.⁵ For the past 15 to 20 years, the advice to African countries was simple: follow the East-Asian model. In other words, reduce costs by improving investment climates and focus on labour-intensive and export-oriented manufacturing to capitalise on labour-abundance and labour-cost advantage. This model has been shown to lead to fast growth and employment, mainly in assembly line jobs that often do not require many skills beyond basic literacy. However, with the current disruptive technological changes and its impacts on global production and trade, the way forward is not so clear. What preparation for the youth is needed for the new world order?

The challenge goes beyond developing a model of secondary education and training which prepares the youth for the new order. There are disruptors, both external and internal, which must be accounted for to ensure effective delivery. Among the external disruptors to the effective delivery of secondary education and training programmes are: (a) technological changes; (b) improved (and more

direct on shorter time-scales) access to information; (c) rapidly changing job and skills requirements, (e) increased migration (both domestic and international); and (e) faster turnover of enterprises and investment conditions. Internal challenges for secondary education do exist in most African countries.

Then there are often the internal issues: (a) outdated and overloaded curricula; (b) bureaucratic centralised administrative system and mismanagement; (c) high comparative unit-costs prohibiting expansion of secondary education; (e) fast turnover and serious shortages of teachers, combined with a lack of career development incentives; (e) unqualified teachers (in many disciplines, but notably in the sciences) who do not have adequate access to relevant and modern learning and teaching materials; (f) lack of access to facilitating technological tools for teaching; (g) crumbling infrastructure and serious shortages of secondary education-ready facilities; and (h) inflexible and sometimes outdated legal and regulatory frameworks through which to pursue recourse when needed.

These disruptors for secondary education will also carry social implications. As has been seen in many middle-income countries, populations tend to demand more and better services—and life-improving conditions overall—as the level and quality of secondary education improves. This scenario almost always creates a more volatile social and political environment, which can disrupt economic flows.

In addition to the internal and external disruptors, economic transformation has been slow, which has hampered growth in productive jobs. The structure of most African economies has not changed much over the past 40 years. Production and exports are still based on a narrow range of commodities; the share of manufacturing in production and exports remains relatively low, as do the levels of technology and productivity across economies. Employment transformation, which usually lags transformation in output, is likely to take time, meaning most young people will continue to face work in the informal sector despite many hoping for a stable wage job in the formal sector. Thus, for African countries with comparatively little industry and a job creation crisis, discussion of the future of work must be grounded in current realities. Across the continent, these realities include “jobless growth” and deficits in infrastructure, skills and the application of modern technology.

African countries are recognising the urgent need for tailored strategies for the future of work, even as the unfolding technological revolution is speeding up the present. Key to this are: (1) transformative strategies that promote job creation and boost productivity in labour-intensive

5: ACET, African Transformation Report I – Growth with DEPTH” World Bank (2017), The Future of Manufacturing-led Development; Schwab, Klaus (2016) The Fourth Industrial Revolution: What it means, how to respond, World Economic Forum (Jan 14, 2016); World Economic Forum (2017), The Future of Jobs and Skills in Africa: Preparing the Region for the Fourth Industrial Revolution; McKinsey Global Institute, A Future that Works: Automation, Employment and Productivity (January 2017).

sectors and (2) ensuring young people have the skills for productive and fulfilling work. Countries across the region have invested significantly in education and access to primary education has improved substantially. However, progress against commitments made by education ministers to ensure basic education⁶ for all has been slow. In Sub-Saharan Africa, one in five children are excluded from primary school and education attainment remains relatively low. Many Africans are not developing the skills they need for productive employment.

A strategic approach to skills investment that covers all skills, from literacy and basic to tertiary education that is aligned with evolving labour market demands, is crucial for successful transformation. This paper focuses on recommendations for reforming the secondary education phase. Improving its quality, relevance and efficiency, as well as increasing access, will require major, time-consuming and costly reforms, not only in secondary but in the earlier stages of the education system as well. Such efforts will be extremely challenging, given limited funding and a rapidly expanding school-aged population, alongside a large adult population without a good basic education. Furthermore, countries face unprecedented global challenges of relatively high international economic competition, a need for a wider range of skills and ability for workers to adapt to key global trends, such as 4IR.

No other region has ever faced the magnitude of the education challenges most SSA countries will face over the next couple of decades. Strong institutions, including political capacity to make resource trade-offs between population groups and sectors will be needed. These trade-offs are much starker for Sub-Saharan Africa than for other regions, where the demographic transition is completed, universal primary education and literacy are achieved and the economic transformation is much more advanced.

Objectives of the study

The objective of this background paper is to try to determine, in light of the likely disruptive evolution of technology and global trade and urbanisation, what African countries should do to provide productive jobs for their large and fast-growing youth population.

The focus will be on secondary education. By secondary education, we mean education that

comes after primary education (i.e., the first six years of school), but before tertiary or university level education. It includes both academic-oriented secondary schools (both lower and higher) and technical and vocational training institutes (TVETs). In terms of age, we are referring to education from year 13 to 21. Conventionally, the six years of secondary education should span the years from 13 to 18, but in Africa, due to late starts in school and repetition, the wider age bracket may be more realistic.

As already noted, Africa has a large and growing number of youth who are engaged in the informal sector. Most have completed primary education and many have either completed secondary education or have dropped out after some years of secondary education. Many, particularly those with secondary education, are in the informal sector, but not by choice. They aspire to something more formal and remunerative but are held back by both the slow growth of formal sector jobs and their own inadequate training. Furthermore, even if the formal academic secondary school and TVET systems could be successfully reformed, between now and 2030 it is unlikely that African economies can provide enough remunerative jobs in the formal sector for all the prospective graduates. A significant number of them will also end up in the informal sector to add to those already there. So, from an employment and income generating perspective, it is imperative to also focus on how secondary education can prepare graduates to venture off on their own into more productive informal sector activities, including farming.

Thus, this review aims to answer the following questions:

1. What are the jobs that are likely to be available or the jobs that African countries should target in the future—i.e., by 2030—in light of: (1) evolving disruptive technological changes and expected 4IR impacts and (2) countries' own natural comparative advantages?
2. What growth strategies should African countries adopt to pursue these job opportunities?
3. What changes should African countries make to their secondary level education systems to prepare graduates to successfully take advantage of the productive opportunities, including in the informal sector and agriculture, in the face of the evolving landscape?

The review will stay at the macro level in terms of the types of jobs for which Africa should prepare its secondary school graduates to be able to acquire—the types of institutions and training programmes needed and the balance and linkages between them.

6: Basic education is up to and including lower secondary education.

The review will not discuss the micro-level issues of how to run particular institutions and training programmes.

Conceptual framework, methodology and structure

The conceptual framework of the review is rooted in a model of the 4IR ecosystem and the four interrelated domains that will unleash the dynamics of future work and achieve inclusive growth—and in turn, spur innovation, productivity, demand and, most importantly, jobs (see Figure 1.1).

The first domain concerns the **labour force and market, education and skills**. This relates to demographic, labour supply and labour market dynamics and to education and skills development issues—such as access, quality and relevance at all levels, including technical and vocational education and training and apprenticeship and their alignment with the requirements of the 4IR and their impact on jobs.

The second domain is the **enabling infrastructure**, which is the backbone for 4IR uptake; it is internet penetration, with a focus on coverage (fiber optic cable, broadband), quality (speed and reliability) and cost (affordability). Internet penetration is fundamental to 4IR uptake. While energy, power and transport are important, they are not unique to 4IR and are assumed as given and thus are not treated in this framework.

The third domain, **Innovation systems**, refers to the type of technologies employed and deployed, as well as the supportive environment to facilitate 4IR uptake, scaling up and commercialisation.

The **regulatory and investment climates**, the fourth domain, ties the first three domains together as the drivers to unleash the full potential of 4IR. The coordination and management of all four domains determine the nature and scope of the impact of the 4IR on productivity, job creation and inclusive growth (Figure 1.1).

Figure 1.1: The 4IR ecosystem: Four domains for unleashing dynamism



Source: ACET June 27, *The Future of Work and 4IR*, ACET report (2017 commissioned by AfDB).

The study methodology is largely based on an extensive desk review of the literature. It also includes two case studies: Ghana and Senegal, which explore employment prospects in 3 key economic sectors (ICT, hospitality and agri-business) and the implications for the secondary education and TVET systems in each country. Annex I describes the technologies driving the Fourth Industrial Revolution and the remaining elements of the 4IR ecosystem. Annex II sets out the Senegal case study and Annex III sets out the Ghana case study.

The review begins by analysing the current and future employment challenges that lie ahead for the growing youth population in Africa, with a focus on the potential impact of rapid technology advances due to 4IR innovations. We consider five sectors that have high potential for job creation under 4IR. We then take a similar approach to Fox and Filmer (2014) in focusing on two constraints for achieving productive work in each of these sectors:

- 1. Business environment:** the factors that affect productivity but are not in a worker's immediate control, such as access to finance and infrastructure. This also includes access to technology, which we consider through the lens of 4IR, as well as government policies and regulations.
- 2. Human capital:** the skills, education and ability of workers, but with a focus on secondary education and formal sector TVET and skills needs under 4IR. This also includes networks and connections that help people find productive work, but these factors are not explored in this paper.

Chapter 2 reviews the demographic and labour market trends shaping Africa's jobs landscape, including a brief overview of women and youth employment challenges and an assessment of education and skills development in African economies. The chapter scans the literature on the impact of 4IR on the labour market and reports on simple modelling scenarios for the impact of 4IR on job creation. It ends with observations on the prospects for achieving the demographic dividend in Africa and briefly considers the emigration challenges.

Chapter 3 considers the potential for job creation across key sectors under 4IR and looks at pathways to boost growth, employment and productivity in those sectors. It also considers core strategies under economic transformation to ensure the potential job benefits of 4IR are realised.

Chapter 4 considers the current education landscape and reasons behind the learning crises.

Chapter 5 recommends policies to improve formal secondary education and TVET outcomes.

References and Annex case studies also are included.



CHAPTER 2

Labour Force Challenges and the Fourth Industrial Revolution

The demographic and labour market forces shaping Africa's jobs landscape include the special challenges of female and youth employment and the relevance and reach of education and skills development. A broad overview of the literature on the impact of 4IR on the labour market and simple modelling scenarios on job creation reveal that 4IR has significant potential to increase productivity, especially in the most dynamic parts of the agriculture and services sectors. Falling birth rates are bringing the demographic dividend within reach in African countries, suggesting that it can be accelerated with the right policies. Finally, with aging populations elsewhere, Africa will drive global growth in the working age population, which, after expanding rapidly for several decades, is slowing—except in Africa—and will start to decline by around 2050. Thus, integrating the African labour force into global supply chains would be beneficial both to Africa and to other regions.

Labour Force and Employment – Structure and Trends

Sub-Saharan Africa's working age population (15-64) will reach nearly 900m by 2030, from about 585 million in 2017. As fertility rates continue to decline, the rate of population growth is expected to fall from 2.8 percent per year (2010 to 2017) to 2.5 percent per year (2017 to 2030) and so the age-based dependency ratio is also forecast to fall, from 0.85 to 0.74. This predominantly youthful workforce with abundant energy and skills will need to be deployed effectively.

However, the current structure of the labour force is also a major challenge. Table 2.1 below presents an uninspiring labour force landscape spanning nearly two decades (2000–2018): (a) employment growth stagnated at 3 percent; (b) the proportion of working poor averaged 43 percent; (c) about 73 percent of the labour force were in vulnerable employment⁷; (d) unemployment averaged 7 percent,

7: Vulnerable employment: the share of self-employment and unpaid family work in total employment (who are less likely to have formal work arrangements and are therefore more likely to lack elements associated with decent employment, such as adequate social security and a voice at work)

but underemployment—not being able to work as many hours as desired—is often much higher (AfDB, 2018, [Bolton, 2016](#) and [Handel et al 2016](#)); and (e) productivity growth (which is one indicator of a transformed economy) has been in decline, decreasing from 3.1 to -0.7 during the same period. The average productivity growth is 1.3 over the same period.

The structure of the labour force when further disaggregated by gender, is equally less inspiring for working women. The trends spanning nearly two decades (2000–2018; Table 2.1) put women at a disadvantage: (a) the proportion of working poor women averaged 45 percent against 43 percent for men; (b) labour force participation among women averaged 64 percent compared to 75 percent among men; and (c) unemployment rate averaged 8 percent for women, against 6 percent for men. A high labour force participation rate combined with a low unemployment rate is a sure sign of a robust job market—but the reverse is seen from the table below—indicating a frail labour market outlook for women in Sub-Saharan Africa. Also employment to population ratio for women in Sub-Saharan Africa over this period averaged 58 percent comparing unfavourably to 70 percent for men⁸.

Imperceptible shifts in the sectoral composition of employment have also taken place over the last decade, with little evidence of a structural change in employment. A large share of the growth in non-farm employment in the past few decades has been in household enterprises—unincorporated, non-farm businesses owned by households rather than modern industrial or services enterprises as would be expected under transformation. And most workers in the region are still in the agriculture sector, which has yet to see rapid productivity growth as in expanding economies outside Africa (Fox and Thomas, 2016). Most workers are also self-employed—around 80 percent in low income countries and around 60 percent in lower-middle income countries in the region (ILOSTAT, 2017).

8: In general, a high ratio is 70 percent and above employment rate to the working-age population, whereas a ratio below 50 percent is considered low.

Table 2.1: labour Market Indicators and Trends in Africa (%)

	2000-2007			2008-2013			2014 -2018		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Labour Force Participation	75.1	62.9	68.9	74.5	63.9	69.1	74.0	64.4	69.1
Unemployment Rate	6.6	9.1	7.8	5.9	7.9	6.9	6.1	7.9	6.9
Employment Growth*	-	-	3.0	-	-	3.1	-	-	2.9
Employment to population ratio	70.1	57.1	63.5	70.1	58.8	64.3	69.5	59.3	64.4
Vulnerable Employment*	-	-	74.3	-	-	72.6	-	-	71.4
Working Poverty (less than \$1.90 per day)	50.5	52.1	50.5	42.6	43.9	42.6	36.7	37.9	36.9
Productivity growth*	-	-	3.1	-	-	1.6	-	-	-0.7

Source: KILM-ilostat.org, accessed 05 December 2018 *Indicator not disaggregated by gender

Employment projections to 2030 suggest this picture is not going to change soon (Figure 2.1):

- **Agriculture** will continue to dominate employment in the low and lower middle-income economies in the region, providing about two-thirds of total employment during the period.
- **The services sector**—including trade, transportation, finance and other commercial services—dominates employment in the upper middle-income economies and ranks second in the two categories of low-income economies.
- **The manufacturing sector** provides the least employment—6.5 percent of total employment—in all three country income categories and shows no dynamism in job creation potential. This raises concerns about manufacturing-led industrialisation in Africa.

The services sub-sectors are the most dynamic in terms of job creation. Productivity growth in the agriculture sector, measured by real value added per employee, is relatively high (2.5 percent), but in part reflecting its relatively low starting position ([World Bank Group 2014](#)). Manufacturing productivity growth has been disappointingly low; this sector typically helps spur on aggregate productivity growth as exporting firms become more productive through their exposure to foreign goods and markets and these benefits spill over into the rest of the economy.

Employment across the continent is largely informal, with on average close to 80 percent of total employment in the informal economy.

As shown in Figure 2.3, while age variations in employment are distinctively similar across regions, an interesting regional variation can be discerned in the level of informal employment. The share of informal employment in total employment shows a bunching close to 90 percent for three of SSA regions: Western, Eastern and Central. Southern Africa has the lowest, below 40 percent for adults 25 year and over. The Northern Africa region also shows lower share of informal employment, much lower than the African average.

Informal employment falls with education attainment (Figure 2.3).

The highest informality is found among those with no education (about 90 percent). This drops precipitously across all regions to below 50 percent for tertiary education. Southern Africa is an interesting outlier, where even informality among those without education is lower than those with secondary education in other regions except Northern Africa.

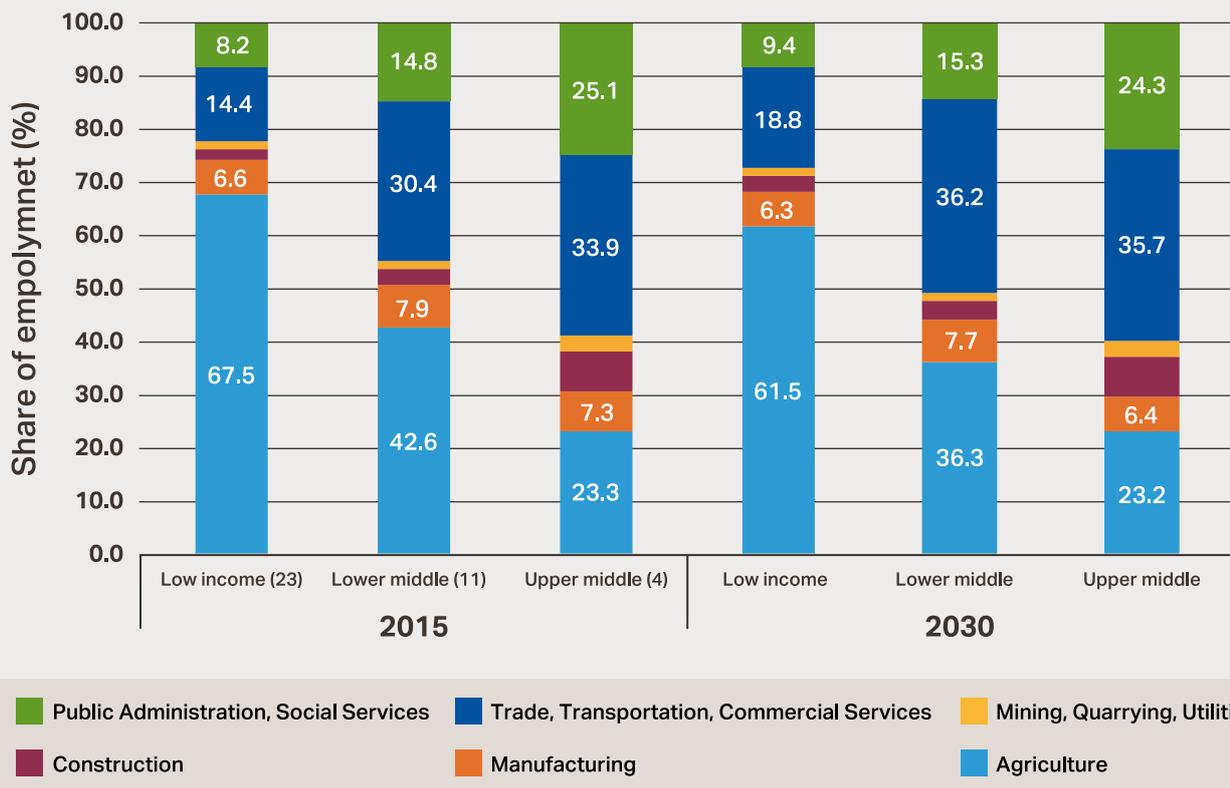
Countries with a higher share of informal employment in total employment also have a higher share of informal economy in GDP (Figure 2.4). Mauritius, South Africa, Rwanda and Namibia, have a lower share of informal economy in GDP (20-30 percent) compared to countries such as Nigeria, Tanzania and Benin with between 40 to 60 percent of GDP contributed by the informal economy.

Thus, while economic growth has been decent in most countries – above 5 percent during the period – it has not translated into sustained creation of decent jobs. Indeed, Benjamine and Mbaye (2014) indicate some 90 percent of jobs created are in the low-productivity informal sector. Inequality is also higher in Sub-Saharan Africa than in other developing regions⁹, underscoring the fact that growth is not widely shared. Growth has fallen well below 5 percent recently and is projected to be around 4 percent in the

medium term (IMF, 2018). Yet the average employment to GDP elasticity for SSA is just 0.41 (African Economic Outlook, AfDB, 2018), which means that the economy must grow by at least 6.8 percent annually just to absorb the expected increase in the labour force (of around 2.8 percent a year). This is twice the region’s average growth rate between 2014 and 2016 and above the medium-term forecast, which adds to the youth employment challenge.

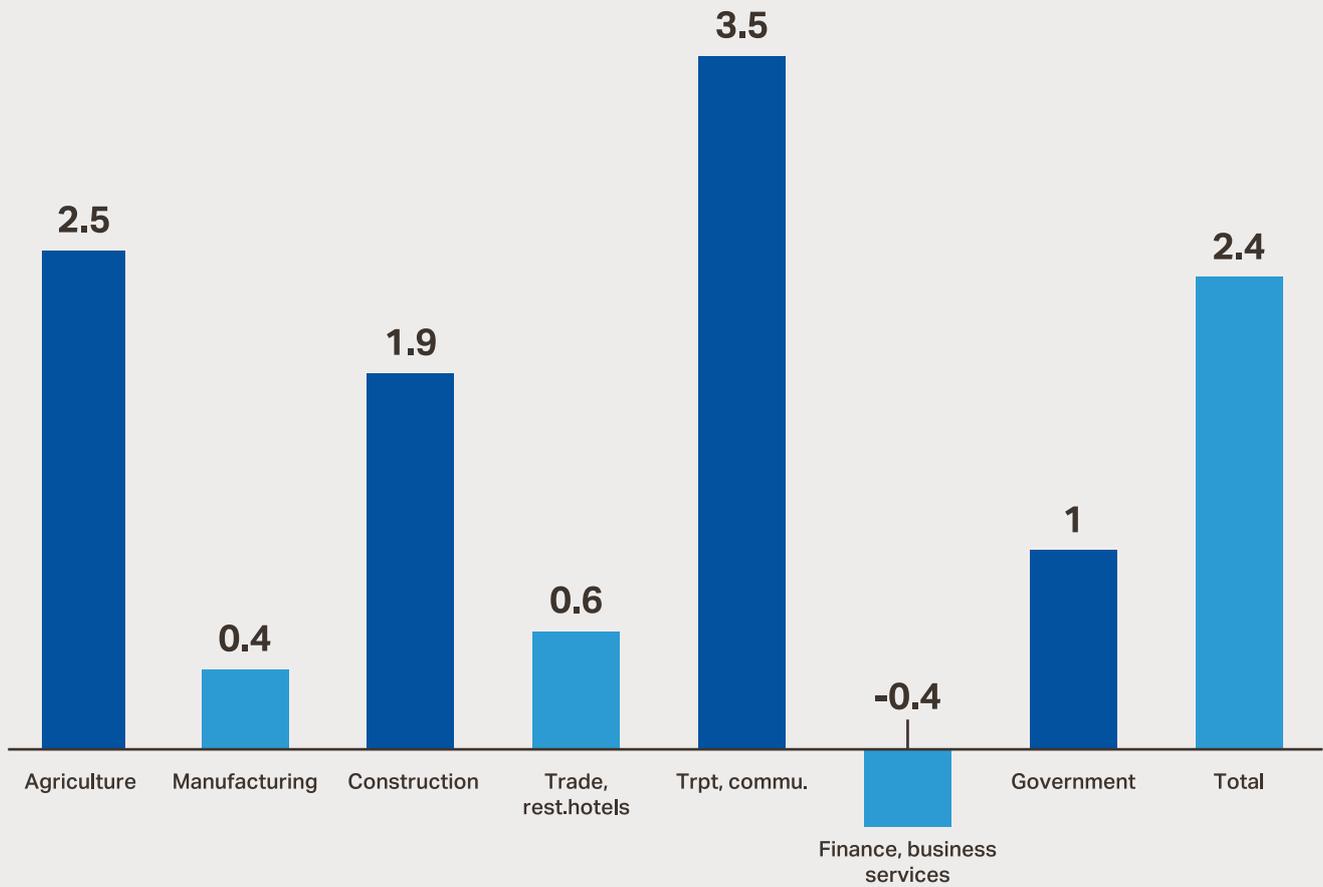
9: Although this masks differences within the region. South Africa, Namibia, Botswana, Central African Republic, Comoros, Zambia and Lesotho have particularly high inequality. Between 1990 and 2011, inequality fell in agricultural economies in West and East Africa, while inequality rose in oil and resource rich countries in Central and Southern Africa. (UNDP, 2017)

Figure 2.1: Share of employment, by economic activity and country income group, 2015 and 2030 (%), in SSA



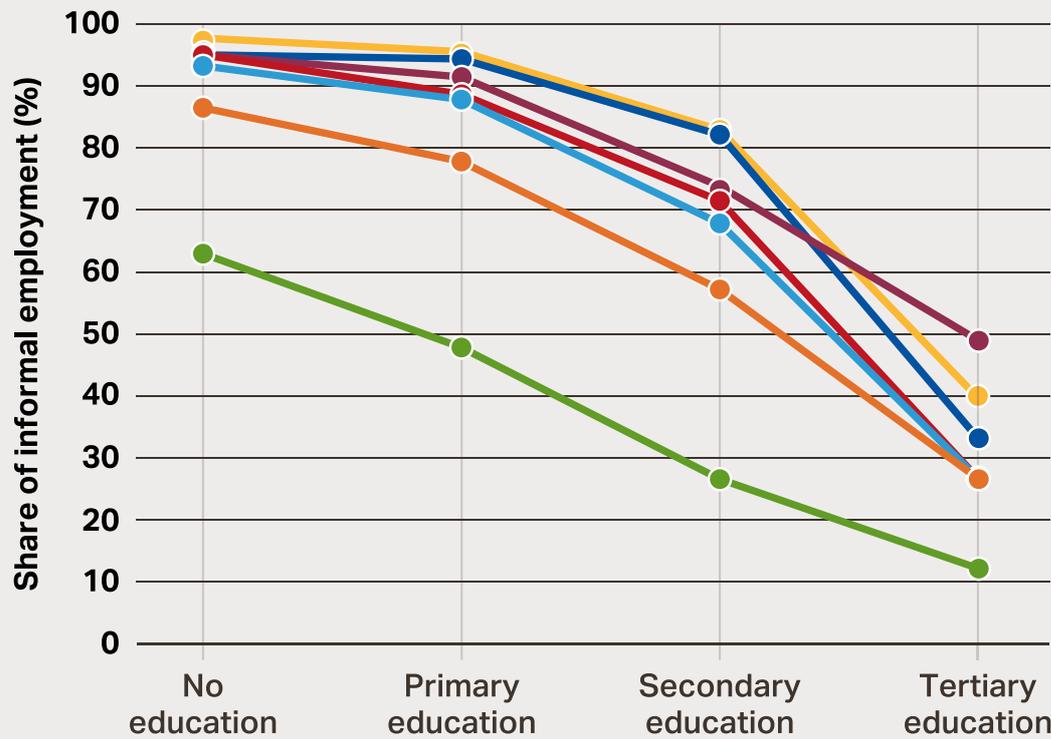
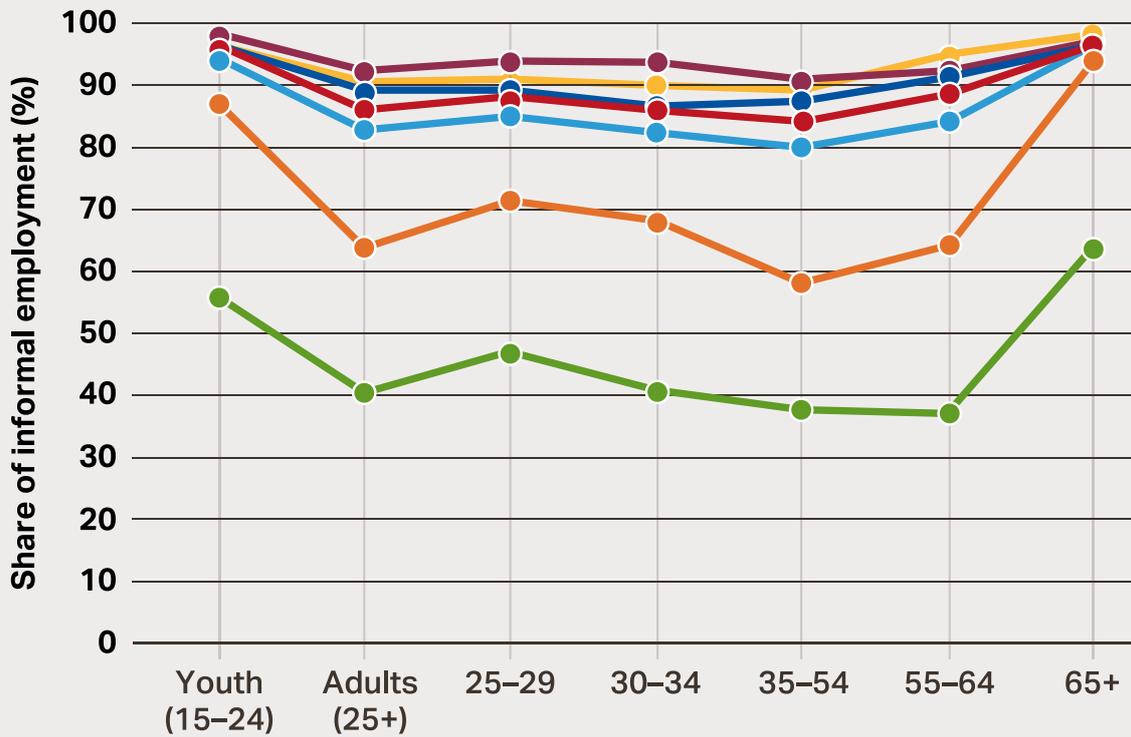
Source: ILOSTAT modelled estimates and projections (November 2017) and Timmer et al (2015)

Figure 2.2: Average annual growth of real value added per employee in Africa, 1995-2010 (%)



Source: ILOSTAT modelled estimates and projections (November 2017) and Timmer et al (2015)

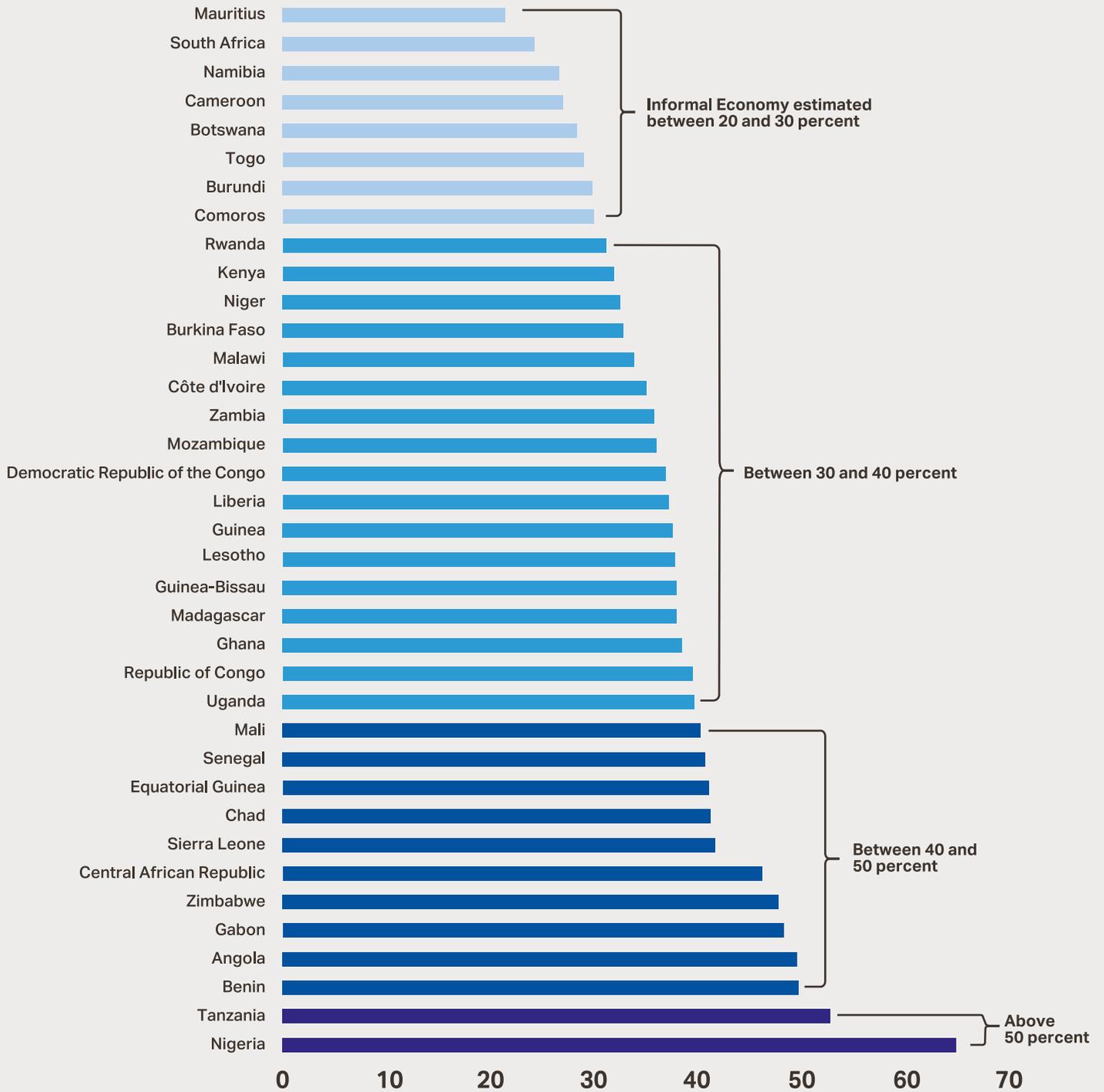
Figure 2.3: Informal Employment, by Region, Age and Level of Schooling



- Africa —●— Northern Africa —●— Sub-Saharan Africa —●— Central Africa
- Eastern Africa —●— Southern Africa —●— Western Africa

Source: ILOSTAT, 2017

Figure: 2.4: Informal Economy -Average Share of GDP (2010-2014)



Note that the employment share of informal work is considerably higher than the GDP share

Source: IMF 2017

Box 2.1: The informal economy

The informal economy is defined as “all activities that are, in law or practice, not covered or insufficiently covered by formal arrangements”. Workers in the informal economy often are not registered, do not appear in the national statistics and are not covered by social protection, labour legislation or other protective measures in the workplace. Work can be unsafe and unhealthy, a worker’s employment status can be uncertain and productivity and incomes are often low. As a result, work is often insecure and vulnerable. Furthermore, workers often lack access to productive resources such as finance and land, which combined with low skills, confines them to low income work. However, not everyone in the informal economy is poor – some even earn more than in the formal sector (Fox and Filmer 2014). There may also be formal firms in the informal economy that voluntarily remain informal to avoid tax or registering workers. The informal economy comprises workers in the informal sector as well as informal workers outside the sector, such as:

- Own-account workers (self-employed with no employees) in their own informal sector enterprises;
- Employers (self-employed with employees) in their own informal sector enterprises;
- Contributing family workers, irrespective of type of enterprise (whether formal or informal);
- Members of informal producers’ cooperatives (not established as legal entities);
- Employees holding informal jobs as defined according to the employment relationship (in law or in practice, jobs not subject to national labour legislation, income taxation, social protection or entitlement to certain employment benefits (paid annual or sick leave, etc.);
- Own-account workers engaged in production of goods exclusively for use by their household.

Multiple factors drive informality, which vary by country context. In developing countries, economic downturns force people into the informal economy, but they often struggle to move into the formal system once the economy picks up. Lack of education and recognition of skills gained in the informal economy prevent people from entering the formal system, while discrimination acts as a barrier for many disadvantaged groups, including women. Another driver is the inability of the industrial sector to create enough productive jobs, so people move to the services sector. Flexible working arrangements are also becoming more common.

ILO (2013) The informal economy and decent work: a policy resource guide supporting transitions to formality

Women and youth employment

The employment situation has a disproportionately negative impact on women and youth. Women are overrepresented in the informal sector—89 percent of employed women work in this sector—and are also more likely than men to be underemployed (UN¹⁰ and AfDB, 2017). Gender differences tend to be more pronounced in countries with high levels of youth unemployment (AfDB, 2015).

The predominantly youthful workforce makes it all the more urgent to meet Africa’s current employment challenge, which is essentially a youth employment challenge. The rate of unemployment

among the youth is estimated to be double that of adults in most African countries (AfDB, 2017). NEET (not in education, employment or training) rates are higher than the average rate in developed countries, with young females disproportionately more likely to be NEET than men (ILO, 2017). Young people in work are more likely to be in the informal sector and about a third of young people aged between 18 and 35, who are not students, are vulnerably employed¹¹. As a result, there is an aspirations gap—where some young people’s expectations of work in a stable wage-paying job in the formal sector aren’t being met—while productivity and so earnings remain low.

11: This applies to the continent, not just SSA..

10: <http://www.unwomen.org/en/news/in-focus/csw61/women-in-informal-economy>

Youth unemployment and underemployment are already contributing to new challenges at home and abroad. Forty percent of youth joining the ranks of rebel and terror groups cite the lack of economic opportunity as the key motivation (AfDB, 2017). Many youth are also migrating to search for jobs, many are aided by criminal networks smuggling people, especially to Europe. This is a particularly dangerous option—over 3,500 people, many of them young, died in the Mediterranean in 2015 while trying to make the perilous journey (AfDB, 2015¹²).

The challenge will become even bigger. Africa's youth population is expected to double to more than 400 million by 2050 (UN, 2017¹³). If these young people are equipped with appropriate education and training and if favourable economic policies that support job creation are implemented, this population surge could be an economic boon (Bloom, Canning and Sevilla, 2003). But it could also be a bomb. If youth unemployment rates remain unchanged, nearly 50 percent of those young people (excluding students) will be unemployed, discouraged, or economically inactive by 2025 (AfDB, 2016). It is instructive to note that the "Arab Spring" that started in Tunisia was due to a combination of highly educated and unemployed youth.¹⁴ The emergence of unemployed graduates' associations in some countries points to coming agitation if softer means of engagement fail.¹⁵

Education and skills

Compared to other regions of the world, educational attainment in Africa is low. Less than a third of adults have completed primary education compared to nearly all adults in advanced economies (UNDP, Human Development Report 2016). Access to primary education and completion rates in primary and lower secondary have improved substantially over recent years, yet rates remain low. Around 30 percent of lower secondary school aged children enrol in the phase¹⁶ and just 35 percent of students complete it (UIS, 2017 and UNESCO, 2017¹⁷). These averages

mask significant variation across countries: fewer than 60 percent of children in lower-income countries in SSA complete primary school, while the top 20 percent countries have a completion rate of over 90 percent. Around 50 percent of lower secondary school age young adults enrol in the phase in Ghana, compared to just under 20 percent in Mozambique and 30 percent in Malawi (World Bank Edstats, 2015). Children in conflict-affected countries are less likely to complete school (World Bank 2018). For example, the primary net enrolment rate was around 40 percent in conflict affected South Sudan in 2011, compared to 78 percent in its neighbouring country, Ethiopia.

Around one in five children of primary school age are still denied the right to education (World Bank 2018 and UIS 2018), a rate that rises to nearly 35 percent at lower secondary education. A disproportionate number of those excluded are from marginalised groups, including females (Figure 2.5) and rural areas (Bashir et al 2018).

According to the UNESCO's 2016 projections, SSA is at risk of falling further behind other regions in terms of education attainment. They project that only eight percent of countries in SSA will achieve universal lower secondary education by 2030 and only if education progresses at the fastest rate the region has ever seen. This compares to 70 percent in Southern Asia, 60 percent in Latin America and the Caribbean and 80 percent in Northern Africa and Western Asia.

The quality of education is also poor. The challenge of low attainment is compounded by the fact that those who get schooling do not learn much. For example, in SSA, less than 7 percent of students in late primary school are proficient in reading, against 14 percent in Mathematics (Figure 2.6). Three quarters of primary school students in Kenya, Tanzania and Uganda were unable to understand the sentence "The name of the dog is Puppy". There is also a learning gap between students from poor and rich families which widens as children move up through education grades (World Bank 2018).

Such low levels of attainment at primary school affect future learning outcomes and preparedness for future jobs. For example, nearly 80 percent of Ghana's working age population are only able to understand basic texts and cannot "integrate, evaluate and interpret information from a variety of text materials" (World Bank 2018). Yet most job training and productive jobs require a higher level of literacy and increasingly so, as technology changes will shift the focus towards cognitive and non-cognitive tasks in jobs (ibid).

12: This paragraph uses data for the continent, not just SSA.

13: World Population Prospects: The 2017 Revision

14: In Tunisia, the 2007 unemployment rate for university graduates was 40 percent, compared with 24 percent for non-graduates (AfDB, 2015).

15: Observers have noted that high unemployment is not enough by itself to lead to an uprising; additional compounding factors tend to be present. For example, in North Africa, the compounding factors were a sense of social injustice and the need for dignity (UNESCO, 2011).

16: Net enrolment rate - so doesn't include children of lower secondary school age who are enrolled in other phases of education

17: Net enrolment rates from UIS stat and completion rates from: <https://data.unicef.org/topic/education/secondary-education/>

Fig 2.5: Lower secondary out of school rate (%) by region and sex, 2014

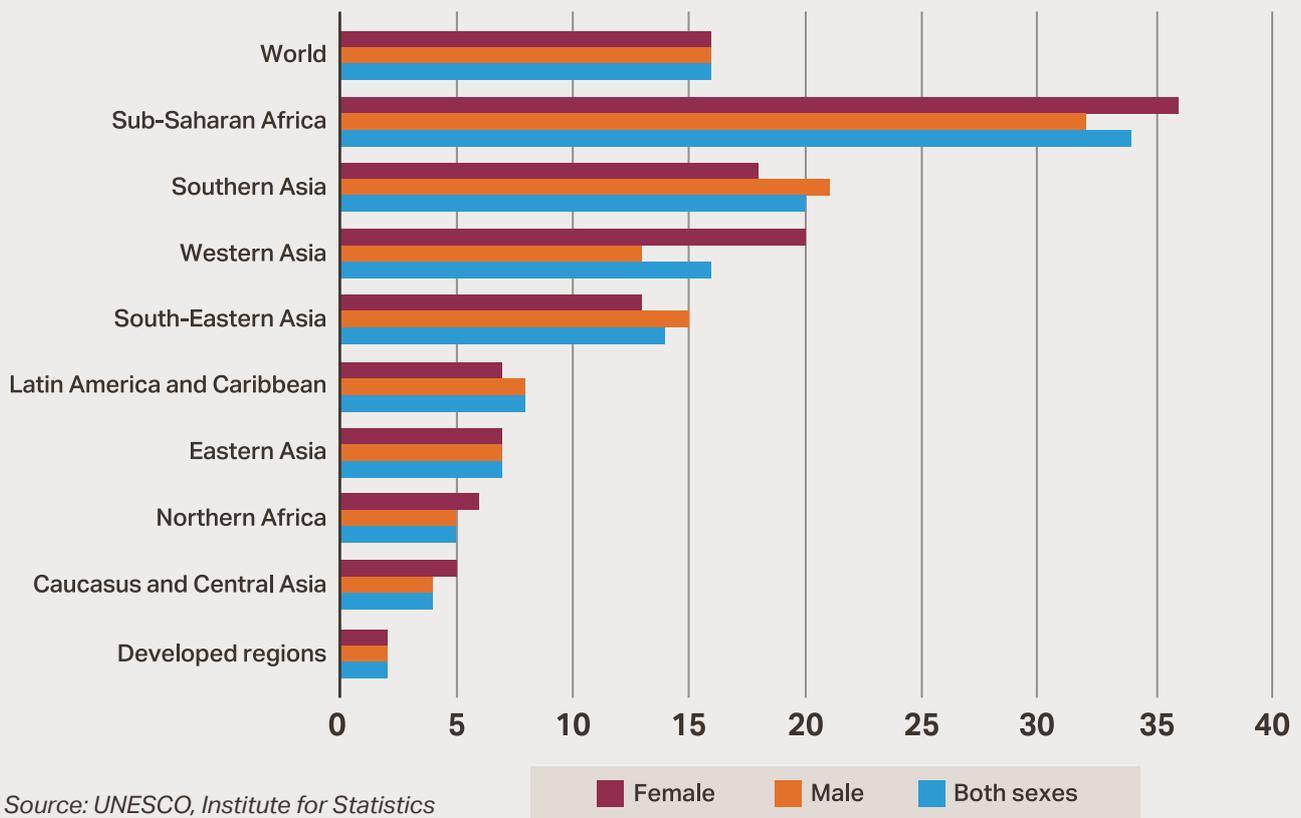
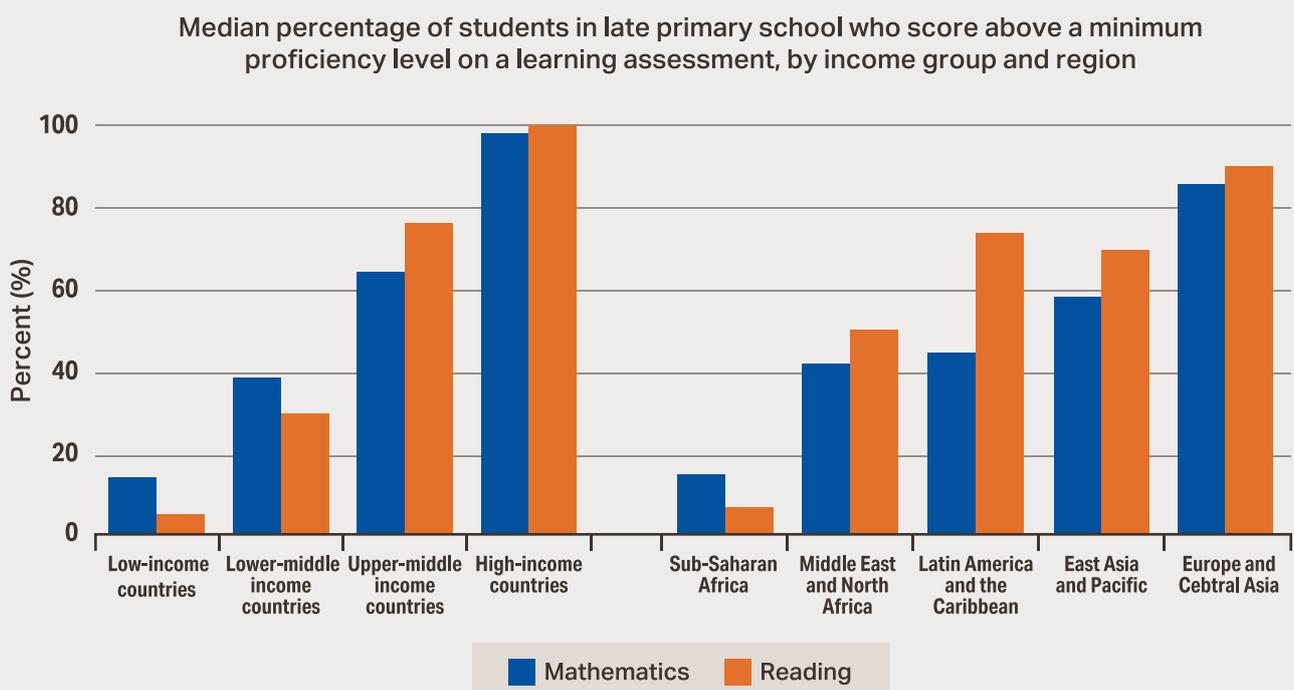


Figure 2.6: Primary school pupils not meeting basic learning level in literacy, 2017



Enrolment in STEM-related programmes, which are crucial for driving transformation especially under 4IR, is relatively low. In 2010, the share of college students in engineering, manufacturing and construction programmes was 7 percent in Burkina Faso, 3 percent in Burundi, 4 percent in Cameroon, 6 percent in Madagascar and Ghana and 13 percent in Morocco. Comparable data for Austria, Germany, Malaysia and Mexico were all above 20 percent (AfDB, 2018). Sub-Saharan Africa also produces less than 1 percent of the world’s research output, which remains a far cry from its share of global population at 12 percent (R4D 2016; UIS 2015; Blom et al., 2017; World Bank 2018).

MGI (2016) estimates that Africa needs to enrol 33 million young Africans in vocational and technical education in secondary schools by 2025 compared to four million in 2012 to support transformation. To be sure, secondary enrolment ratios are not likely to stay the same. They will rise as political and social pressures mount in African countries to provide secondary school and TVET spaces for all the children coming out of the expanded and nearly universal primary education system. Already, several countries (including Ghana, Kenya and Uganda) have introduced free secondary education for all.

Tertiary education access is also relatively low. The gross enrolment rate in tertiary institutions is under 10 percent in Sub-Saharan Africa compared to around 50 percent in China and just over 25 percent in India (World Bank Edstats, accessed June 2018). According to MGI (2016), Africa would need to put 16 million students through university in 2025, up from 6 million in 2013, to match India’s enrolment rate of secondary students in university.

Many SSA countries report skills gaps among firms. The WEF (2017) found that employers in Africa identify an inadequately skilled workforce as a major constraint to their businesses; this includes around 40 percent of all firms in Tanzania and 30 percent in Kenya. As economies and sectors grow, skills constraints are likely to become more binding (Fox and Filmer 2014). Many youth are ill-prepared to fill the few openings because they do not have the skills required by employers (AfDB 2015) due either to the poor quality of their education or specialisation in subject areas (such as arts and humanities) other than those that employers demand (such as science, technology, engineering and mathematics, STEM).

However, Fox et al (2016) and Fox and Kaul (2018) argue that the binding constraint is a lack of labour demand in the formal wage sector. Many young people aspire for work in a formal wage-paying enterprise, but the size of the sector is small and there are not enough jobs available to meet demand. The gap between opportunities available and the aspirations of youth is the result of a slow pace in demographic transition and slow growth in a modern, export-oriented sector (Fox and Thomas, 2016). Each year, 10-12 million youth, many educated, enter the workforce, yet only three million formal jobs are created (AfDB, 2017¹⁸). As a result, young graduates either face low earnings in the informal sector and underemployment, especially in rural areas, or for those who can afford it, a typically protracted period of job search. Youth unemployment is often high among (secondary and tertiary) graduates from rich households in urban areas and in upper income countries with broad safety nets (Fox et al 2016; Table 2.2).

18: Africa here is the continent, not just SSA

Table 2.2: (ILOSTAT, 2017)

Unemployment rate, by education in selected countries			
	Basic	Intermediate ¹	Advanced
Ghana (2015)	4.8	15.2	5.9
Burkina Faso (2014)	8.4	11.2	16.6
Senegal (2015)	6.5	11.6	14.3
Rwanda (2014)	1.2	12.4	13.0
Sierra Leone (2014)	6.1	9.4	11.9
Uganda (2012)	6.2	20.0	14.6
Tanzania (2014)	6.5	4.0	8.5

1: Intermediate education comprises upper secondary or post-secondary non-tertiary education. Advanced includes short-cycle tertiary education, a bachelor’s degree or equivalent education level, a master’s degree or equivalent education level, or doctoral degree or equivalent education level.

Creating jobs in the formal sector is important, but even with extraordinary job growth, it would only generate a relatively small number of jobs for Africa's growing workforce. Fox et al (2016) project that most new entrants to the labour market, particularly the less skilled, will need to create their own livelihoods in the informal sector in the foreseeable future. Therefore, the bigger challenge facing governments is how to improve the productivity of the 80 percent of the workforce in informal employment. This will require addressing the low qualifications in the workforce (supply side) as well as constraints in the business environment (demand side) to creating more productive opportunities.

Global trends

Countries in the region face several global and regional trends that offer opportunities and challenges to transformation—the move from lower to higher productivity sectors and raising in-sector productivity growth—and so need to be factored in to country transformation strategies.

For example, many countries are experiencing rapid urbanisation which can be a boon for innovation and rapid economic growth due to productivity and skills spillovers (Fox and Filmer 2014), but it also presents a challenge for governments in supporting those left behind in rural areas. Climate change, a major global trend, threatens productivity in key sectors such as agriculture. Adapting to climate change will require re-training for low and middle skill workers, but there are opportunities for particularly high-skilled workers in creating green industries (UNESCO, 2016). Two major trends are explored in more detail below: a growing youth population and the potential for a demographic dividend and rapid advances in technology.

Demographic dividend

Africa is yet to experience the demographic transition that propelled rapid economic growth in East Asia by expanding the working age population and simultaneously decreasing the dependency ratio.¹⁹ Population growth rates since 2005 have been hovering around 2.8 percent annually, almost doubling the continent's population during the period (ILOSTAT, 2017). Thus, education and skills challenges in Africa are exacerbated by the unabated demographic headwinds. In East Asia, in addition to inclusive

19: To be sure, a few countries have progressed considerably (e.g., Tunisia), with fertility rates that are below replacement levels, but most African countries in the past decade are demonstrating surprising delays in the transition. Some countries are showing very little movement along the natural transition and are stuck at very high fertility rates (World Bank, 2015). <http://documents.worldbank.org/curated/en/131891468179371220/pdf/100383-PUB-PUBLIC-Box393231B.pdf>

transformative policies, savings generated by the demographic dividend enabled increased investment in primary, secondary and technical education and skills development. Thus, the impact of the dividend was huge. Bloom et al (2016) attribute a full one-third of the Asian growth miracle, between 1975 through 2010, to the demographic dividend experienced in the region during the period.

While achieving a demographic dividend is within reach, the demographic transition in Africa has been slow. In 2015, the average total fertility rate (TFR) was still 4.4 and much higher at 5.3 in West Africa, 2.3 in Southern Africa; 5.2 in Central Africa; and 4.5 in East Africa (Ngom, 2017). A lower TFR means that the working age population increases while capital dilution is reduced, which also holds back structural changes in employment (i.e., moves from low productivity work in the informal sector to higher productivity work in enterprises (formal sector), Fox and Kaul, 2018). A one percentage point increase in growth of the working age population rate results in a 1.4 percent increase in GDP per capita (Bloom et al. 2016). Fewer children enable greater female labour force participation, more income invested in education and rising retirement income.

Achieving a demographic dividend is, of course, not automatic; it requires strong policy support to ensure there are enough productive jobs and a workforce with the right skills for those jobs (Drummond et al, 2014). The SSA region will have to create productive jobs at an average of about 20 million each year until 2035 – a fast pace to absorb new entrants into the labour force. This is twice as many jobs than have been created in the last five years (IMF, 2018). Clearly, the significant, inclusive growth required to harness the demographic dividend means that transformation of Africa's economies is crucial. Furthermore, sustained encouragement of voluntary Planned Parenthood should be a priority. The World Bank (2015) recommends a strong focus on the education of girls and women, as well as higher labour force participation by women, as these highly correlate with lower fertility rates.

Rapid technological advances

The global impact of 4IR on economies and in particular on jobs is an active area of research, due in part to raised anxieties about job losses, especially in manufacturing. Findings from a review of the literature on the general impact of 4IR include the following key points:

- Highly pessimistic estimates of the impact of 4IR on jobs are being revised downwards, as the impact is becoming better understood. Early

estimates put jobs susceptible to automation at 47 percent in the United States. Recent estimates foresee only 5-10 percent of jobs susceptible to automation—although at least 30 percent of the tasks can be automated for more than half of those jobs (MGI, 2017a). McKinsey's latest estimate puts global job losses due to automation at around 15 percent through to 2030 (MGI, 2017b).

- Gains in productivity are expected, but hard to quantify. A recent estimate puts productivity growth between 0.8 percent and 1.4 percent (MGI, 2017a).
- The manufacturing sector is likely to be the sector most affected by 4IR.
- Studies tend to focus on robotics and automation; the impact of other 4IR technologies is given less attention.
- Potential loss of middle-level jobs resulting in (what has been termed "lousy and lovely jobs") polarisation into low-paying and high-paying jobs (Goos and Manning, 2007).
- Loss of job security and other job-related benefits as on-demand jobs (part-time) and the "gig economy" grows.²⁰
- Though jobs will be lost, many new jobs are likely to be created as new industries emerge and new ways of connecting people to opportunities are found, while lower prices (reflecting productivity gains) should boost aggregate demand. Historically, technology innovation has supported productivity growth and net job creation (Autor and Salomons, 2017, AfDB 2018 and IMF 2018). Bessen (2018) finds that computer use is associated with a 3 percent per annum job loss in manufacturing but a 0.3 percent per annum rise in national employment. Productivity growth in an industry tends to generate positive employment spillovers elsewhere in the economy (Autor and Salomons, 2017). Also, Mann and Putterman (2017) find that a one-unit increase in new automation patents lead to a 0.20 percent increase in the employment-to-population ratio.

However, the general impact may differ in Africa.

Discussions of likely impact of 4IR in the African context include the following points:

- Estimates of job losses in Africa need to be treated with caution. Very high estimates—such as predictions that 85 percent of jobs in Ethiopia

could be automated (Frey and Osborne, 2013) – have also been revised down generally to 5-10 percent. McKinsey's latest estimates suggest automation may have a smaller impact in African countries than in advanced countries: 5 percent of work activities could be displaced in Kenya, 8 percent in Nigeria and 13 percent in South Africa (MGI 2017b).

- Structural adjustments to new technologies may be more painful as labour market frictions are high (Banga and te Velde, 2018).
- Susceptibility is not inevitability. What is technologically feasible may not be economically feasible. Although the cost of robots is falling, there is a significant window of opportunity before they become feasible in Africa. Using the wage rate of a high-end robot (costing \$28 per hour) that can be used to make furniture and assuming an annual decline in the cost of robots of 6.5 percent, Banga and te Velde (2018) find that it will take until 2032 for robots to become cheaper than labour in this sector in Kenya.
- Banga and te Velde (2018) find that the impact on productivity in low-income countries is muted (9-10 percent lower) due to lower preparedness, particularly in lower-level skills. At the same time, the impact for SSA if all conditions are met is higher due to convergence effects.
- The manufacturing sector is very small in Africa, employing less than 7 percent. So, even though the sector might be more susceptible to automation, the impact of automation is small, except in terms of loss of potential jobs as the low-cost labour advantage is no longer a factor.
- There is not clear evidence yet that new technologies are causing a polarisation of the labour market in low and middle-income countries (Maloney and Molina 2016). Emerging economies may see a rise in middle-wage jobs in services, construction, etc. (MGI, 2017b).
- 4IR may hasten formalisation through new platforms and applications that increase efficiency and also create new types of jobs. For example, mobile banking opens up job opportunities for self-employed workers while also making it easier for them to register payments, pay taxes and gain access to credit.
- 4IR technologies are likely to increase opportunities to find "gigs" (short-term jobs), which has been the way of life for many in the informal sector.

20: The ICT revolution has coincided with a shift towards more short-term, flexible job structures which are associated with reduced worker benefits and welfare protection, with potentially significant economic and social implications (UN, 2017)

The potential is huge for 4IR to help transform African economies and unleash new opportunities.²¹Beyond aggregate demand and productivity pathways, 4IR can also increase the participation of previously excluded people, especially women, the youth and people with disabilities. The key is ensuring the supportive infrastructure exists, including the right skills and access to technologies, so that everyone can make the most of the potential benefits of 4IR. This is explored in more detail in Chapter 4 and Appendix I.

21: For example, the internet facilitates market entry by lowering fixed and marginal costs of starting up a business and low (marginal) transaction costs allow firms to scale up quickly. It also creates possibilities for new sectors to emerge such as renewable energies and financial technology (fintech). Technology can also help bring people into the labour market by providing flexible working opportunities that allow people to work around caring responsibilities. It can open foreign markets and lower production costs which, if passed on in lower prices, can boost aggregate demand and thus demand for labour. Digital finance could also improve access to finance for individuals, especially women and firms, thereby supporting new businesses, stimulating aggregate demand and creating jobs (MGI 2016).



CHAPTER 3

Potential Employment Impacts Under 4IR

Creating decent jobs in line with future 4IR expectations requires policies and strategies that increase productivity, labour absorption and enable the reallocation of labour from traditional to modern jobs and sectors. As such, five potential pathways with high potential for job creation can be identified: (1) agriculture-driven transformation, (2) exports-oriented manufacturing, (3) a modernised services sector, (4) tourism and (5) the creative industries. This Chapter provides an overview of these pathways and offers some suggestions for key transformative and inclusive growth strategies to take advantage of emerging 4IR innovations.

Agriculture-driven transformation

For many countries, agriculture presents the easiest path to industrialisation and economic transformation by leveraging their relative comparative advantage in abundant low-wage labour and land. It is the largest employment sector in the region - in 2015, around 205 million people in SSA were employed in agriculture and employment is forecast to grow by just over 2 percent on average, each year, out to 2030 (ILOSTAT, 2017). Agricultural transformation incorporates two main processes: transforming or modernising farming by boosting productivity and running farms as businesses and strengthening the links between farms and other economic sectors in a mutually beneficial process. Increasing productivity and output in a modern agricultural sector would, beyond improving food security and the balance of payments (through reduced food imports and increased exports), sustain agro-processing (the manufacturing of agricultural inputs) and a host of services upstream and downstream from farms, creating employment and boosting incomes across the economy (ACET, 2017).

Rising incomes, urbanisation and growing food consumption in cities provide enormous opportunities for agribusiness – the World Bank projects the value of SSA's food and beverage markets will reach \$1 trillion by 2030, up from \$313 billion in 2010 (cited in Brookings Institute 2018). Expanding employment in off-farm activities and agriculture-related manufacturing provides many

productive jobs, including for workers leaving farms,²² in contrast to the current situation where they end up in vulnerable employment or unemployment in cities and towns. Investors such as input dealers and commercial farmers can be incentivised to expand their operations and thus employment (ACET, 2017).

As agriculture commercialises on a larger scale, so farms can meet time-sensitive delivery schedules with specific quality requirements, the need will grow for specialised trucking services, including refrigerated trucks. This will provide employment opportunities for drivers, packers, quality inspectors and other occupations.

A more productive agriculture sector will become more attractive for young people, rejuvenating a sector dominated by aging farmers. Attracting young people into agriculture is particularly important given that rapid urbanisation is putting pressure on already stretched resources in urban areas and leaving rural areas with skills gaps. A modernised farm system can also attract young people to become service providers to the sector. Modernised farming can also spur a vibrant fabrication sector that can make simple tools and machines and service agricultural machinery, thereby creating jobs (ACET, 2017; AfDB, 2018).

The impact of 4IR innovations would be far less on job losses in this sector, which is likely to be even more energised by 4IR innovations, with Information and Communications Technology (ICT) helping to upgrade all stages of agricultural value chains. Precision agriculture can increase productivity at farm level using "big data" and autonomous vehicles to optimise application of inputs. ICT platforms can help develop new business models particularly amenable to increased youth participation. Examples include enabling farmers to "buy" mechanisation services by connecting them to service providers such as "Troto Tractor"²³, "Hello Tractor" and the Esoko²⁴ platform that connects farmers to markets. Blockchain technologies are being used in Malawi and Ethiopia to guarantee food safety standards that are key to accessing lucrative international food markets (Box 3.1).

22: As productivity increases, some workers will lose their jobs on farms.

23: <http://www.trototractor.com/>.

24: <https://www.esoko.com/>.

Box 3.1: In Malawi, Blockchain Certifying Food Safety

A pilot one-year project in Malawi is exploring the use of blockchain technology, to track supply chains for tea sold by consumer goods giant Unilever and the British supermarket Sainsbury's. Up to 10,000 farmers in Malawi could join the pilot, which will reward those who produce a fairer, more sustainable brew with financial incentives, such as preferential loans and access to credit.

Further, a group of 10 large food and retail companies, including Nestle, Unilever and Tyson Foods joined an IBM project to study how blockchain systems can help track food supply chains and improve safety.

Win T. L. (2017). Can blockchain ensure Unilever's tea farmers produce a fairer brew? Thomson Reuters Foundation. 13 December 2017. <http://news.trust.org/item/20171213163250-gu8do/>

Big data and the Internet of Things (IoT) are making "telephone farming" a reality.²⁵ The prospects are good for a middle class able to farm out-of-town remotely, creating the medium-scale farming segment—the crucial missing middle in the farming ecosystem—that drives transformation, brings in investment, linkage to markets and knowhow that spills over to smallholder farmers. This segment of commercial farmers can contract smallholder farmers and provide rural employment (ACET, 2017). Thus, while so far, there has not been any reliable estimates of the job-creation potential of 4IR in the sector, there is growing evidence to suggest that its impact would be significantly positive.

However, to create jobs and raise productivity in African agriculture, considerable attention needs to focus on access to land and security of land rights. Customary land tenure systems will need reforming by securing land rights, easing access to land, protecting the land rights of local communities from dispossession by large investors and promoting principles of responsible agricultural investment. Land rental markets, for example, have been shown to promote commercial farming in Ghana and to encourage the transfer of land to smaller-scale farmers in Sudan (Fox and Filmer 2014). It also requires farmers to have adequate access to "green revolution" technologies, such as improved seeds, fertilizer, farmer education, irrigation (where needed) and appropriate mechanisation that deliver higher yields and is tailored to local conditions.

25: IBM's EZ-Farm project is exploring how sophisticated data analytics can help farmers keep in touch with what is really happening on their out-of-town smallholdings. Sensors strategically placed around the farm monitor water tank levels, the amount of moisture in the soil, as well as the performance of irrigation equipment. Infrared cameras measure rates of photosynthesis, which can indicate whether crops are being watered too much or too little. All these data are streamed wirelessly to the IBM Cloud and accessed by the farmer via a smartphone app. <http://www.bbc.com/news/business-33610593>.

For example, countries could support the use of fertilizers through short-term, well-targeted subsidies for poor smallholders. Programmes that help farmers purchase farm machinery to rent out to other farmers, in addition to using it on their own farms, would also enable farmers to expand cultivated areas and raise yields. Such programmes help the owner fully utilise the machine—and quickly recover cost—and expand mechanisation access to nearby farmers who lack the capital or credit to purchase their own machines. This approach is being tried in Ghana (ACET, 2017). Public investment and climate smart employment strategies will also be increasingly needed to ensure productivity in agriculture under climate change. For example, soils that can hold moisture longer (Jayne et al, 2017).

Policies and regulations must also create a conducive environment to enable the business of farming (and agribusiness in general) to be profitable and support the commercialisation of farming. Macroeconomic, trade and regulation policies, in addition to purely agricultural policies, should aim to reduce the considerable natural and policy risks facing farmers and support the efficient development and functioning of agricultural input and output markets. For example, to support output markets, countries should invest in transport infrastructure in the medium to long term, while increasing the availability of cheap "first mile" transport solutions (such as motorised tricycles) through removing import duties and incentivising local assembly and manufacture via tax breaks. Including risk management education in government agricultural extension programmes to improve farmers' understanding and awareness of available tools is one measure that could be taken.

Agro-processing, which typically offers a big step-up for agriculture in generating employment, income and foreign exchange, could be spurred through strategies that:

- Target support to specific product value-chains of high promise, within the overall context of supporting agricultural modernisation, to ensure that supplies of produce are available at the scale, quality and reliability needed by industrial processors.
- Work to attract agribusiness investors into export processing zones and industrial parks, through private sector development and industrial policy that prioritises the targeted agricultural value chains.
- Promote the growth and expansion of local small and medium-size enterprises. For example, supporting rural artisanal food processors and linking them to urban industrial processors as suppliers and supporting local fabricators of simple agricultural machinery and tools.

Export-Oriented Manufacturing

Export-oriented manufacturing not only can be labour-intensive, it can spur productivity gains throughout the economy as exporters compete with foreign firms and adopt foreign products, services, processes and technologies.²⁶ Growing regional markets, an expanding middle class in Africa and potential relocation of manufacturing production out of China caused by rising wages, should create opportunities for export-oriented manufacturing in Africa. However, many African exporters are struggling to compete given relatively high unit labour costs;²⁷ they also struggle to meet international regulatory requirements and standards (Addy and Adhikari, 2017). Moreover, opportunities for job creation are rapidly being eroded by 4IR innovations in areas such as component assembly. As robots and artificial intelligence (AI) change the economics of manufacturing, automation is erasing the cheap labour advantage and is leading to relocation of operations from Asia back to Western industrialised countries. Prices for robots are falling and making them more easily available for manufacturing.

26: The rate of productivity growth in manufacturing is about twice that in services, as the productivity gains seen in exporting firms spillover into the rest of the economy Brookings 2018

27: Ethiopia is an important exception, ODI (2016).

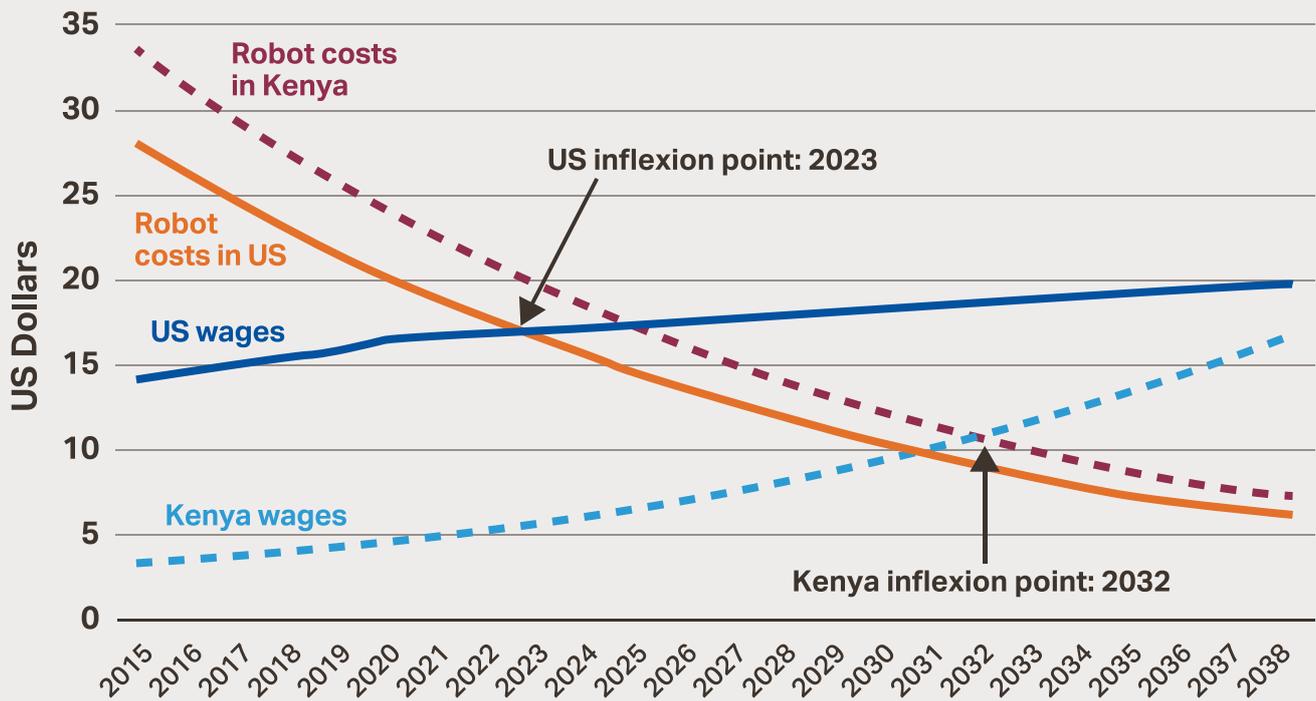
Indeed, Banga and te Velde (2018) point to the fact that as the cost of capital falls in developed countries, their industries will find it more efficient to re-shore manufacturing activities from Africa (and elsewhere). Recent evidence from the US suggests that this leads to a loss of roughly 126 African jobs per company re-shored.²⁸ Thus, the prospect of Asian manufacturing moving to Africa as labour costs rise in Asia is gradually fading or is at best a very problematic job creation strategy. They further point out that new goods emerging from 4IR are based on a digital thread connecting pre- and post-manufacturing tasks with actual manufacturing. This requires advanced infrastructure, research and development (R&D) capacity and skilled labour along the whole value chain. It is thus unlikely that manufacturing will shift to Africa, given its limited digitisation. This will possibly lead to concentration of manufacturing in developed countries, limiting opportunities for technological diffusion and spillovers.

But there are opportunities for African countries to focus on less automated sectors, where technology installation has been slow (Banga and te Velde, 2018) and that make use of countries' relative advantage in labour, abundant land and natural endowments. Automation varies greatly across sectors, with automotive, electronics, extractives and construction sub-sectors at the forefront, while food processing, wood processing and furniture production, garments and leather production lag behind. These sub-sectors (as well as agro-processing) could provide opportunities for labour-intensive local and regional market-focused manufacturing, particularly regionally traded goods given recent large increases in intra-Africa trade shares in manufacturing industries (Brookings 2018). Furthermore, even as these industries become susceptible to automation, Banga and te Velde (2018) point out that due to lower labour costs, African countries will tend to have a decade or longer to adjust before the cost of robots falls enough to replace human labour.

Figure 3.1 from Banga and te Velde, (2018), demonstrates the evolution of automation on the furniture industry in Kenya offering a window of opportunity for increasing productivity in the sector. This window can be used to build manufacturing capabilities, emphasising the need for continued focus on improvements in basic infrastructure such as reliable power supply, telecommunications and roads and railways, combined with a targeted approach to building industrial capabilities, through upgrading technology and labour force skills.

28: As of 2015 250,000 jobs have been re-shored to the US since 2010 (Reshoring Initiative 2015, cited in ODI, 2018).

Figure 3.1: Evolution of Automation economics in Kenya for Furniture industry



Source: Banga and te Velde, 2018

With the right policies and strategies, mastering traditional manufacturing makes it easier to jump into more complex digitised manufacturing. These policies include prudent macroeconomic policy, streamline regulation and efficient and honest administration of customs and ports to help support export-oriented businesses to set up and grow. Access to finance is key to support the productive growth in firms, particularly for smaller and younger firms, which struggle to gain finance, but are a source of innovation and productivity growth. Basic policy reforms to address credit markets include steps to increase competition in the banking sector alongside strong supervisory systems. Stronger credit information systems—giving information on prospective borrowers—can also help lower risk premiums (Fox and Filmer 2014).

Domestic exporters will be at a disadvantage if they do not have access to reliable infrastructure at reasonable prices. In the short term special economic zones that do not support rent seeking behaviour can provide quality infrastructure, which a country may not be able to afford to provide on a national basis, ease the administration of duty drawback schemes and pilot the streamlining of regulations. The aim should be to realise large productivity gains between firms and so help make firms more cost competitive. In addition, governments can actively promote foreign direct investment (FDI) to support export industries

(ACET 2014) and can also look to reduce barriers to trade, particularly within Africa, given its growing middle class and urbanisation.

Trade liberalisation can boost productivity, but it needs to be accompanied by measures to reduce the costs of trade. For example, reducing regulation costs of intra-regional transactions and simplifying customs procedures. More integrated regional markets would also greatly improve the chances of attracting FDI in garments, textiles, agro-processing and other forms of manufacturing, particularly for smaller countries. While efforts to introduce a common currency for the West African sub region is a step in the right direction, a more serious approach to implementing the various regional agreements (regional free trade, customs unions and economic integration) is needed if countries are to seize the opportunities that regional integration offers for transformation. ICT can help - online information, for example, reduces time spent at checkpoints and mobile phones can speed up and ease the payment process of fees. In the long run, improvements in transport infrastructure and border crossing management will be crucial to supporting regional integration in Africa (ACET 2014).

Modernising the Services Sector

Services is perhaps the sector that would benefit most from 4IR. Already, it is the fastest growing sector in terms of job creation and value added to GDP in most African economies, employing around 111 million people across SSA in 2015. It is forecast to grow by 3.8 percent on average each year out to 2030 (ILOSTAT, 2017). And although highly informal, most sought-after wage employment jobs are in this sector (largely public sector, followed by commerce and transportation, Fox and Filmer (2014)). And the potential for increased job creation is even greater with 4IR. Demand for services is increasing with rising incomes and urbanisation; 4IR is creating opportunities for entrepreneurs and businesses to meet increasing demand. While there are no reliable estimates of the job-creation potential of the sector, the key is to improve productivity, particularly in its large informal sub-sector.

The ICT sub-sector is relatively small and highly-skilled, accounting for around 1 percent of the workforce in developing countries (World Bank 2016). But indirectly, ICT as well as 3D-printing and software, will be a powerful force for job creation and productivity as inputs into businesses, particularly in the large informal services sector. The use of ICT—such as mobile systems for payments and orders, internet and mobile phones enabling services to be developed and rolled out—holds a lot of promise. One example is the Africa Internet Group (AIG) which leveraged internet platforms to create the first billion-dollar internet business in Africa.²⁹ Another is Kenya-based M-Pesa, now the biggest money transfer system in the world. The M-Pesa platform allows people to pay for all kinds of services and is rapidly formalising the informal sector by bringing many transactions online. Mobile phones have also brought banking, insurance and other financial services to many previously excluded people, particularly women and youth. In East Africa, M-Kopa is selling solar power to 500,000 poor households using an IoT platform that connects solar panels and cooking stoves to the internet.³⁰

Other fast-growing service industries are those referred to as “industries without smokestacks” (Page 2018). These include ICT-based services, such

29: AIG businesses in Africa include: Jumia (an e-commerce platform), Zando (shoes and clothing), HelloFood (a food delivery service), Kaymu (an online resale marketplace), Lamudi (a real estate classified platform), EasyTaxi (a cab-hailing service), Jovago (a hotel-booking portal), Everjobs (a jobs classified site) and Carmudi (a car-selling platform). Started in 2012, AIG now operates in 23 African countries.

30: <http://www.idgconnect.com/abstract/26156/how-iot-big-data-tackling-africa>.

as business process outsourcing (BPOs³¹), as well as transport and tourism.³² These services, which are being driven by new technologies, share many characteristics with manufacturing: they are tradable, have higher productivity, can absorb large numbers of moderately-skilled workers and benefit from economies of scale and agglomeration (Page 2018).

These new service industries offer a new perspective on industrial policies that can be characterised as “Industrial policy 2.0”. Thus, in addition to the traditional light manufacturing policies which have been at the core of most African countries’ industrial policies, increased spotlight should be given to these service industries being spawned by 4IR innovation. While it is important to mainstream support for these emerging industries in national industrial plans and strategies, targeted reforms and interventions, particularly skills development, will be crucial to becoming globally competitive.

New technologies will make some jobs in this area vulnerable to automation. According to AT Kearney, BPO jobs in finance and accounting have high potential for automation in the next five years (AT Kearney 2017). Customer service, sales and human resourcing jobs are at lower risk in the short to medium term, given their higher human component. In the longer run, they will be at risk as technologies continue to advance, such as natural language processing (AT Kearney, 2017). This window should be used to build the skills and the supportive infrastructure needed to make the most of 4IR-induced job opportunities higher up the value chain, such as software programming, translation and interpretation.

Harnessing the Full Potential of Tourism

Tourism is one of the assured pathways to economic transformation due to its capacity to create jobs (particularly for women and youth) and create linkages with other sub-sectors (ACET, 2014). In 2017, the sector directly supported just under seven million jobs (around 2 percent of total employment) in SSA and is projected to support more than 2.5 million additional jobs by 2028. Including jobs supported indirectly by the industry, the total employment contribution is expected to rise from around 17 million to 24 million in 2028 (WTTC, 2018).³³ A study found that a US\$250,000

31: Outsourced jobs also offer the potential to bring more people into formal employment (UN, 2017)

32: It also includes agro-industries, including horticulture.

33: [tps://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2018/subsaharanafrica2018.pdf](https://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2018/subsaharanafrica2018.pdf)

investment in the tourism sector in Zambia generates 182 full-time formal jobs, nearly 40 percent more than the same investment in agriculture (Christie et al., 2014).

Tourism is already an important source of jobs in countries such as South Africa, Kenya and Senegal, but very much under-developed in many countries in Africa despite the wide variety of cultural and leisure attractions. Barriers to realising the potential benefits in the sector include a weak economic environment, poor infrastructure and increasing insecurity in several countries, including in the Sahel. The 2018 OECD States of Fragility Report notes a growing concentration of fragility in SSA which accounted for 35 of the 58 countries considered fragile (because of one or more of five factors: political, societal, economic, environmental and/or security). Countries will need to be mindful of the potential impact of climate change, which threatens to disrupt tourism potential in the region, such as through rising sea levels, damage to coral reefs and extreme weather events.

Already, the tourism sector in many African countries is benefiting from 4IR innovations by helping to expand job opportunities. Virtual reality tools are providing a new marketing tool by allowing people to “sample” places by visiting the location virtually. New sharing platforms (e.g. Airbnb and Couchsurfing) are expanding the range of tourists, making it possible for young people to travel. Big data and social media provide opportunities for micro-targeting and marketing tourism at individual level. While the number of jobs created is yet to be assessed, anecdotal evidence suggests that these platforms are crowding micro and small entrepreneurs into the sector and creating jobs that hitherto did not exist.

Tourism is subject to changes in tastes and trends, so operators must constantly upgrade their product to stay ahead of the curve. Each country, at a different stage of development, requires a different solution for supporting tourism, but there are some areas countries should consider in developing their country-specific policy package:

- **Easy and safe access for tourists to countries.** For example, flexible flights are needed to ensure that tourists can reach countries and return safely at suitable times. This implies close relations between civil aviation and tourism authorities. It also requires finding investors to support air transport. Countries also need to facilitate transfers through the point of entry. Tour operators are smoothing the process by issuing

visas processed on board (charter planes) before reaching the destination. But for some countries a visa can be obtained only at the point of departure, often a considerable inconvenience.

- **Access to land.** It is often at the heart of efforts to promote tourism, yet many countries lack adequate and transparent procedures for allocating land, making it hard to develop tourism in new areas. Governments should create incentives to conserve, protect and use land for productive purposes as well as a land registry providing authoritative information on land ownership and transfers within a jurisdiction. That includes controlling land speculation with penalties for non-development, such as a tax on vacant land. In Senegal, many sold lots have stayed vacant for more than 30 years, held for speculation.
- **Building supportive infrastructure.** The best incentive for investment in tourism may be secure access to serviced land and so long-term plans for utilities must factor in the needs of tourism development. Innovative infrastructure solutions, such as renewable energy, offer the prospect for creating tourism where it was formerly impossible—remote areas or small islands.
- **Diversifying the product.** For example, Senegal has been very successful in beach resort tourism, but there is potential to combine that with niche market attractions such as sport fishing to make new products. Although demand for niche markets is small, they have high rates of growth and tourists are usually professional people with higher incomes. They can also be packaged in a variety of combinations to suit the taste of tourists not so interested in the beach.
- **Getting taxes right to maximise the economic benefits of tourism.** A good tax is fair, easily understood and simple to administer for those paying and those collecting. Poor administration and costs of compliance can be more onerous on taxpayers than the incidence of the tax. Tourist demand is elastic to price and value added taxes are clearly not neutral. So, taxation is a double-edged sword. It must generate revenues in a stable and predictable way. But it is also a tool for stimulating or dampening economic activity. In general, a simple broad-based tax system with lower rates is preferable to one with high rates, lower collections, numerous exemptions and weak administration (ACET, 2014).

Creative Economies³⁴

Only recently recognised as a bona fide economic sector, creative economies are some of the more resilient and fastest growing sectors in Africa.

The AfDB points out that creative industries can play an important role by: (a) using African culture and creativity as a unique selling point; (b) boosting productivity and structural transformation; (c) creating jobs for women and youth (labour-intensive, generating more skilled and unskilled jobs); (d) generating local content, building micro, small and medium enterprises (MSMEs) and developing skills; (e) accelerating economic growth and industrialisation; and (f) enhancing regional integration and new trade patterns and boosting exports.³⁵ The sector is huge, with a global value in 2012 of around \$2.2 trillion, while world trade in creative goods and services was US\$624 billion (Lopes, 2015; UNDP/UNESCO, 2013). Sector forecasts are hard to come by, but PWC projects growth of around 6-7 percent a year over the next two years in the entertainment and media sectors in Kenya and South Africa and around 10 percent a year in Nigeria (PWC, 2016).

However, Africa's share remains small despite significant endowments in culture, arts and music (*African Business*, 2014). The reasons include limited supply capacity, lack of intellectual property protection, obsolete policies and regulations and under-investment, particularly in infrastructure (*African Business*, 2014). Nevertheless, the rapid rise of the Nigerian movie industry, Nollywood, shows that entrepreneurs are overcoming some obstacles. Nollywood is now the second biggest employer in Nigeria after agriculture, employing close to 300,000 people directly and over 1 million indirectly (Hruby, 2018). Motion pictures, sound recordings and music productions account for 1.42 percent of Nigeria's GDP (Lopes, 2015). Developing Africa's creative economy could trigger a value chain between artists, entrepreneurs, distributors and support services across multiple sectors to provide modern jobs, especially for the youth and women.

The Creative Britain report (Newbiggin, n.d.) argues that there is a clear link between the development of creative industries and ICT in that

34: The general definition of this sector covers all arts and crafts and their product outputs and is being expanded to sports, leisure parks and software development (e.g. games), culinary arts (food) and even creative endeavours that happen in traditional organisations, especially R&D (Newbiggin, n.d.).

35: Similarly, the seminal UNCTAD report (2010; cited in UNESCO, 2013) on the creative economy points out that "adequately nurtured, creativity fuels culture, infuses a human-centred development and constitutes the key ingredient for job creation, innovation and trade while contributing to social inclusion, cultural diversity and environmental sustainability."

when the creative and media industries join with digital technology, they become an essential source of jobs and creativity for the whole economy.

The connection is evident as creative industries are often the first to employ new technology. Music distribution has totally changed and is now largely through digital channels. 4IR technologies are also providing new ways of creating products. Already full-length feature films have been created using digitally created images, e.g. *Avatar*. 3D printing is allowing artists and designers to manufacture their own designs, removing the need for third parties. In Africa, Hruby (2018) points out that components of market success are starting to come together aided by 4IR technologies. Rising smartphone and tablet ownership is creating a foundation for digital content development and dissemination. The South African music economy will have estimated annual growth of 4.4 percent between 2015 and 2020, fuelled by surging digital music streaming revenues.

Governments can support creative industries through measures that define and enforce property rights, invest in necessary infrastructure, including technology and support innovative and effective financial services, such as microcredit schemes in partnership with the private sector. Microfinance platforms, such as M-Changa in Kenya, are already helping to match investors to a range of individuals and projects in creative industries and so support growth.

Job creation in capital-intensive sectors

Both the construction and extractives sectors have high growth potential but are both capital-intensive and unlikely to create relatively many jobs directly. Their indirect job creation potential is much greater given their links to other sectors and potential to generate positive spillovers.

Construction is forecast to grow strongly, by 4.4% year on year to 2030 (ILOSTAT, 2017), reflecting rapid growth in cities, housing markets and infrastructure.³⁶ That will directly create some job opportunities particularly for skilled workers in power generation, rail and roads (MGI, 2016), but the scale will be small as the sector is relatively capital-intensive – construction is expected to encompass less than 4 percent of total employment in 2030. The sector does have potential to create many more jobs indirectly, as

36: The African Development Bank (AfDB, 2018) suggest that Africa's infrastructure needs amount to \$130–\$170 billion a year and they face a financing gap in the range \$67.6–\$107.5 billion. The infrastructure need includes the internet (more detail on the infrastructure gaps around 4IR are in Appendix I).

infrastructure can increase productivity and output in other sectors as an input into production. It can also support trade flows, help firms to enter markets and expand and so create job opportunities for workers (MGI 2016).

While no potential total job creation estimates are available, an example from the MENA (Middle East and North Africa) region offers some useful insights. According to the World Bank (World Bank, 2013), construction accounts for just over 10 percent of employment in the MENA region and around 20 percent including infrastructure services (largely transport and communication services). Meeting the infrastructure needs in the region (costing around \$50bn) would generate 2.5million jobs (around 2 percent of the labour force) in the short run. They estimate the potential long-run effect on jobs, through indirect and induced employment, could be significant: an additional one percentage point increase in GDP growth, driven by an increase in infrastructure investment, could generate nine million jobs over 10 years. The increase in infrastructure stock needed to generate those jobs ranges between 8.7 percent and 3.1 percent, depending on the growth elasticity with respect to infrastructure.

In Sub-Saharan Africa, the employment share in construction in the region is a lot lower than in the MENA region (around 4 percent), but the potential job creation return from infrastructure investment is likely to be higher given the relatively low existing infrastructure stock. Therefore, the potential employment impact of infrastructure investment could be similar to that estimated for the MENA region. The challenge will be financing expensive infrastructure investment. Countries will need to be strategic and prioritise investment in areas with the biggest economic and social returns, whilst looking for alternative sources to fund priority needs, such as through Private-Public Partnerships as in Mozambique (AfDB 2018).

The extractives sector provides a potential pathway to transformation for countries rich in natural resources, as the revenues it generates can help pay for skills and technology upgrades needed for transformation. But it is highly capital-intensive and increasingly dependent on high skills as technologies advance. For example, in Uganda the oil and gas sector accounts for no more than 0.2% of total jobs (ACET, 2014). Hence job creation in the sector alone is likely to be relatively muted. But policies to help strengthen links throughout the extractives value chain, links between the extractive industry and other sectors alongside policies to generate productivity improvements, such as meeting (particularly advanced) skills needs in the sector, can

help increase the sector's job creation potential. For example, strengthening links with the manufacturing sector (which can provide inputs for the extractives sector) and promoting local content can help capture value, spur local entrepreneurship and stimulate local employment.

Transformation strategies under 4IR

Creating enough productive and fulfilling jobs will rely on transforming economies in Sub-Saharan Africa.³⁷ That means actively pursuing policies and strategies that promote growth with DEPTH: more Diversification, Export competitiveness, Productivity increases; Technological upgrading and improvements in Human well-being. Growth with depth is not mechanical. To pursue it, countries need to develop and implement integrated transformation strategies that are appropriate to their local circumstances. But rather than starting from scratch, they can learn from other country experiences in regions that have already transformed (ACET 2014).

Political and economic governance will also determine how well countries meet their transformation challenges and realise their full potential in moving forward. Weak institutions, entrenched corruption and weak accountability mechanisms will hamper the ability of countries to transform and realise the benefits of 4IR. Countries will need strong institutional and political systems to define a long-term transformation strategy, drive value for money and successfully implement strategies and policies, using a coordinated approach across government ministries and agencies. Governments will also need to work in close collaboration with the private sector, as it is entrepreneurial firms, both large and small that will spearhead the creation of employment and the production and distribution of goods and services that drive economic transformation (ACET 2014).

Beyond peace and security, which are particularly important for high-potential industries such as tourism, job creation policies that support

37: The youth employment challenge is a subset of the overall employment (and earnings) challenge, which is effectively a structural employment challenge. Indeed, when employment transformation – the move from lower productivity to higher productivity work – occurs, youth normally secure a large share of the new opportunities it creates, commensurate with their share in the labour force (Filmer and Fox, 2014). Young workers do face some specific challenges, such as weaker access to the labour market, compared to other workers and these challenges can be addressed through youth specific policies. However, in general, there is no clear evidence to suggest that social welfare would be improved by targeting policies on the young over other workers (Fox and Filmer, 2014 and Fox and Kaul, 2018).

transformation foremost will create a supportive business environment. This includes measures to support the move from the informal to formal sector. These key aspects are discussed below.

Creating a supportive business environment

Managing the economy to enable businesses to flourish and so create jobs and help raise incomes relies on policy action on many fronts. In general, it includes sound fiscal and monetary policies pursued in ways that ensure that their impacts on inflation, wages, interest rates and exchange rates are positive for promoting rapid growth in GDP, jobs and exports. It also means strengthening infrastructure investment and services, such as electricity access and transport³⁸ and streamlining and implementing appropriate regulation to encourage entrepreneurship, innovation and business expansion. For example, after Rwanda introduced procedural reforms, the number of new firms created more than quadrupled, from 700 in 2010 to 3,000 in 2016 (AfDB, 2018).

Better financial inclusion, particularly of young and female workers, can also support business creation and growth across all sectors. Innovative financial instruments to ease access to farmers and entrepreneurs are being tried and tested, such as matching grants and leasing, rather than a loan which requires some or more collateral and so can be prohibitive, especially for the young. In addition to supporting the creation of more productive employment opportunities, governments may also need to design policies to help people find those opportunities, such as through online employment portals. These general policies should be considered alongside sector specific policies to support job creation and productivity in the key sectors previously discussed.

38: Basic infrastructure services are crucial for businesses, including the self-employed, to operate effectively. Yet, in 2013, excluding North Africa and South Africa, only 32 % of Africans had access to electricity, while, in 2015, 68 % had access to running water. Power generation and transportation lead the list in infrastructure development needs (MGI, 2016). Infrastructure investment is expensive and African countries face a financing deficit of \$67.6–\$107.5 billion (AfDB 2018). Private partnerships could help finance projects, as in Mozambique, but they need clear and coherent institutional and regulatory frameworks to be effective and to entice the private sector to take up the opportunity of investing with governments. Kodongo and Ojah (2016) also suggest that in countries with low basic infrastructure endowments, such as SSA, the biggest growth returns come from investment that improves incremental access to infrastructure, rather than quality (AfDB 2018)

While making it easier to do business and improving the investment climate are normal industrial policy pillars, they are even more crucial under 4IR. This is because the technologies are new and regulatory authorities, which tend to be conservative and understaffed, may not be nimble enough to develop needed regulations or may create stifling regulation based on poor understanding or unwarranted fears. For example, Kenya, which has otherwise been at the forefront in creating a conducive regulatory framework for 4IR that has seen the development of the most dynamic mobile banking landscape, has been fairly erratic in the development of drone regulations. This has largely been driven by fear of drones being used by terrorists. First, Kenya temporarily banned drones, then recently introduced very punitive regulations, especially charging exorbitant fees for the use of drones.³⁹

There is clear need for more exposure of policy makers to 4IR technologies and what they mean.

Survey results for a complementary study for the African Development Bank (ACET 2018) point to a low level of awareness among policy makers of 4IR technologies and their potential applications. Prolonged inaction has been a bane rather than a blessing, as manifested by the widening digital divide. Thus, governments must invest in building the capacity of the regulatory agencies, to increase awareness and understanding of 4IR. Country-specific studies exploring in-depth 4IR ecosystems in each country would be needed. This was a request made by policy makers who were focus group discussants in the ACET survey. However, some governments are already taking experimental approaches to help increase understanding. For example, South Africa's Reserve Bank is adopting a Sandbox environment that will allow experimentation with blockchain technologies in the banking sector to better understand them and thus devise an appropriate regulatory regime. (Sandbox is a testing environment that isolates untested code changes and outright experimentation from the production environment.)

Tax and other incentives can also spur investments in 4IR technologies and business.

For example, to increase access to ICT, both Kenya and Rwanda consider ICT equipment as capital goods, which are zero rated for customs duties. Rwanda has also reduced corporate tax from 30 percent to 15 percent for ICT investors (Banga and te Velde, 2018).

39: Under the new regulations, commercial drone owners must pay Sh100,000 (about \$1,000) for an operator's certificate while commercial drone pilots will part with Sh40,000 (about \$400) and a further Sh40,000 when renewing their flying permits after one year. These fees can be punitive for young people who are likely to be the key innovators in using drones. Currently, young people use them to shoot movies, weddings, etc. (Kariuki, 2018).

Box 3.2: Young entrepreneurs

The relatively small size of the formal sector means limited job opportunities for the expected increase in the youth entering the workforce and many will end up in the informal sector, creating their own jobs. In Africa, one in five of those in the working-age population start their own businesses—the highest rate in the world. And, most early-stage entrepreneurs function in low productivity sectors that need low level skills. Small early-stage firms in Africa tend to create the most jobs in the formal sector, but not many grow very fast (AfDB, 2017).

Technological advances offer opportunities for entrepreneurs to set up and expand innovative businesses and so create new jobs, increase productivity and expand formal employment. The agriculture sector offers plenty of opportunities for young entrepreneurs and the services sector, where most young entrepreneurs in Africa already exist. This is particularly promising as incomes and so demand for services continue to rise. Increasing urbanisation should also help entrepreneurs to set up and expand, through the potential to realise economies of scale and greater opportunities to create, innovate and learn (AfDB 2017).

Transformation strategies should include policies to encourage entrepreneurs and boost their productivity, particularly in sectors that align with countries' comparative advantages (AfDB, 2017). The AfDB recommends such policies follow all the development phases of a business, from seed to expansion and be based on country-specific context, opportunities and challenges.

Policies should also combine multiple policy tools to address the range of constraints faced, such as access to financing, skills, infrastructure and the regulatory framework, as it can improve programmes efficiency (AfDB, 2017). For example, the Local Employment for Development in Africa (LEAD) programmes, set up by the Dutch Finance Ministry, supports young entrepreneurs in three countries in Africa, with a special focus on females. It gives access to business and social skills training, mentoring, co-working spaces, incubators and innovation labs. It also links them to interested investors and helps them to gain access to finance.

Good foundational (cognitive and socio-emotional) skills, which are honed through primary and secondary school, are an important predictor of entrepreneurial performance. Hence, developing these skills and an entrepreneurial mindset from an early age is important. Evidence also suggests that training programmes and apprenticeships that incorporate a psychological mindset approach can increase entrepreneurial profits (Campo et al, 2017).

Moving resources towards the modern formal sector

Bringing more firms into the formal sector can increase productivity and promote growth as informal sector firms tend to be smaller, have lower level skills, restricted use of government services and access to finance (AfDB, 2017). Employment transformation (move to formal jobs in growth orientated firms) typically lags output transformation and so, given the rapid growth in the labour force, employment transformation is likely to be slow in SSA (Fox et al 2016). However, governments can support the transition of resources to the formal sector. According to the ILO, formalisation requires progressive steps "that can catalyse transition through comprehensive and integrated strategies that addresses the multi-rooted problems of the informal economy". It has developed a policy and diagnostic framework to help countries develop strategies to support transition which includes seven areas of policy action (Box 3.3):

A formalisation strategy should also be embedded within a national development strategy rather than act as stand-alone project, given the complex and multidimensional nature of the informal sector (ILO, 2014). In general, it should enable the formal sector to expand and reduce the costs and increase the relative benefits for workers and firms in joining the formal sector. For example, measures to allow skills acquired in the informal sector to be validated through certification, such as in Benin, Ethiopia, Mali and Senegal. Or to support entrepreneurs and their move to the formal sector, establishing cost effective and simplified registration procedures and opening access to microfinance, business advisory services and market information. Supportive and appropriate regulation including legal protection is also important, namely stronger property, business and labour rights, to ensure informal workers realise the economic value of their assets and have better working conditions and benefits (Dasgupta, guest blog for World Bank, 2016) and to stop discrimination against vulnerable groups.

Box 3.3: Decent work strategies for the informal economy



Source: ILO 2010: Report VI Employment Policies for Social Justice and a Fair Globalisation.

Extensive use of ICT can support the expansion of the formal sector in both absolute and relative terms (La Porta and Shleifer 2014 cited in UN 2017). As discussed previously, effective diffusion of productivity-enhancing technology in rural areas can help agricultural firms expand, thus supporting formalisation in agriculture and sectors linked to it through the value chain. 4IR technologies, in particular blockchain and basic technologies such as mobile phones also help to increase the chances of formalisation (UNDP 2017). However, technological changes will need to be properly regulated to ensure they do strengthen formal employment, rather than encourage new forms of informal employment.



CHAPTER 4

Skills Needs for Future Jobs and the Secondary Education and TVET Systems

The previous Chapter explored policies to support job creation and boost productivity within the business environment in sectors that have potential for job creation under 4IR. This Chapter focuses on the supply side—the skills needed to support transformation and boost earnings potential of workers in the formal and informal sectors. Drawing on the case studies from Ghana and Senegal, it also considers reasons why young people in Africa are failing to develop the skills needed through the education and TVET systems. The Chapter discusses policy measures to address the challenges identified, with a focus on the secondary education and formal TVET system (level 2 and 3⁴⁰) in Africa. While transformation under 4IR will rely on reforms to the whole education and training system, this is beyond the scope of this review.

Skills needs for future work

Economic transformation demands a workforce equipped with the knowledge and skills to be highly productive on farms, in firms and in government offices—and to generate innovations in technologies, processes, products and services (ACET 2014). At a minimum, that means ensuring young people have solid foundational skills:⁴¹ good basic cognitive, basic STEM and digital and non-cognitive skills, including interpersonal and socio-emotional skills, such as resilience and curiosity. These will be essential for all workers in the future labour market (Cunningham and Villasenor 2014; Almund et al 2011; WEF 2017; and Moffitt et al 2011).

These foundational skills—cognitive and non-cognitive—are crucial for transformation, inclusivity and adaptability. They affect future labour

40: 40: This paper covers formal TVET, at level 2 and 3. The International Standard Classification of Education (ISCED) is designed to serve as a framework to classify educational activities as defined in programmes and the resulting qualifications into internationally agreed categories (UNESCO-UIS 2011). Level 1 is equivalent to primary, level 2 to lower-secondary and level 3 to upper-secondary education. Level 4 is post-secondary non-tertiary education and training. Level 5 is equivalent to short-cycle tertiary and levels 6-8 are university education. <http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf>

41: Non-cognitive skills start forming at home and are honed at school. Cognitive learning happens most rapidly until the age of 15, non-cognitive skills are learned up to the age of 25 or later (Bertrand et al., 2013).

market outcomes,⁴² complement each other and are essential building blocks from which young people can develop higher-order cognitive and technical skills (Heckman et al 2006; World Bank 2018; Duncan et al 2007, Cunha et al 2006, Sondergaard et al 2012). They are also important for entrepreneurship, enabling adaptation to new technologies (Krishnan and Patnam 2014), which is particularly important as countries undergo structural change. For example, evidence from rice farmers in Ghana suggests non-cognitive skills support productivity and technical adoption as well as the returns to technology adoption (Ali et al 2017). Basic business skills will also be important for many young workers, given the relatively small number of wage jobs available alongside basic technical skills (Klinger et al, 2013, AfDB 2017 and Banerji et al, 2010).

Higher-order cognitive and technical skills, which build on foundational skills, also will be crucial for accelerating transformation. For example, higher-order cognitive skills, which include unstructured problem solving, learning and reasoning (World Bank, 2016), are increasingly in demand by firms as workplaces become more complex. Transformation also relies on STEM skills and technicians at the secondary and tertiary levels who are trained to work in dynamic and labour-intensive sectors (ACET 2014) as they help drive innovation and productivity gains and generate multiplier effects on employment and earnings.

A more skilled workforce will also be needed under 4IR. The Overseas Development Institute (ODI, 2018) finds that in Kenya, companies with higher internet penetration (a proxy for 4IR integration or digitisation) have a higher share of skilled workers and higher productivity. A skilled workforce can not only increase the impact of technological progress on productivity, but this impact is also found to be higher for Low Income Countries (ODI, 2018). Cirera (2016) also finds that inadequate education can lower the capacity of firms to transform knowledge into innovation. Thus, a

42: The evidence is clear that increasing cognitive skills leads to higher earnings and growth, but evidence on the labour market returns to non-cognitive skills in low-income countries is not so clear (Fox and Kaul 2018). Qualitative research suggests non-cognitive skills are important for work in both the formal and informal sectors (Fox and Filmer 2014) and research in advanced countries suggests they are strongly linked to employment outcomes (Heckman and Kautz, 2013 cited in Fox and Kaul, 2018).

skilled work force, particularly armed with technical/STEM related knowledge, is key to leveraging 4IR innovations.

Skills needs by sector

More advanced cognitive, non-cognitive and technical skills in key catalytic sectors will also be needed to drive transformation, while technical and business skills in labour-intensive areas in the informal sector will also be needed to support inclusive growth. The relative importance of developing advanced, intermediate or basic skills will depend on a country's specific circumstance.

Agriculture will continue to employ a large share of the workforce in many countries, so meeting its skills needs will be crucial for jobs, growth and productivity. Young farmers will need good foundational skills and basic business skills to enhance their productivity). Foundational skills help farmers adopt new and efficient farming techniques (Ayalew et al 2017), learn from one another (Fox and Filmer 2014) and increase the effectiveness of agriculture extension programmes. Small hold farmers will also need at least basic technical skills, while more advanced technical skills will be needed for agriculture related jobs throughout the value chain, including jobs in marketing, logistics and quality control as well as in high productivity specialist areas in agri-business. Marketing and business skills will be important for competing internationally (Maiga and Kazianga, 2016). Many young Africans also mix livelihoods to earn income. Providing them with financial literacy, business development and non-cognitive skills can help them manage a portfolio of self-employment and temporary and seasonal work for others in household agricultural production (Fox and Filmer 2014).

The services sector is forecast to employ roughly 1 in every 3 workers by 2030 (ILO projections, 2017) and includes a large informal sector made up of household enterprises as well as a small formal sector⁴³ (Fox and Filmer 2014). Good foundational skills will be important for young people to identify and seize job opportunities here, which is particularly important for young females who face specific challenges entering this sector (Fox and Filmer 2014). Business and management skills, including project management and marketing skills, will be particularly important given the high incidence of self-employment and potential for entrepreneurial activity.

43: Unincorporated, nonfarm businesses owned by households. From an employment perspective, they include self-employed people running unincorporated businesses and family members working in those businesses. Most are purely self-employment, with around 10 percent hiring someone outside the family. (Fox and Filmer 2014).

In the ICT and BPO fields, skills requirements will vary across different sectors. Basic technical skills are crucial, but more advanced technical skills will be needed in industry-specific jobs, while higher-order non-cognitive skills will be needed in market research and other high-skilled jobs in knowledge process outsourcing. There may be growing demand for high-value nonvoice BPO (e.g., accounting) which needs technical but also relatively advanced cognitive skills (World Bank, 2016).

Skills needs for future work and the (general) secondary education system

A large share of students who enrol in secondary education fail to gain good foundational skills, so they struggle to progress through the education system and gain productive employment (World Bank, 2018). There are several key drivers of effective learning at school. The World Bank identifies four: learner preparation, effective teaching (skills and motivation), the availability of relevant inputs and good school management and governance, which is often missing from schools. A lack of head teacher or school management committee autonomy combined with insufficient capacity and capability can also constrain improvements in service delivery. Meanwhile, education inputs, including learning materials, have failed to keep up with growing enrolments and so are often in short supply, often due to insufficient financing, poor governance and ineffective procurement (Fredriksen et al 2013).

Learner preparation

The optimal period for acquiring foundational skills is through early childhood (and into adolescence for non-cognitive skills, although they can also be acquired throughout early adulthood). Strong early childhood development, starting in the womb, helps children learn at school and sets children onto higher learning trajectories (World Bank 2018). However, many children, especially from disadvantaged households, arrive at school with learning deficits. As skills beget skills, these children often struggle to learn and initial gaps widen over time (ibid).

The opportunity for people to develop good foundational skills also reduces over time. For example, adult education programmes have limited success. Hence early childhood investment to ensure young people arrive at school ready to learn are crucial to ensure students have at least good foundational skills for productive work with income growth prospects, particularly under 4IR (ibid).

Effective teaching – teacher skills and motivation

Improving access to education while also expanding the number of effective teachers is a key opportunity for SSA countries to leapfrog education progress. Countries in the past expanded education access but without also boosting teacher quality and capacity, which are key drivers of quality learning. Yet significant challenges remain in Africa on both counts (World Bank 2018).⁴⁴

Institutions struggle to recruit and retain enough high-quality teachers and trainers to meet demand⁴⁵ (Majgaard and Mingat 2012). Absenteeism is a problem and teacher-student contact hours remain comparatively low (UNESCO, 2017). For example, on unannounced visits by World Bank survey teams, one in five teachers across seven African countries were absent from school, while another fifth were at school but absent from the classroom (World Bank, 2018).⁴⁶ In Senegal, between 2007 and 2014, schools were closed for 50 out of 188 official school days—nearly 20 of which were lost due to individual teacher absence and (mostly teacher) strikes. However, the remaining 30 lost days were due to school closures that were beyond the control of teachers and so also need to be addressed (UNESCO 2017).

In Africa, education cycles are generally dominated by an excessive number of examinations and testing at all stages which takes away from teaching-learning time (Majgaard and Mingat, 2012). As a result, teachers try to teach facts and how to memorise for exams, rather than ensuring students have a solid understanding of the subject. Teachers also often lack access to continuing and structured professional development, so they are unable to use the latest evidence based pedagogical techniques (Oketch and Lolwana, 2017, Majgaard and Mingat, 2012).

44: Quality learning also depends on three other key factors: prepared learners, effective teaching, learning- focused inputs and effective management and governance that pulls them all together (World Bank 2018). Schools need resources to get access to learner focused inputs. Spending on education in SSA is relatively high on average, but the bulk of the spending is on teacher salaries, which are often politically sensitive and so difficult to change. However, it leaves little room for funding other (important) inputs. Greater efficiency is needed, particularly as secondary completion rates and the youth population rise. This can be achieved through stronger accountability systems, especially to address teacher absenteeism. Funding should also focus on developing foundational skills and improving access for disadvantaged groups and PPPs could help crowd in resources to meet gaps in provision.

45: This is not surprising as less than 25 percent of Sub-Saharan Africans currently complete secondary education (World Bank, 2018). The World Bank found that across six countries in the region, 40 percent of primary school teachers were not as knowledgeable as their students should be.

46: The seven countries were: Uganda, Mozambique, Kenya, Tanzania, Togo, Senegal and Nigeria

Box 4.1: Boosting Teacher Quality and Capacity

Both Ghana and Senegal are taking steps to boost teacher quality and capacity. In Senegal, the government is developing teacher-based performance standards that underpin training, reforming pre-service training to focus on pedagogy and increasing the minimum-level qualification for becoming a teacher to the BACC level (World Bank, 2013). It is also working with the Regional Centres for Training of Education Staff to develop in-service training at all levels (World Bank, 2018).

In Ghana, the government, with T-TEL, is developing a new teacher training framework and curriculum, underpinned by standards, which include a focus on pedagogy and subject knowledge relevant for each education phase. Curricula are being designed in consultation with the sector and so more proactive and interactive engagement with key stakeholders may be needed to help design deliverable policy solutions and implement the government's reforms successfully.

Stronger achievement in cognitive outcomes will require more rational examinations policies, better pre-and in-service teacher training that covers relevant cognitive and non-cognitive skills and pedagogical techniques as well as a change in teacher behaviour (R4D 2016; World Bank 2018).⁴⁷ A strong accountability framework that does not allow for poor performance at all levels is key (World Bank 2018 and Fox and Filmer, 2014), underpinned by relevant, frequent and transparent performance data and increased oversight by parents and students.

47: Early years investments are more cost effective as skills accumulation is a cumulative process. However, there is still scope for effective interventions later in life, for example some areas of the brain associated with socio-emotional development remain malleable into early adulthood. The evidence on what measures works best to develop socio-emotional skills is growing, although is relatively nascent and so needs further investigation. There's positive evidence from the US that teaching students how to plan tasks and to review their work in groups has long lasting positive effect on socio-emotional skills. (Heckman et al 2010, cited in World Bank Digital Dividends, 2016). The Escuela Nueva model, which is being replicated in 16 countries, suggests its use of self-directed, self-paced and group learning among primary school students boosts socio-emotional skills (World Bank 2016). Countries in SSA will need to pay increasing attention to how young people develop these skills while drawing on emerging evidence to help define appropriate policies.

Ensuring students learn relevant skills relies on a National Qualifications Framework (NQF) that is clear, flexible and reflects a country's socio-economic and labour market needs. Engagement with the private sector in its design is crucial (Oketch and Lolwana, 2017), including both the formal and informal sectors. The NQF should aim to address gender equality, link to clear career pathways and encompass both the TVET and general education system. Effective coordination of national frameworks at a regional and subregional level can also facilitate labour mobility and increase job prospects for youth.

The underpinning curriculum and assessment system and processes need to reflect the NQF.

In many African countries, curricula are often "overloaded", rigid and lack a focus on non-cognitive as well as basic cognitive skills. Multiple ministries and institutions are involved in curricula decision making, leading to heavy bureaucracy that can slow modernisation and adaptability to better standards. The curricula design process and content should be streamlined and include both the cognitive and non-cognitive skills that are needed in the digital and globalised economy, as described above (World Bank 2018; Brookings 2018).⁴⁸ That includes developing entrepreneurial skills, which include non-cognitive skills--a relatively nascent area--although some good examples exist such as Educate! in Rwanda and Uganda. The programmes provide training for secondary school students in leadership and entrepreneurship skills as well as a mentor to help start real businesses. Participants are significantly more likely to own a business and earn more income as a result.⁴⁹

Curricula at lower secondary should include some practical elements linked to key economic sectors, such as agriculture, to reflect the fact that many young students will move into the labour force after lower secondary education or possibly some TVET. However, that should not be at the cost of delivering an all-round good quality, basic education (up to and including lower secondary). At upper secondary, curricula also need to better prepare students for work in key economic sectors by integrating economically relevant knowledge (e.g., linked to the key sectors in each country) and

practical examples. Indeed, countries, including in SSA, are generally integrating more general vocational and technical skills in the general secondary curriculum (lower and upper) to help maximise the potential for young people to become employed. Successful implementation will rely on strong institutions and complementary measures, such as relevant teacher training, teaching materials and an updated exam system to reflect the new curricula. In many African countries, deficiencies in these factors have hampered a shift towards competency-based curricula (Tikly et al, 2018).

Skills needs for future work and the formal secondary TVET system

The quality and relevance of most TVET in the region is also low. TVET systems need urgent reform (ILO 2017; Blom and others in World Bank 2017), having suffered from years of under-investment (Kingombe 2011). They are often supply driven and systems lack a clear TVET strategy with strong accountability and financing systems that are tied to performance measures (UNESCO 2015). Trainers either don't have the industry and practical experience needed or an understanding of effective pedagogical techniques⁵⁰ (Oketch and Lolwana, 2017). Continuing professional development for TVET trainers is often ad-hoc and geared towards teachers in general schooling and workplace exposure or industry training is not yet a structured part of TVET teacher training in most countries (Grijpstra, 2015). As a result, TVET is often seen as a low-quality option aimed at students who have dropped out of the academic route, which in turn makes it difficult to recruit high-quality trainers.

A key lesson from more advanced TVET systems is that private sector engagement, in designing and delivering TVET, is crucial for quality and relevance. TVET systems need to be demand-driven and dynamic so they can respond to the changing needs of the labour market (World Bank 2008), which in turn depends on private sector input in the design of TVET curricula and standards. Students also need to be encouraged to train for work in key sectors, rather than aiming for subjects where there is weak labour demand. For example, our focus group discussion for the accompanying case study in Ghana confirmed

48: The Center for Curriculum Redesign (CCR, <http://curriculumredesign.org/>) is a non-profit global organisation dedicated to improving education. It brings together international organisations, jurisdictions, academic institutions, corporations and non-profit organisations including foundations. It focuses on both designing and propagating new curricula. The CCR notes that education curricula require fundamental redesign across four dimensions (Knowledge, Skills, Character and Meta-Learning,) and adapting to 21st century needs means revisiting each dimension and the interplay between them.

49: <http://www.experienceeducate.org/results#results-1>

50: Links with higher education (HE) institutions could help. In Germany, Ethiopia, Mozambique and South Africa, HE institutions have helped with teaching content and delivery, while TVET colleges and employer-based training facilities focus on practical aspects of learning. This approach can be accompanied by an incentive system that promotes the exchange of knowledge and "know-how" between institutions (OECD 2018; Martin 2017).

evidence from other studies (ACET, 2017) that agriculture is not seen as an attractive career choice. This is probably due to its current low productivity and older age dominance, but, as described in Chapter 3, with the right policy support, there are plenty of productive opportunities for young people in this sector. The formal TVET system also needs to better cater for the needs of the informal, non-wage sector. Formal TVET institutions try to prepare students for work in the very small formal sector, but most of the opportunities are in the informal sector and self-employment. TVET curricula should include entrepreneurship training, developing skills for self-employment and ensuring students have good transferable skills that can be applied across jobs within a chosen sector.

The private sector also has a key role to play in providing essential work experience or practical training opportunities for students (Fares and Puerto, 2009). For example, in Singapore, TVET students often work on projects commissioned by private industry in their final year which also helps promote their employment chances. Strong links with the private sector can also help develop TVET trainers to gain up to date industry experience that they can then apply in their teaching. Regular and reliable labour market information is also needed to ensure TVET remains demand-led, but data such as graduate tracer studies are not yet common in African countries (UNESCO, 2013).

TVET is relatively expensive to deliver⁵¹ but given the benefit of a quality TVET system for firms, governments across the world are increasingly looking to the private sector to help fund the cost through taxes and levies. Levies can also help align TVET institutions and training centres to government regulations and national training strategies (R4D and SEEK Development 2017 and ILO 2015 and 2018), but institutions will want a say in how the money is spent. Some African countries, including Botswana and Tanzania, have introduced firm levies but they're generally managed by the public sector who struggle to align the fund with skills needs. They have also proved unpopular with the relatively small proportion of firms who make up the formal tax base in African countries, which also puts the sustainability of that financing into question.

The private sector, with the right incentive framework, could help deliver high-quality TVET. Not only is TVET expensive to deliver, the quality of public TVET provision can be low and slow to adapt to the needs of the labour market. Private sector TVET provision in the region is growing and

accounts for about 35 percent of formal TVET enrolment (Majgaard and Mingat, 2012) on average. Given the size of the informal sector and relatively poor performance of public provision, Fox and Filmer (2014) suggest that governments could step away from TVET provision in general and focus instead on addressing market failures, such as improving access to the most vulnerable through vouchers and defining an accountability system for providers, such as outcomes-based funding agreements, to guard quality.⁵² However, TVET provision in the private sector is largely undocumented and so a first step should be to gather data to get a clearer understanding of the sector before implementing measures to expand it⁵³ (Akoojee 2016).

Many countries, including Botswana, Ghana and South Africa, are reforming their TVET systems but the evidence on what works is not very clear.

Ongoing TVET reforms in the SSA region are mostly based on the lessons learned in the 1990s in Asia, OECD countries and Latin America (World Bank 2018). However, system wide reforms are challenging to implement and the evidence on which TVET reforms work best, particularly in a given socio-economic environment is limited; what works best in one country may not work best in others. For example, attempts to introduce the German dual system in South Africa are being hampered by a lack of private sector engagement which may be due to firms not seeing skills training as an investment that they benefit from. Firms cited other reasons for low engagement such as capacity and resource constraints (to engage with TVET colleges) as well as safety risks (Kolver, 2015). Furthermore, many TVET reforms in African countries have yet to be thoroughly evaluated.

TVET reforms are often ambitious but progress is slow due to capacity and resource constraints, frequent government changes and resistance to change (Kingombe 2011). Often multiple ministries are involved and a lack of coordination and alignment hampers progress. Rather than setting over-ambitious reform agendas that may be hard to deliver countries could develop a TVET reform strategy as part of a wider economic strategy and identify a set of priority areas or sectors to focus on, with well-defined implementation plans that include monitoring and

51: TVET unit costs are often 2-3 times higher than general secondary education (Fox and Filmer 2014)

52: Many countries still use input-based funding rather than output/outcomes based funding (Darvas and Palmer 2014)

53: This paper only covers the formal TVET sector (levels 2 and 3), which misses out the, often large, informal training sector (as high as 80-90 percent in some countries, such as Ghana) and includes apprenticeships and private training. The informal training sector trains many young Africans for the majority of jobs available (i.e. work in the informal sector) so should be considered as an important part of the education system. The overall TVET (informal and formal) system is fragmented with varying standards and quality of delivery, which undermines the image of TVET.

evaluation. Based on the evidence, countries can consider which reforms may be worth scaling up. Given the relatively poor quality of formal public TVET systems to date—high delivery costs while providing little foundation for jobs—a priority should be improving quality and efficiency before trying to significantly expand access. It is also important that countries continue to share and discuss the evidence base on interventions.

The link between TVET and upper secondary education

TVET should begin after lower secondary education at the earliest as students need good foundational skills to engage in technical and vocational education and training effectively.⁵⁴ The general trend in OECD countries and Asia is towards TVET starting at upper secondary. Indeed, delaying the starting point for TVET has had a positive impact on education attainment (Jakubowski et al 2016). TVET (and general education) should align with local labour market needs, but the degree of specialisation will depend on country-specific circumstances. The key is to ensure students have a broad enough skill sets that will help them gain productive employment now and in the long-run—that means avoiding very

54: This is in line with evidence from middle and high-income countries.

narrow skills that may quickly become outdated and leave them vulnerable to job loss (World Bank 2018).

The trend is towards greater flexibility between TVET and the general education route. Comparative studies conclude that secondary education and TVET should be complementary and flexible. A lot of higher-income countries now have close and flexible links between the two and into the tertiary levels (OECD 2016). This also means allowing the opportunity for higher level and specialised TVET study (level 5 and above) in priority sectors, with clear pathways into work or further study. For example, Singapore's "bridges and ladders" system gives flexibility for students—not just between and within TVET and secondary education but also between employment and the education system—and opportunities for students to progress as far as their interests and ability allows them. This flexibility makes TVET more appealing and is particularly important as rapid technological change and constantly changing labour market demands will affect the skills needed by students and entail life-long learning (Oketch and Lolwana 2017; ILO 2018; and R4D 2013 and 2015).

The distinction between the TVET and upper secondary education is also becoming less clear. Lower- and upper-secondary education is moving towards more vocational content and TVET systems are tending towards teaching more general as well as technical and vocational skills (Oketch and Lolwana

Box 4.2: Reforming the TVET System Ghana and Senegal

Ghana is preparing a wide ranging TVET strategy that will be published soon. However, the scale of the challenge in reforming TVET is vast given the relatively low starting position. It will be important to prioritise reforms, based on a much better understanding of current and future skills gaps and TVET provision in the informal and formal sectors. It may mean prioritising sectors in which to test and evaluate approaches first to ensure quality and relevance, before expanding access. This is particularly important given the current weak state of the TVET sector overall and relatively limited evidence base on TVET reform in lower income countries. Priority should be given to developing good technicians (secondary and tertiary level) in key economic sectors that could help underpin economic transformation, such as in agri-business, who are needed to modernise the sector, as well as in ICT and hospitality.

Senegal has a national strategy for TVET that aligns to the overall education development plan and aims to improve access, quality and relevance and governance of TVET (Annex B). In addition, it plans to integrate the traditional apprenticeship system into the TVET system to provide 300,000 TVET students (compared to around 1.1 million secondary students, UIS 2015) the opportunity to get on-the-job and practical experience.

The government is also introducing certified, short-duration training for young people who are excluded from the education system, lack relevant qualifications to get a job or work in professions that have significant responsibilities but lack regulation, such as taxi drivers. This is an important policy innovation in Senegal because of the high school exclusion rates and relatively low primary and lower secondary completion rates (UNESCO 2017). However, the long term goal should be to ensure all students achieve a high-quality lower secondary education, before moving into any form of TVET.

2017; ILO 2018; and R4D 2013 and 2015). However, TVET has an important and distinct role in education delivery, so countries should avoid the temptation to subsume it within academic secondary schools. In Botswana for example, “Brigades” were secondary TVET institutions that successfully combined some academic subjects (English, mathematics, science) with community-based apprenticeships and practical learning of specific trades. But in the last 15 years, the Brigades moved under the Ministry of Education and suffered from low funding. They have since become less relevant and effective and under-utilised.

The importance of STEM performance and participation for future work

A substantial increase in STEM participation will be needed if countries are to make the most of the opportunities presented by 4IR and drive transformation. For example, the Africa 2063 Agenda Framework Document sets a target of 70 percent of all high-school graduates going to tertiary education, with 70 percent of those graduating in science and technology related subjects. That target is twice the global average enrolment of 32 percent and more than eight times the Sub-Saharan African average of 8 percent (Tikly et al 2018). Some countries, such as Nigeria, have introduced institution targets for STEM graduates, but they are difficult to enforce legally.

Low STEM participation at upper secondary is driven, in part, by low attainment in STEM related subjects at lower secondary. So, increasing STEM uptake and performance will require large improvements in the quality of STEM education in the primary and secondary phases. This means implementing measures to address the acute shortage of (high-quality) STEM teachers, ensuring enough resources to meet the relatively high cost of teaching STEM as well as updating and adapting the curricula to reflect the ability range and with examples that students can relate to (Tikly et al 2018).

Measures will also be needed to overcome social attitudes towards STEM subjects, which are often seen as being too hard or predominately for men. Extra-curricular STEM camps and clinics (for example, STEM clinics in Ghana for females aim to demystify STEM through information and discussions with female role models) are often used to try to increase enthusiasm, but the evidence on their effectiveness and scalability is limited (Tikly et al 2018). Just providing information on returns to STEM subjects may help improve uptake, particularly of females. For example, a vocational training voucher programmes in Kenya increased female uptake of ‘male-dominated’

subjects by 5 percentage points when students were provided with accurate information about returns to courses (Hicks et al 2011).

Low participation and performance in STEM-related subjects has been an issue in several countries across the world, so many initiatives have been tried and tested. STEM delivery can also be expensive and so partnerships with other countries, donors and the private sector to share expertise and bring in financing to improve STEM performance in SSA countries will be important. One such example is the World Bank-funded Partnership for Skills in Applied Sciences, Engineering and Technology, which brings governments from Sub-Saharan Africa, the private sector and partners, including Brazil, China and India, to work together and share expertise to help build human capital in the region, including STEM skills in priority areas.

Box 4.3: Strengthening STEM in Ghana and Senegal

Ghana is introducing a teacher and learning portal in 125 schools targeted at STEM uptake, as part of a secondary education improvement project with the World Bank (2014). The portal will allow teachers and students access to online learning and teaching resources, with a focus on science and mathematics. Teachers will also get support in using ICT to help teach effectively. The portal will act as a platform for knowledge exchange and discussion in national and international networks.

Senegal has taken steps to improve the uptake and performance of STEM related subjects, including the “Festival of Science and Innovation”, a two-week event featuring workshops, experiments and laboratory visits. The government also created new research-intensive universities to boost STEM uptake at the tertiary level and to increase the number of STEM teachers. However, more concerted action is needed, particularly for female and disadvantaged students (World Bank, 2017).

The role of ICT in education delivery

Technology can help African education systems to leapfrog⁵⁵ by improving efficiency, creativity and access to learning opportunities. The evidence is still relatively weak in terms of the impact of each type of technology on education outcomes, but there is growing belief that ICT integration has a multiplier effect through the education and training system (UIS 2015; World Bank 2018; R4D 2016) as it can help to: connect teachers to content; give students access to education materials where teachers are unavailable; tailor learning to a student's needs; reinforce learning (such as with Eneza Education in Kenya that provides questions and answers to students via mobile phones); and make learning more interactive and fun (World Bank 2016). Digital technologies could also support the development of higher-order cognitive and non-cognitive skills (Pedro, 2012; Trucano, 2005). Technology could also drastically reduce the time it takes to update curricula (which often takes years) for pre- and in-service teacher training so that teachers and schools keep up to date with the latest pedagogical techniques⁵⁶. It could also reduce the time it takes to update curriculum in secondary schools and TVET institutions.

Technology can also drive efficiency by tracking and monitoring student outcomes. ICT applications are driving improved data collection and monitoring practices around the world. More effective Educational Management Information Systems (EMIS) that support data transparency and sharing within and between countries, can drive accountability and improved governance, which in turn can lead to better outcomes (Abdul-Hamid, 2014). For example, Bridge International Academies gives each teacher an electronic tablet with scripted lessons. This enables head teachers and teachers to track the progress of each class as well as teacher attendance (the Economist, 2017). Better access to data can also help teachers identify and resolve issues with an individual student's progression more quickly (Lopez, 2017).

ICT also has the potential to be a cost-effective approach for education delivery, particularly through distance learning and teaching STEM subjects through virtual labs and simulations, instead of resource-intensive labs on site. Many SSA countries already have

55: It rapidly accelerates learning education progress.

56: Teaching and learning processes also need to change for education systems to leapfrog other countries (Brookings Institute, 2018). For example, non-cognitive skills cannot be taught by rote, but require different teaching approaches. An example is Learner Guides (Camfed-run programmes), who use student led learning and collaboration through peer to peer learning to teach skills such as resilience and goal setting.

considerable experience with "old fashion" distance learning methods such as interactive radio to enrich teaching processes by introducing interactive learning activities.⁵⁷ Students across the world are already accessing secondary education resources online, which will become increasingly important in SSA in helping to meet the surge in demand for secondary education (Daniel, 2010).

However, on average, ICT use in education in the region is low and expansion is slow. The chart below shows computer resources are particularly overstretched in countries such as Gambia and Zambia. While no country has a particularly low ratio of computers to students compared to other regions, countries such as Rwanda and Mauritius have made relative progress compared to other countries in the region. Many countries have rushed ahead to invest in complex technological systems only to find that the physical infrastructure, teacher capacity and resources are insufficient to support full operation or maintenance (UIS, 2015).⁵⁸ The introduction of ICT has failed to improve outcomes where teachers haven't been able to use and apply the technology to complement their teaching effectively (World Bank 2016). Therefore, countries need to ensure expansion on ICT is complemented with the investment in the teacher capacity to utilise it effectively in the classroom.

Comprehensive strategies for the use of ICT in education are needed and should focus on building ICT capacity as well as pedagogy and training for teachers to use and apply ICT to support teaching across subjects (UIS, 2015). That means incorporating ICT use and application into teacher training and continual professional development.⁵⁹ It also means basic ICT and STEM literacy for all young students. Early integration of ICT into primary and secondary curricula should also be included in an

57: The literature for SSA includes: Paul Murphy et al (2002): "Enhancing Learning Opportunities in Africa: Distance Education and Information and Communication Technologies for Learning". African Region Human Development Working Paper Series No.

58: Kenya has deployed electricity and internet access to remote rural schools, raising the proportion of schools with electricity from 43 percent in 2013 to 95 percent in 2016. More than 90,000 teachers have been trained in delivering digital learning while e-learning has been introduced in more than 18,000 primary schools.

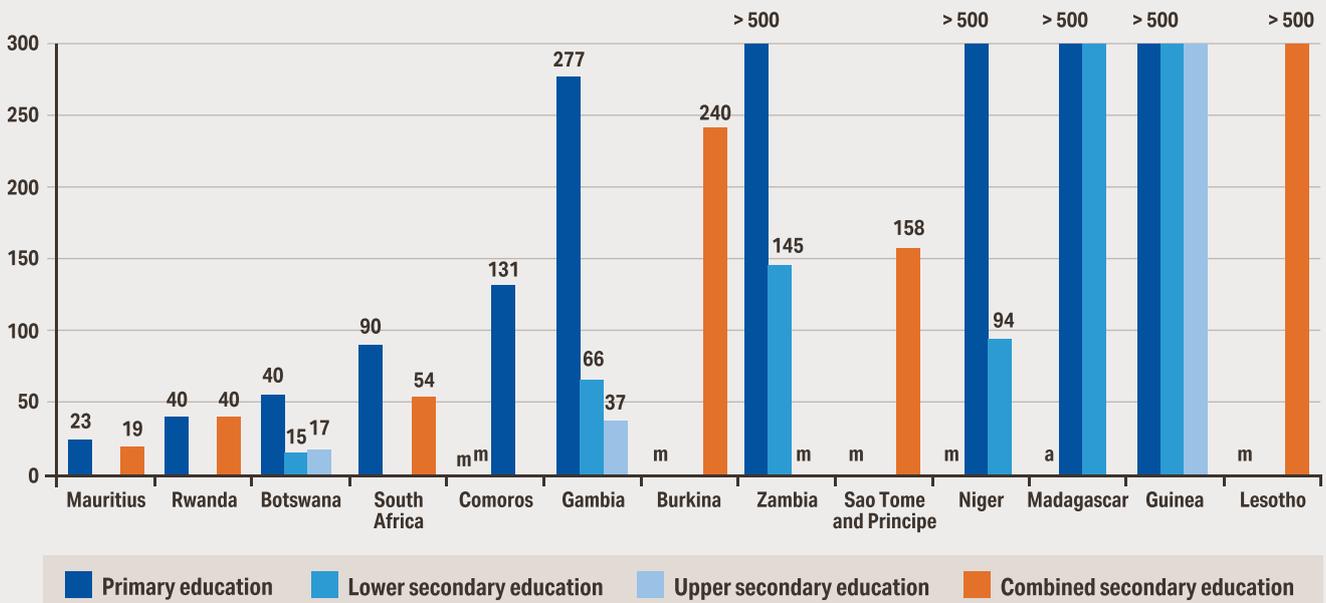
59: New ways of learning, characterised by personalisation, engagement, use of digital media, collaboration, bottom-up practices and where the learner or teacher is a creator of learning content are emerging, facilitated by the growth in online education resources available via the internet.

ICT strategy,⁶⁰ as it is an important lever to ensure students develop digital literacy skills. Several countries don't yet include an objective or basic

course in computing skills in their education or wait until lower secondary education to start (Figure 4.1). ICT interventions that boost capacity can be costly, but Public-Private Partnerships can offer innovative and effective solutions.

60: Although obviously the infrastructure is needed to implement the curriculum.

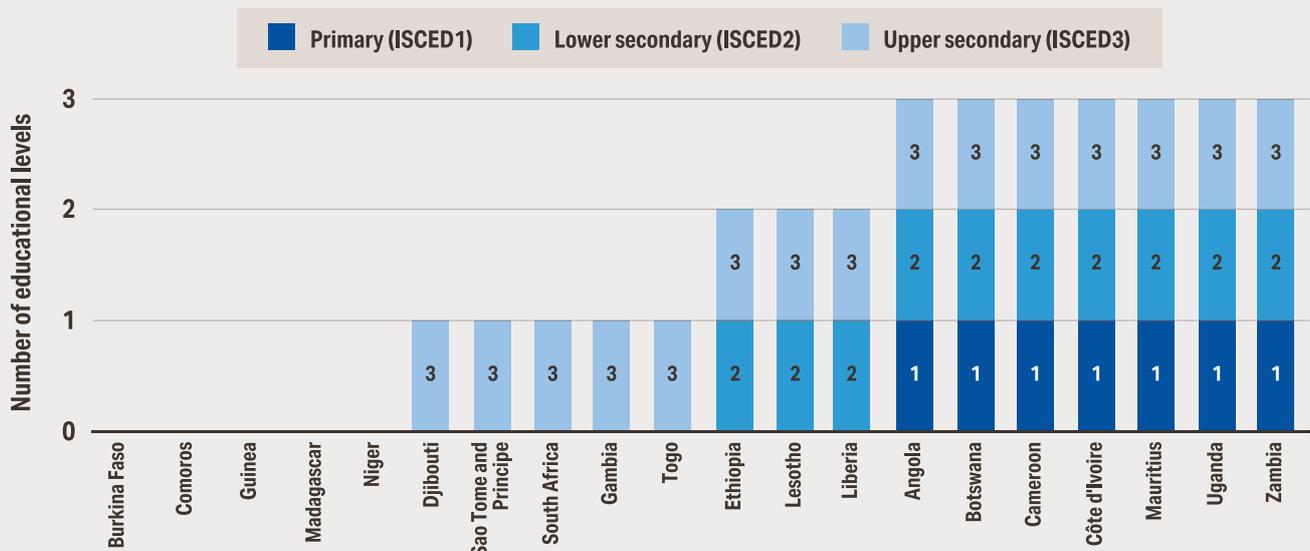
Figure 4.1: Learner-to-computer ratio in primary and secondary



Notes: m = missing data; a = not applicable. Data from Botswana reflect public sector schools only. Data from South Africa reflect 2011; data from Botswana, Rwanda and Zambia reflect 2012; data from Gambia and Mauritius reflect 2014

Source: ILO 2010: Report VI Employment Policies for Social Justice and a Fair Globalisation.

Figure 4.2: Education levels with an objective or course in basic computer skills or computing, 2013



Notes: Educational levels are represented according to the International Standard Classification of Education 2011 (ISCED 2011). In ISCED 2011, the following education levels are labelled as follows : primary education = ISCED 1; lower secondary education = ISCED 2; and upper secondary education = ISCED 3. Data for South Africa reflect 2011; data for Angola, Botswana, Togo and Zambia reflect 2012; data for Ethiopia, Gambia, Liberia and Mauritius reflect 2014.

Source: UIS statistical database, 2015 (Statistical Table 2)



CHAPTER 5

Secondary Education and TVET Policy Recommendations

African countries face a daunting challenge of designing skills strategies that support transformation and inclusive growth (and so increase earnings of workers in current employment, especially the poor) as well as deliver an adaptable and resilient workforce that can cope with the rapidly changing nature and location of work caused by global trends, such as 4IR. That means developing skills strategies that underpin a wider economic strategy, cover all education and training phases and support employment in the informal and formal sectors.

In developing education and skills strategies, governments also need to consider provision in the informal sector, its links with formal sector provision and as far as possible, try to improve its quality and relevance. The extent to which informal provision matters vary across countries. For example, according to Adams et al (2013), about one in 10 informal operators have been through a traditional apprenticeship in Tanzania, while in Ghana, apprenticeships are the main source of skills for workers in the informal and formal sectors. Informal sector vocational training is often more flexible than formal TVET, which is often characterised by rigid admission criteria, operations and training curricula. Quality apprenticeships include a mixture of classroom based/theory and practical learning, cover the latest technology use and application and have well trained master craftsmen who can teach a wide range of non-cognitive skills, not just technical skills. Policies should focus on improving the quality of informal sector training, including certification to help young people gain employment, while recognising that policies are hard to enforce in the informal sector.⁶¹

Skills strategies also need to reflect reality that transformation will take time and so most young Africans will need to generate their own productive opportunities in the informal sector (Fox and Filmer, 2014). Expanding upper secondary and tertiary education without a commensurate increase in labour demand and number of productive opportunities for the self-employed and entrepreneurs, risks higher youth unemployment and underemployment as secondary graduates will just displace workers with lower skills, rather than help create additional jobs

(Fox and Kaul, 2018). Addressing constraints to job creation in the formal wage sector will help, but even with rapid growth, the employment share of the formal sector is unlikely to increase sharply soon (ibid). Hence most young people will need to find productive work in the informal sector.

Core strategic aims

This paper focuses on the implications of future work for secondary education, including formal secondary level TVET. However, improving the quality of learning in secondary education and TVET as well as increasing access and completion rates will require massive reforms beyond the secondary phase, particularly to pre-primary and primary education. Limited budgets mean difficult trade-offs will need to be made between different groups, such as investing in the skills needed for transformation—largely secondary and tertiary education to support work in dynamic sectors—and those needed for inclusivity. Another trade-off is between today's workers, a large proportion of which lack basic skills and tomorrow's workers, for whom early years investments should be a priority given their relatively high returns (World Bank, 2018).

The relative weight placed on different trade-offs and education policy priorities will depend on a country's cultural, political and geographic context. Socioeconomic and school-specific contexts vary considerably between SSA countries, particularly between Francophone and Anglophone countries whose education systems are typically underpinned by the French and English education systems respectively. For example, countries with very low basic education attainment and fragile economies may place a much higher weight on improving basic education access and quality rather than investing in upper secondary and higher education. Countries that have progressed further on basic education attainment and have more stable policy environments may place a higher weight on investing in upper secondary/TVET and/or higher education to help spur transformation. And countries that are in the more advanced stages of transformation will place a greater weight on ensuring their workforce can adapt and update skills in the face of structural and technological change.

61: See Adams et al (2013) for a detailed discussion of measures to support productivity in the informal sector, which is beyond the scope of this paper.

In general, however, there is a package of interrelated policy measures for the secondary education/TVET phase that countries should consider, to prepare young Africans for productive employment under global trends, including 4IR. That package includes **two core strategic aims**:

1. **Prioritise improving access, efficiency and quality of outcomes for lower-secondary education by ensuring wide coverage and the completion of good quality and relevant primary as well as lower-secondary education.** By the end of lower secondary, students should have good foundational skills—both cognitive and non-cognitive, including basic STEM and digital literacy, skills. Entrepreneurial and business skills should also be included throughout the primary and secondary education phase (with a focus on business creation and more technical skills in secondary). The transition to universal lower secondary education will take time and so in the medium term, young people who have had to drop out of the education system before completing lower secondary need to have access to good quality vocational training, so they can develop the key foundational skills needed for productive work. However, this should be a temporary measure, with the aim being to universal lower secondary education for all.
2. **After lower secondary, prioritise the quality and relevance of upper secondary and TVET, before gradually expanding uptake to meet labour demand.** Students should develop higher-order cognitive and non-cognitive, STEM and wide-occupation technical skills needed in sectors with high job creation and productivity potential (as described in Chapter 3) and be supported to move into work or further study, based on their potential. Skills development at this stage should be driven by demand, not supply, which will entail much closer engagement with the private sector in both the formal and informal sectors. It will also mean a much higher proportion of students taking STEM-related subjects and clear pathways into and between technical and academic routes.

Secondary education and formal secondary TVET policy recommendations

Specific policy goals and measures to support these strategic aims are listed below. They should not be seen as an either/or, but as a package of complementary reforms needed to drive better outcomes, where the relative weight placed on different policies will depend on a country's specific circumstances.

1. Improve the quality and relevance of general secondary education

Improving the quality and relevance of secondary education and TVET is crucial to ensure young people stay in school and obtain the skills they need for productive work. It requires action on many fronts, including, improving the availability and quality of learning materials and ensuring there are enough effective teachers and trainers in the classroom teaching relevant skills for the labour market. It also requires action to ensure schools have basic services and facilities (such as toilets and water access) and an orderly and secure learning environment (Bashir et al, 2018).

- a) **Improving the availability and quality of learning materials.** Many SSA countries face severe shortages in textbooks and learning materials, even in core subjects, often due to insufficient financing to cover high costs—which is a by-product of poor governance and ineffective procurement (Birger et al, 2013). Countries can lower the costs and increase the availability of textbooks through, for example, better procurement practices and predictable and sustainable financing for timely book procurement and delivery (ibid). Electronic learning materials also offer an opportunity to support learning.

In the near term at least, a cost-effective approach is likely to be a combination of textbooks in certain subjects and an increasing use of electronic materials and technology in science lessons in secondary schools, which also includes replacing costly science laboratories in some areas. Governments can help build capacity for ICT use in education through developing comprehensive and integrated ICT strategies that focus on building capacity overall, pedagogy and training teachers to use and apply ICT across subjects; integrating digital content into the curriculum; and considering public-private partnerships to share costs (Bashir et al, 2018).

- b) **Ensuring there are enough effective teachers.** Good teacher management is also important to ensure there are enough effective teachers in schools. That means recruiting high-potential teachers, deploying them in schools and TVET institutions where there is demand, ensuring they are in the classroom and they have the support, environment and training to teach effectively, progress and stay in the profession. Conditions vary across countries and so will appropriate policies, but Bashir et al (2018) suggest⁶² some key areas to address. They include:

62: The measures put forward by Bashir et al, 2018 are in the context of schools, but these will also apply to many TVET systems.

- *Strengthening pre- and in-service teacher training, with better co-ordination between the two, to improve teacher knowledge and teaching practices.* This includes better quality assurance measures to ensure training programmes have a positive effect on student learning. In schools, governments have often brought in under or unqualified teachers to help meet teacher demand quickly, but in doing so, these teachers also need to receive appropriate training. In some countries, such as Ghana, training underqualified teachers has proved a cost-effective way of meeting demand for teachers, particularly in remote areas. However, reforming teacher training is not an easy task. It is complex and requires strong institutional capacity to handle the political and operational challenges that policy players are likely to face.
 - *Improving management capacity of school leaders to boost operational oversight.*
 - *Ensuring teachers have the minimal conditions for a conducive learning environment.* Examples include manageable class sizes, material resources and basic services.
 - *Improving teacher deployment and attendance.* Examples include using better data and modelling on teacher demand and supply and using enrolment-based criteria for teacher allocation. There should also be tight links between teacher pay and expectations of teachers, which will rely on constructive dialogue between stakeholders, especially unions and credible data and analysis on salaries and outcomes. Close links between schools and communities could also help to lower unauthorised teacher absence at school.
 - *Strengthening accountability and teacher incentives to align teacher behaviour with objectives within the education system.* Again, this will require constructive dialogue with, often strong, teacher unions to enhance teacher motivation, performance and effort which in turn requires sufficient capacity to do so within government ministries.
- c) Devising flexible and relevant National Qualification Frameworks (NQF).** These should be underpinned by curriculum that reflect cognitive development and the needs of the labour market. For example, at lower secondary, the curricula should include some practical elements linked to key economic sectors; at upper secondary, the curricula should integrate economically relevant knowledge and also include practical examples. The NQF and curricula should also address gender equality, link to clear career pathways and encompass both the TVET and general education system. However, NQF and curriculum reform is time consuming and challenging as it involves a range of factors such as retraining teachers and trainers, publishing new learning materials and reforming the assessment system to match the new curriculum. It also relies on buy-in from stakeholders such as teachers and parents. In short, it requires “long-term commitment, leadership, capacity and adequate resources to be implemented successfully” (Bashir et al, 2018). A more incremental approach, starting with strengths in the current system, with feasible small-scale changes in some countries may be more prudent.
- d) Improving STEM uptake.** As discussed in the previous chapter, the uptake and performance in STEM subjects (which is important for productivity and innovation) is relatively low. Improving STEM uptake at secondary education will require a holistic and coherent approach to tackling the underlying challenges, which are many and inter-related (Tikly, 2018). A significant shift in STEM uptake at upper secondary will require clear targets, matched by necessary resources and incentives for providers and students. Examples include addressing the shortage of qualified STEM teachers (which could be aided by measures to increase STEM uptake at tertiary level) with the right subject knowledge and pedagogical skills in primary and secondary school, ensuring STEM curricula is relevant and engaging and ensuring resources align with STEM targets alongside accountability systems to help drive delivery. Given limited public resources, governments could also look to Public-Private Partnerships and ways to increase effective collaboration between schools to achieve economies of scale. Student incentives to select STEM related subjects don't need to be expensive—a cost effective approach could be providing information on potential returns to STEM subjects (Hicks et al, 2011).

2. Increase access and internal efficiency across formal secondary education

Access is negatively affected by numerous factors, including excessive travel distances, particularly in rural areas where children often travel further than students in urban areas. For example, in Ethiopia 27 percent of students in rural areas must travel more than 3 km to their nearest school compared to 3 percent in urban areas. Financial costs, such as uniforms or the opportunity cost of helping at home, also increase the likelihood that students, especially from poor households, don't attend school. Indeed, Bashir et al (2018) found cost (including travel distance) to be the main reason young people dropped out of lower secondary, followed by low quality of education. In some countries, early marriage or pregnancy also prevents young girls from attending school.

In addition to access, internal efficiency must be a priority. Ensuring students progress from primary and complete at least lower secondary is still a major challenge in SSA, as is keeping young girls in school. Low quality primary education means some students struggle to progress and high stakes exams at the end of primary and lower secondary school (which determine placements in the next education level or regulate access) confound the problem as they create perverse incentives such as focusing on test preparation and malpractice. They also lead to higher repetition rates as students are deliberately held back from taking exams to help artificially inflate pass rates. Key policy actions include:

- a) **Addressing supply-side constraints.** The most obvious measure is to increase the opportunity for access by building new schools nearer pupil populations, particularly in rural areas, that offer at least a minimum package of facilities (see Bashir et al, 2018 for a more detailed discussion).
- b) **Addressing demand-side constraints.** For existing facilities, ensuring a safe and healthy learning environment is essential for attracting and retaining children, particularly girls. According to Bashir et al, 2018, removing high stakes exams in favour of improved classroom assessments for certification purposes can improve transition rates between primary and lower secondary—but they should be replaced by improved classroom assessments for certification purposes, alongside a strong inspection system. And stackable, or modular courses—where students don't have to complete modules straight after one another—could encourage completion rates for TVET students who are working or have additional

responsibilities outside school. Flexibility will become increasingly important as workers update their skills in light of technological advances and structural change.

3. Improve the quality and relevance of formal secondary TVET

Countries should prioritise and focus on improving the quality of TVET provision for key growth sectors, including the informal sector, with explicit industry linkages first. The temptation to rapidly scale up provision while implementing large system scale reform should be avoided because TVET is relatively expensive to deliver, reforms are often complex, take time to implement and the evidence on what works in a particular country is not that clear. For example, in Senegal, the government is establishing a cluster of training centres to support three priority economic sectors that align to its overall economic strategy and in close partnership with the private sector. Again, implementing a system wide competency-based NQF in TVET is popular yet resource and time intensive. It may be prudent instead to start small, test and build, such as starting with accrediting specific industries to instill some discipline in the market before moving on to accrediting programmes. Other key policy actions include:

- a) **Tracking TVET from upper secondary.** Students need a good set of foundational skills before they start learning more advanced, technical skills. That means tracking TVET from upper secondary, so students start only after they have developed necessary skills through basic education.
- b) **Ensuring enough effective TVET trainers.** High-quality TVET trainers are in short supply. Several policy measures can be enacted to help attract and retain qualified trainers, including: creating clear and flexible pathways for becoming a TVET trainer (with commensurate salaries); developing progression routes within the profession for career growth; implementing a consistent training protocol to ensure skills are current and relevant; and enacting minimum competence standards. However, more in-depth research on prospective and current TVET teacher motivations is needed to help inform policy design to ensure reforms succeed (Grijpstra, 2015).
- c) **Ensuring TVET is relevant and demand-driven.** Close and continuous engagement between policy makers and industry is necessary to jointly agree on standards and curricula that meet the needs of the formal sector—and as much as possible, the informal sector as well. In particular, curricula should include entrepreneurship and

business skills training, focused on supporting non-cognitive skills and not force students into narrow specialisations so they are able to adapt in the labour market.

For example, in Ghana, the government is introducing 22 sector skills councils to help define and develop occupational standards which will underpin competency-based curricula and a national qualification TVET framework. COTVET—the coordinating body for TVET—has also commissioned detailed sector skills gap analysis in seven priority sectors to inform the design of standards. The councils will have representatives from bodies such as unions, employer associations, business networks, large employers and the informal sector. A sector-based approach allows the government to engage with industry more effectively and efficiently as it reflects existing industry structures and allows the possibility to prioritise sectors based on wider economic development priorities and reforms.

However, many countries, such as India and Nepal, have struggled to get sufficient private sector involvement to make their sector skills councils work effectively. Experience shows that employers need to understand the benefits of creating a demand-led system and their role in delivering it for them to engage. This is likely to be particularly crucial in Ghana given that results from some surveys suggest not all firms see skills gaps as a major constraint (Darvas and Palmer, 2014). Furthermore, bureaucracy and slow pace of implementation can frustrate the private sector causing them to withdraw. Employer involvement is most likely to occur in a favourable business environment with minimal bureaucracy and a fully-committed government (Dunbar, 2013) alongside capacity and capability in government ministries and agencies to engage effectively with the private sector.

4. Improve the value for money and implementation across formal secondary education

On average, SSA countries spend around 5 to 8 percent of GDP on education, which is above the internationally recommended level. However, in most countries, education spending will need to increase just to keep current primary and secondary enrolment rates constant, let alone achieve universal access, improve lower secondary completion rates and improve the overall quality of education (Bashir et al, 2018). Given forecasts for relatively weaker economic growth than in the recent past and reductions in donor aid for education, countries will need to look towards

greater domestic resource mobilisation and ways to achieve better value for money from education budgets. For example, through better deployment of teachers and timely payment of teacher salaries to drive efficiency as well as defining and implementing minimum standards for all schools. In TVET, the use of training funds could be improved so they better meet the needs of the private sector (rather than being spent on non TVET activity) by engaging the private sector in their use. Other key policy actions include:

- a) **Seeking smart ways to lower costs.** Building new infrastructure is particularly expensive, but alternative measures such as adding new classrooms to existing primary or secondary schools or double-shifting, if accompanied by monitoring and evaluation plans to ensure quality, can help lower costs in the face of increased demand. Other potential measures include establishing virtual science labs in schools, replacing boarding schools with less costly day schools closer to student populations, relying on multi-skilled teachers to teach several subjects while streamlining the curriculum and engaging the private sector to help provide capacity.
- b) **Establishing effective accountability systems.** These are critical for education systems of good quality and can, if designed and implemented effectively, deliver efficiencies as well, such as reducing teacher absenteeism and improving payroll and expenditure oversight (Bashir et al, 2018). Credible education plans, transparent budgets with clear responsibilities and independent auditing procedures help hold governments to account, while clear and sensible regulations with monitoring mechanisms are needed to support quality improvement measures. However, school and teacher accountability mechanisms need to be supportive and formative as evidence suggests that using student test scores to sanction schools or evaluate teachers leads to negative outcomes, such as demotivating teachers (UNESCO, 2017).

Successful implementation of accountability systems requires information to be transparent, timely, relevant and available to decision makers. There also needs to be enough resources to fund the education system while stakeholders need the skills and training to meet their responsibilities and to effectively hold others to account. This includes governments treating teachers as professionals, with governments investing in teacher professional development training. For example, in Senegal, the government is moving the sector to a results-oriented management system, focusing on improved learning outcomes,

school performance and equitable access. It has introduced performance-based contracts at each level of management and is building decision making capacity throughout the management chain. A key lesson from these reforms so far is that capacity building and community involvement is key to ensuring long lasting and positive impacts from the accountability measures.

c) Ensuring capacity and political commitment.

Stronger institutional capacity, including political capacity to realise the scale of the reforms as well as prioritise and make difficult decisions between different population groups and sectors are needed. Governments also need to build capacity for evidence-based policies that consider cost effectiveness and create incentives to align behaviour of stakeholders towards achieving skills development objectives (World Bank, Africa Pulse, 2017). Finally, better coordination of responsibilities and accountabilities within and between government ministries and agencies is key. Evidence from Kenya highlights just how important implementation capacity and capability is to a programme's success: an experiment that saw teachers hired by schools on short term contracts only had a positive effect on learning outcomes when administered by a non-government organisation. The positive impact was eliminated when the programme was run by the government (Bold et al, 2013).

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APPENDIX 1

4IR Technologies and Ecosystem

Technologies driving the 4th industrial revolution

Processing Technologies: Computing power continues to be key as it enables new applications that were not possible due to limitations of computer power. Computer power has been doubling every 18 months (Moore's Law), however, the limit of computers under the current designs is almost attained. New designs are now emerging with quantum computing capabilities, which is the new frontier in computing. So, we expect the unrelenting growth in computer power to accelerate further, allowing more and more powerful applications to be built on top of it.

Machine Learning /Artificial Intelligence/Robotics: Perhaps, this is the aspect of technology that most defines the 4th Industrial Revolution. AI is enabling machines to undertake tasks that were previously thought to be the domain of human beings. Much like humans, machines are now being enabled to learn and to continuously improve their capabilities. Significant milestones in this area, include the first computer to beat a human being in the Go game. More recently a machine has been able to do a better job of lip reading than a human expert.⁶³

Internet Communication and Proliferation of Devices linked to the Internet (Internet of Things (IoT)): Computing and communication power is increasingly being embedded in all kinds of hardware and devices, e.g. washing machines, coffee makers, refrigerators, security systems. Further, these devices are being connected to the internet. The Internet-of-Things (IoT) is this giant network of connected "things" (which also includes people). Cisco estimates that the number of connected devices will double from 25 billion in 2015 to 50 billion in 2020 (Hatzakis, 2016). IoT allows for virtually endless opportunities and connections to take place, many of which we currently cannot even imagine or fully understand the impact of.

Data Mining Technologies/Data Science: The proliferation of mobile devices, online sensors and other means of collecting information digitally, i.e. IoT. This has seen the capture of vast amounts of

data. When huge amounts of data are combined with powerful computing capabilities and Artificial Intelligence algorithms, the insights generated are unprecedented. New businesses are emerging from these digital platforms, including sharing economy apps such as Uber and supply and demand matching services such as Airbnb, allowing for instant interaction, information exchange and closer and broader collaboration, (WEF, 2017).

Blockchain or Trust Technologies: As new technologies connect disparate peoples and disrupt existing technologies trust systems developed over a long period of time are being eroded. Blockchain lets people who have no confidence in each other collaborate without having to go through a neutral central authority. Blockchain is an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way. Intermediaries like lawyers, brokers and bankers and even government bureaucracies might no longer be necessary. Simply put, it is a machine for creating trust (The Economist, 2015). Moreover, blockchain technologies can cut time of transactions drastically, from weeks or months to days, hours, or minutes. With blockchain, economies are poised to undergo a radical shift, as new, blockchain-based sources of influence and control emerge (Marvin, 2017, Iansiti and Lakhani, 2017).

Renewable Energy and related technologies: The shift to a new energy regime is beginning to happen. The World Energy Outlook (2017) points out that one of the defining trends is the rapid deployment and falling costs of clean energy technologies. It forecasts that in the European Union, renewables could account for 80 percent of new capacity and wind power becomes the leading source of electricity soon after 2030. In general, renewable energy sources (RES) are likely to be the least-cost source of new energy generation by 2040. However, for transition to an RES dominated energy regime, three technologies are going to be critical. These are generation technologies, storage technologies and distribution technologies. The competitiveness of RES will be determined by the weakest link in the three technologies.

63: The computer read lips with 95 percent accuracy, outperforming professional human lip readers who tested at 52 percent accuracy. Hal Hodson, "Google's DeepMind AI can lip-read TV shows better than a pro," New Scientist, November 21, 2016

The 4IR Ecosystem

Chapter 3 set out the elements of an effective ecosystem needed to improve the level of awareness and preparedness for 4IR. The paper focused on two segments: a) education and skills and b) the business environment. More detail on the other two quadrants is given below, including a discussion of facilitative policies.

Enabling infrastructure

Internet penetration and cost are two key factors in 4IR-enabling infrastructure.⁶⁴ In terms of coverage, quality and affordability, Africa lags behind all other regions. Data from International Telecommunication Union (Figure 7.1) for the period 2005-2017, shows that Africa has persistently lagged behind other regions, both in the level and rate of penetration. By 2017, only 20 percent penetration in Africa, compared to about 45 percent in Asia and Pacific and 80 percent in Europe. Many areas simply remain unconnected and even when connected to the internet, access is not easy. In Cameroon, Ghana, Kenya and Uganda, more than three in four users still access the internet in commercial internet cafés, where high costs and slow connections limit use. In their study of firms in selected African countries, Banga and te Velde (2018), find that a doubling of the internet penetration rate increases labour productivity by about 11 percent on average, emphasising the crucial role of infrastructure.

In addition to lower internet access, African countries also suffer from poorer performance, with average download and upload speed significantly lower than in Asian economies.

African internet users face longer delays in processing network data and pay much higher prices relative to their incomes (Banga and te Velde, 2018). This digital divide reflects inequality in access and is a barrier to productive use. The slow pace of internet penetration reflects shortcomings in policy and strategic direction and is consistent with the low level of awareness of 4IR innovations among policy makers observed in ACET focus group discussions for a complementary study (ACET 2018).

Provision of key infrastructure for internet will largely be done by the private sector but would require facilitative measures to enhance uptake. Increasing quality by rolling out 4G and 5G networks is probably the low-hanging fruit for many countries as the mobile phone has the potential to replace broadband as the key internet vector.

64: As indicated in Chapter 1, enabling 4IR infrastructure refers to the proximate determinants—namely internet penetration—coverage, quality and cost; while recognising that energy and power, transport and other services play crucial roles.

Therefore, putting in place incentives to attract private sector investment is key. Such incentives must be well targeted, transparent and properly aligned with country industrial policies. However, public investment will remain important especially where the private sector may be unwilling to go – e.g. remote and marginalised areas. One example is Botswana’s use of a Universal Service and Access Fund (USAF)⁶⁵ to increase Wi-Fi hotspots at hospitals, bus stops and other public places (Banga and te Velde, 2018). Rwanda is another good example, where the state has laid over 2,500 km of fibre optic cables throughout the country, bridging the digital divide between urban and rural areas.

Although the internet is the key infrastructure, there are other requirements as basic as electricity, for example, which must be available for any 4IR device to run. These other investments will also need attention.

Innovation Systems

A vibrant innovation system is a vital part of the 4IR ecosystem, as the power of 4IR comes from innovations built on new platforms and their successful commercialisation. Innovations systems are evolving rapidly, with many dynamic and creative spaces where young entrepreneurs can meet and develop ideas and meet potential investors. There are now over 442 active technology hubs in Africa, representing a 41 percent jump from 2017 (Figure A1.3) and over \$1 billion in venture capital investment in the pan-African start-up movement (Bright, 2017). However, in focus group discussions in Kenya, participants complain that many start-ups have not been able to move beyond start-up stage and have instead become “perfect pitchers” that specialise in moving from one competition to another, pitching for funding.

Thriving innovation systems require collaboration between researchers, entrepreneurs (private sector) and policy makers. While researchers and innovators can create interesting solutions, it is the entrepreneur who turns an interesting idea into a business. The policy maker’s role is both to see how best to fund research and support entrepreneurs by removing policy bottlenecks. This arrangement is called the Triple Helix Model, the building block of a vibrant innovation system being put in place. A number of African governments are beginning

65: Universal Service and Access Fund (USAF) - a fund into which contributions from operators and/or other sources are paid for the purpose of providing basic and advanced telecommunications services to underserved areas, communities or individuals who cannot afford such services on their own, in the pursuit of universal service.

to coordinate and facilitate the development of innovation hubs, crowding in private sector (Box A1.1). But more needs to be done to support ideas, proof of concept, incubation, intellectual property and moving from experimentation to commercialisation.

Further, how innovators become business people is going to be crucial, underscoring the need to develop a variety of skills mentioned earlier. For many start-ups, making the transition to sustainable businesses requires different support from that received from hubs/incubators. This transition is happening as business accelerators are being set up; for example, Kosmos Innovation Centre in Ghana has an accelerator programmes that is driving the development of promising small businesses. Selected companies receive a range of support including capital investment and technical assistance aimed at helping them grow their business⁶⁶ Another path for growth which is happening is successful start-ups being bought by bigger business or investors⁶⁷. However, focus group discussions (FGD), again for our complementary study, found that many are being bought at a much lower value than they are worth and are also being bought by investors from outside Africa (ACET, 2018). This points to the need to support indigenous innovators.

66: <http://www.kosmosinnovationcenter.com/overview-acceleration/>

67: Indeed, some innovators, the so-called serial innovators, focus on developing business ideas and selling out the business before it has been developed

Collaboration between sectors is also being observed. This involves student internships, setting up laboratories in universities in collaboration with the private sector and the sharing of data. However, there is still much to be done, especially in creating an environment where there is cross-pollination of ideas and co-creation across academia, industry and policy makers.

Figure A1.1: Internet penetration rates (IPR)

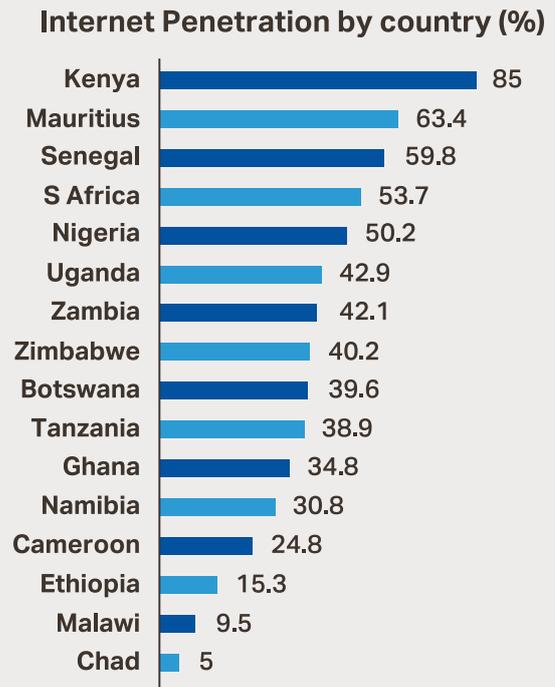
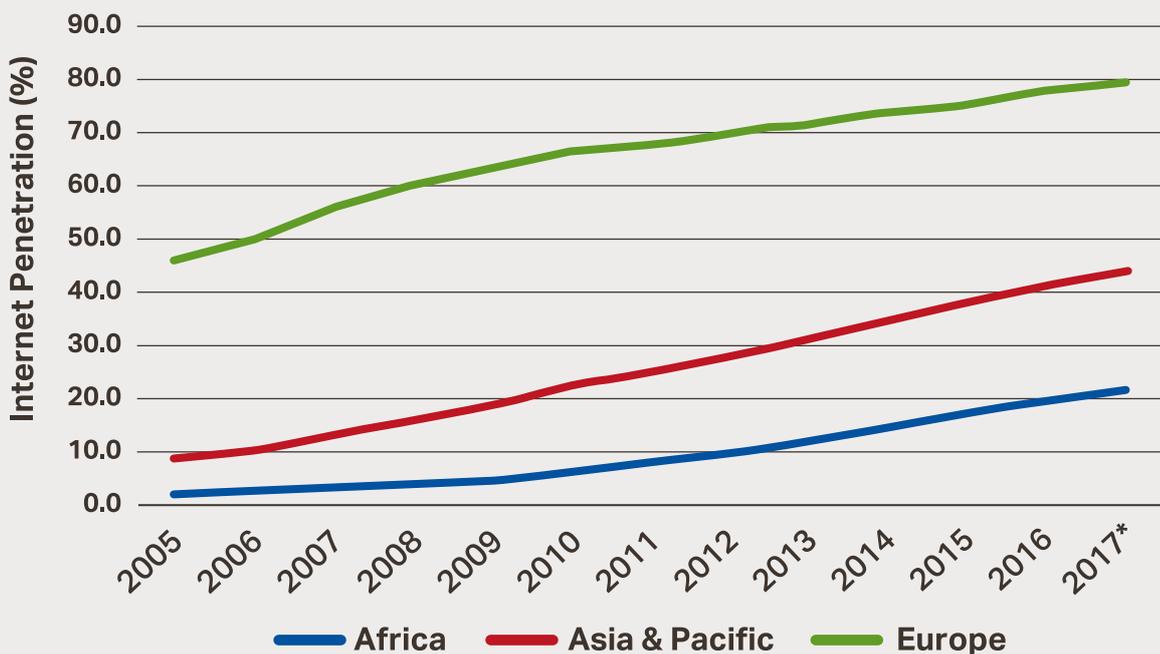


Figure A1.2: Internet penetration rates (IPR)



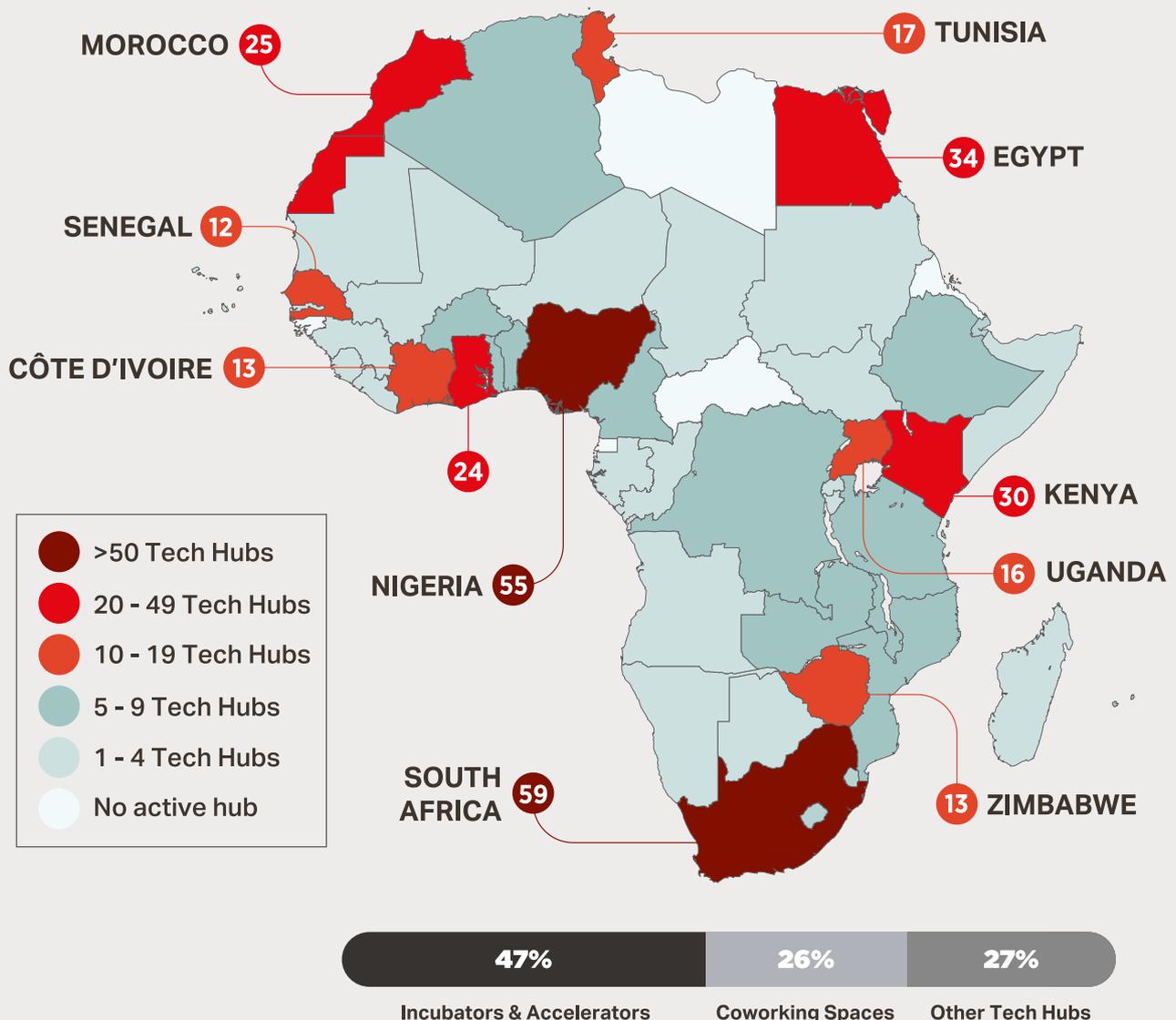
Source: International Telecommunications Union (ITU)

BOX A1.1: Examples of Technology Hubs—Rwanda and Kenya

Across Africa, governments are establishing science and technology parks to foster innovation through closer collaboration between research and industry to drive innovation. Rwanda is at the forefront; the Government in 2016, launched its flagship \$1.9 Billion digitalisation project that aims to leapfrog Rwanda into the 4IR. The Kigali Innovation City (KIC) is a dynamic ecosystem of technology clusters that has universities and industry collaborating closely, with government support. Companies domiciled at KIC are expected to innovate and deliver products and services for global markets. Already operating in KIC are Carnegie Mellon University and the African Institute for Mathematical Sciences; and in partnerships with existing educational institutions such as the International Centre for Theoretical Physics, this network is expected to contribute to creating a critical mass of engineers, mathematicians and scientists who are the heart of the innovations and human capital development. Kenya has also established the Kenya National Innovation Agency (KENIA) that has one of its core mandate to institutionalise linkages between universities, research institutions, the private sector, the government and other actors in the innovation systems .

(<http://www.innovationagency.go.ke/index.php/networking>).

Figure A1.3: Tech Hubs in Africa



Source: GSMA 2018. <https://www.gsma.com/mobilefordevelopment/programmesme/ecosystem-accelerator/africa-a-look-at-the-442-active-tech-hubs-of-the-continent/>

APPENDIX 2

Senegal – Country Case Study

This case study was based on desk research and a primary survey of firms, industry body representatives, education professionals and young people in Senegal. It also reflects findings from several focus group discussions with young people and education, including officials from the government. More detail is given in Annex A. More detail on the education system in Senegal is given in Annex B.

Economic and labour market context

Senegal's working age population (+15) will reach 13.5 million by 2030, up from nine million in 2017.

Fertility rates have fallen, but remain high, with each working age adult supporting several dependents. Over 40 percent of the population is under 15. Senegal could witness a demographic dividend, but only with significant investment in family planning and reproductive health to ensure fertility rates decline and child health improve (John Hopkins University, 2018).

Over the last decade and a half, unemployment averaged just under 8 percent and employment growth was relatively strong, averaging 4 percent per year (ILOSTAT, 2017⁶⁸). However, around a third of those employed are working poor⁶⁹ (ILOSTAT, 2017). A relatively high proportion of Senegal's working age population are not in the labour force – labour force participation is just 57 percent, compared to nearly 70 percent across Sub-Saharan Africa (SSA), largely reflecting relatively low female participation in the labour market (ILOSTAT, 2017).

The structure of the Senegalese economy has remained largely unchanged in the last 3 decades.

It is predominately service-based, accounting for around 60 percent of GDP and (the services sector is) mainly comprised of non-tradable commerce and telecommunications (IMF, 2017). The industry sector accounts for approximately a quarter of output, followed by the smallest sector, agriculture.

68: Note the latest ILO estimates are used for trends in the case study, but they differ from the (more up to date) labour Force Survey data.

69: Earning less than \$1.90 a day (in purchasing power parity terms).

Productivity in agriculture is low – the sector employs more than half of all workers but only accounts for around 15 percent of output. Productivity in the services sector, measured by value added per worker, is around seven times higher than agriculture (ILOSTAT, average 2006- 2016) – but output growth in the past 30 years has largely been in the low-productivity commerce and informal sector.

Youth unemployment is low compared to the average in Sub-Saharan Africa, but many young Senegalese are not in education, employment, or training (ILOSTAT).

In 2015, youth unemployment was just over 8 percent compared to just under 7 percent for adults aged over 25⁷⁰ (National Employment Survey, 2015). Over forty percent of young employed Senegalese are working poor and more than one in three are not in education, employment or training (NEET) (ILOSTAT, 2017). This in part reflects the relatively high inactivity rate of young females, which persists into adulthood – the female NEET rate is over 40 percent⁷¹. The young and women are more likely to be working poor and in informal employment (ILOSTAT, 2017, Echevin et al, 2013 and National Employment Survey, 2015). A survey of young people in Northern Senegal found that young people had a pessimistic view on their labour market prospects and often spent little time looking for a job due to a lack of hope, limited information, or insufficient funds (Echevin, 2013).

Education context

Senegal's education system is heavily influenced by the French system. It follows a 6-4-3 model, with compulsory and free education up to the age of 16 (Annex B). Junior secondary education leads to "Brevet de Fin d'Etude Moyen" (BFEM). Senior secondary education leads to the "Baccalauréat" (Bacc), a national exam diversified into streams. There is a lower secondary vocational education route that lasts three years and upper secondary TVET tracks that last between two and three years (EPCD, 2018⁷²). Most secondary schools are publicly owned and run

70: The SSA average was around 7 percent for adults; youth unemployment rate is around twice as high.

71: Data for Senegal is from 2015 and compares to 30 percent in Ghana (2015), 5.5 percent in Rwanda (2014) and 15 percent in Ethiopia (2013). Source: ILOSTAT.

72: <https://www.epdc.org/country/Senegal>

(85 percent in junior, 75 percent in senior), but qur’anic schools (daaras) are more prevalent in certain regions, especially in rural areas, where the focus is learning the qur’an (SABER, 2016).

Education attainment is low. In 2017, the average Senegalese aged over 25 had completed just 2.8 years of education (UIS⁷³). More than 50 percent of the working age population have less than basic level of education and one in three have a basic level (National Employment Survey, 2015, via ILOSTAT). The proportion of young people with no formal education is high – in 2011, just over 40 percent of 15-24 year-olds had no education and 20 percent hadn’t completed primary school (UIS and DHS, 2011 taken from [education policy and data center](#)).

Education access has increased significantly since 2000, particularly at the primary level, but is still below average. Increased public investments in education over the past two decades has led to better access (World Bank, 2013 and World Bank, 2016). Significant progress has been made on transition rates from primary to lower secondary, as increased dialogue with religious groups generated support for free and compulsory education up to lower secondary and facilitated the incorporation of religious schools in the formal education system (UNESCO, 2015). Yet, primary completion rate is below the average in Sub-Saharan Africa (UNESCO, 2017) and nearly one in four children of primary school age are out of

school (DHS, 2014). Lower secondary completion rates are improving, rising from one in five in 2005 to over one in three students in 2016 (Edstats, 2018) but there are marked differences in attendance and completion rates based on household income and geography. Only one in five children in rural areas goes to secondary school – compared to one in two in urban areas – and only 8 percent of those students complete it (SABER, 2016)⁷⁴. Girls are also much less likely to complete lower and upper secondary education than boys (UNESCO, 2017).

The quality of learning is relatively weak. In 2014, just under 50 percent of grade six students were not competent in Maths or reading on the Programme d’Analyse des Systemes Educatifs (PASEC) (World Bank, 2018)⁷⁵. There are stark differences in outcomes between students from the richest and poorest households - only around 25 percent of primary school students from the poorest quintile had learned enough to continue school, compared

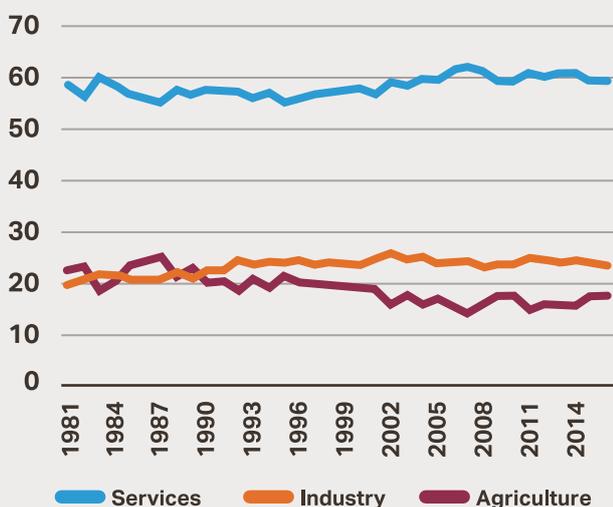
74: Data is from 2010 DHS accessed via Edstats, latest data available. Disaffection is one of the most important reasons young people leave school. Other drivers include repetitive failures, financial barriers, distance to school and socio-cultural factors, specifically in relation to female children. For example, nearly 90 percent of girls who have dropped out of school to get married live in rural areas compared to 10 percent in urban areas (USAID, Étude nationale sur les enfants et les jeunes hors du système éducatif au Sénégal, 2017).

75: Senegal’s performance on the PASEC is low compared to middle-income countries (SABER, 2016). However, Senegal performed better than its neighboring countries on the PASEC and had the fifth highest scores out of ten countries in West Africa that participated in the assessment (SABER 2016).

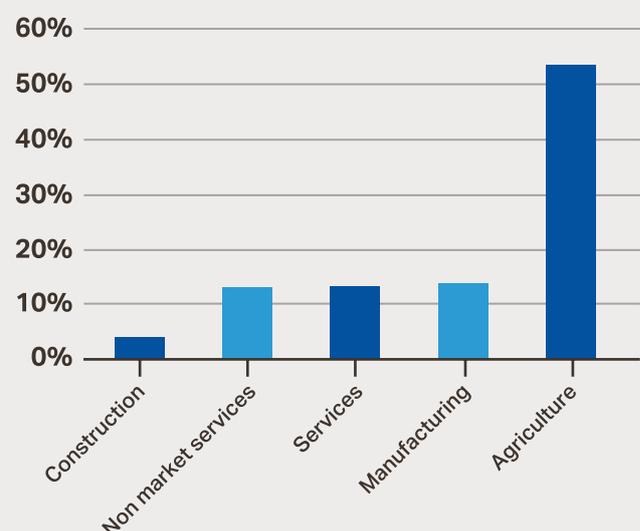
73: <http://data.uis.unesco.org/Index.aspx?queryid=242>

Figure A2.1: Output and employment shares by

Sector shares, percent, of GDP (value-added) 1980 to 2016



Employment share by sector



with over 75 percent of students from the richest quintile (World Bank, 2018). There are also gender discrepancies in results. In 2014, girls performed worse than boys on the PASEC in both Mathematics and French⁷⁶, while in 2016, slightly more boys than girls (39 to 35 percent) passed the Bacc. Additionally, only around 35 percent of students pass the Bacc at the end of upper secondary, while enrolment in scientific courses is low, particularly among girls. In 2016, less than 30 percent of students were enrolled in science series⁷⁷ which is well below the government’s goal of 80 percent of secondary school students enrolled in non-literary fields by 2025.

TVET enrolment is also relatively low and is not meeting the needs of firms. The enrolment in TVET institutions as a percentage of the total enrolment in secondary education has fallen since 2011, from just under 13 percent to just under 8 percent, 5 percent females and 10 percent males, in 2016^{78,79}. Yet there is high demand for TVET (World Bank 2014), particularly in the formal sector – in 2011, TVET diploma holders

were significantly more likely to be employed and earned more than those with just upper secondary education.

In 2012, McKinsey found that around 40 percent of employers surveyed couldn’t find the technical skills they needed (World Bank, 2014). TVET programmes are predominately focused on four areas of specialisation – accounting/management/marketing, hairdressing, dressmaking/tailoring/clothing and electricity – offering little opportunities for training in the priority economic sectors, such as agriculture and tourism (see below). In general, TVET programmes are unresponsive to economic potential and labour market demand (World Bank, 2014).

There are inefficiencies in the system, but as pupil numbers and completion rates rise, more effective financial management will be needed. Government spending on SE is relatively high – per pupil expenditure as a proportion of GDP is around 28 percent⁸⁰ – but most of the money (including in TVET institutions) goes to teacher salaries. Schools therefore charge fees to cover the cost of inputs, such as textbooks, which has a disproportionately negative impact on students from poor households: around 20 percent of dropouts in grade 1 are due to parent financial constraints (World Bank, 2013). Between 2007 and 2014, schools were closed for 50 out of 188 official school days - nearly 20 of which were lost due to individual teacher absence and strikes (UNESCO,

76: World Bank Indicators, grade 6.

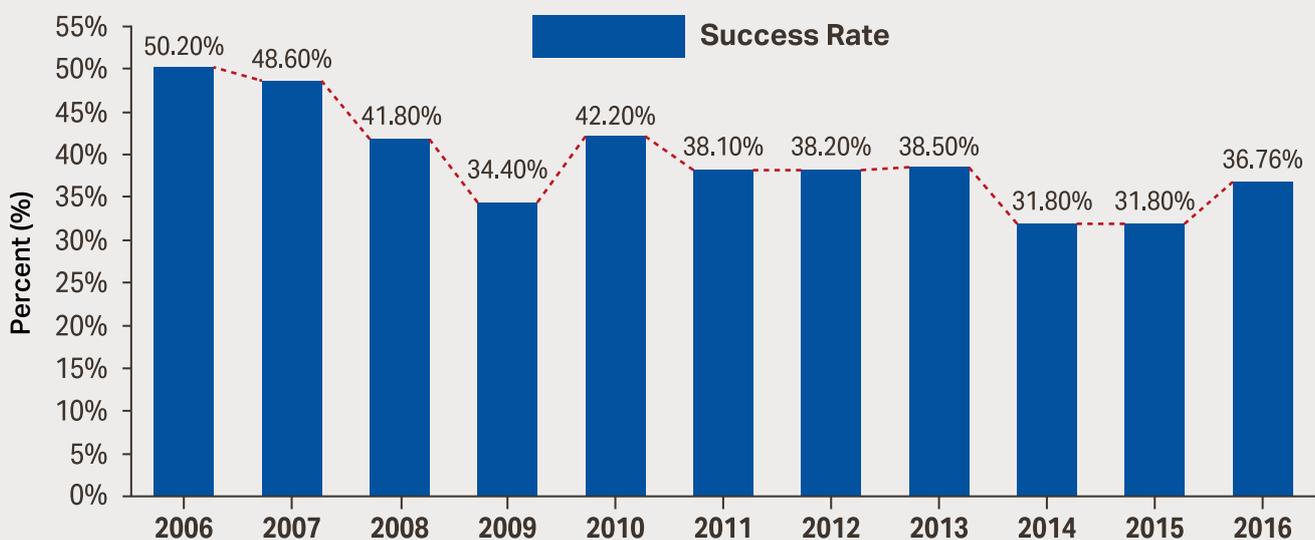
77: Ministry of National Education - Rapport National sur la Situation de l'Education : RNSE 2016 http://www.education.gouv.sn/root-fr/upload_docs/Rapport%20National%20sur%20la%20Situation%20de%20l'Education%202016.pdf

78: UIS UNESCO/Senegal <http://uis.unesco.org/en/country/sn?theme=education-and-literacy>

79: Many students go into apprenticeships, but their quality is low as, for example, they use outdated technologies and equipment and training doesn't include higher-order thinking skills (World Bank 2014).

80: Based on average of data available between 2006 and 2016 (World Bank development indicators).

Figure A2.2: Success rate for Bacc 2006-2016, Ministry of Education



2017). The overall accountability framework is weak while TVET providers have limited ability to make decisions about staffing and programme design as their budgets are managed centrally and offer limited financial autonomy.

Job prospects in the agriculture, ICT and hospitality sectors

This section gives a brief overview of the potential for job creation in three key sectors. These sectors broadly align with the government's priority sectors within its Emerging Senegal Plan (ESP), or national development plan. The ESP aims to improve the business climate and develop a cluster of services and skills to help raise the capacity and productivity of firms and workers and so ensure decent jobs for its growing youth population. Tourism and agriculture in particular have the potential to absorb low- and high-skilled workers – not just in Dakar but in rural areas where good jobs are hard to come by.

Agriculture

A modernised agriculture sector, with strong links through its value chain and wider economy, could help close the country's food gaps, improve food security and provide a substantial number of productive opportunities for young workers. Agribusiness, especially in high-value-added horticulture, has strong potential in Senegal given the country's sunny weather, proximity to Europe, direct ocean access and openness to foreign investors (English, 2016). Poultry farming offers another opportunity for job creation, given its rapid growth since the 1990s.

While the government is giving agriculture priority under ESP – reforms to give investors secure access to land while protecting local community interests already are underway – special attention is needed to ensure the education system provides the skills needed to meet agricultural growth opportunities. For example, the horticulture industry needs skilled workers with scientific knowledge about production, packaging and logistics. And the poultry industry needs skilled workers and technicians who can drive productivity gains by leveraging new technologies and successfully manage farms that comply with international quality standards. This will require TVET reforms, such as upgrading the skills of trainers and increasing access to relevant courses (World Bank, 2014).

ICT, including ICT-enabled services

The ICT sector, including Business Process Outsourcing (BPO), is expanding rapidly. The communications sector has been the fastest-growing part of the economy (English 2016), averaging over 10 percent growth per year between 1995 and 2013 and driven largely by domestic services demand. Senegal is a key destination for outsourcing due to its economic and political stability, telecoms infrastructure and cost advantages. It has also scored highly on the World Economic Forum Global Competitiveness Index for potential to innovate and be productive (ranked 51 out of 137 countries in 2017⁸¹). Call centres are the dominant ICT exports, but Senegal also exports higher value-added services such as software development.

However, Senegal is losing its relative competitiveness as a supplier of outsourcing services (English, 2016) due in large part to a lack of workers with relevant skills. Continual skills development will be crucial for ensuring Senegal retains its strength in ICT-related services, particularly as technological advances put certain jobs in the sector at risk of automation. A concerted strategy to develop the ICT sector overall is needed. Stronger competition in the market for internet service providers would help lower prices and improve service quality⁸². The ESP recognises the need to reform the regulation framework to help promote competition and the government, in partnership with the African Development Bank, is developing a business park to attract BPO-related firms (English 2016).

Hospitality/tourism

Senegal's natural wealth, rich culture, location and stability mean business and cultural tourism could be important potential sources of growth. Evidence suggests that in developing countries, on average, each hotel room creates a job in the hotel, one job in the tourist industry and one job in the wider economy through indirect linkages (English, 2016). Travel and tourism directly supported 177,500 jobs in 2017 (3.8 percent of total employment) but is only forecast to grow by 0.9 percent per year over the next ten years.⁸³ Declining quality and limited range of services, due in part to a lack of qualified workers and investment, are preventing the sector from reaching its potential (World Bank, 2014).

81: <http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf>.

82: Internet speeds are generally slow and the cost is high.

83: World Travel & Tourism Council – Travel & Tourism Economic Impact Senegal 2018. Found here: <https://www.wttc.org/-/media/files/reports/economic-impact-research/countries-2018/senegal2018.pdf>. In 2017, the total contribution to employment, including indirect jobs, was 422,000 jobs and is expected to rise by 1.7 percent a year until 2028.

A clear and comprehensive tourism strategy with a regional approach that is managed with the private sector is needed, including re-development of the main tourist destinations: Saly-Portudal and Casamance (English, 2016). Education and TVET reforms are needed so that youth can develop the skills needed to gain productive work in this sector, either as employees or entrepreneurs. The current TVET system falls short in this regard. For example, pre-employment (public) TVET training offers almost no courses in restaurant and hotel industries, while the sole tourism-specific public training institution is low-quality and attracts only 40 students a year (World Bank, 2014).

Survey Data

The focus groups held in Senegal for this study support the need for policy action in the three sectors discussed in the previous section (Annex A). Participants highlighted the mismatch between skills developed in the education system and those needed for the labour market; poor learning conditions, such as overcrowded classrooms and outdated TVET provision; and a weakness in the SE/TVET system to deliver the practical skills needed for work as well as more specialised business and entrepreneurial skills. They also highlighted a struggling teaching profession, including outdated teaching methods and poor teacher training. To improve the system, participants called for a review of curricula involving major stakeholders and communities.

Most firms surveyed by individual questionnaire believe SE does not develop non-cognitive skills or business and entrepreneurial skills well. A third of young people interviewed felt SE/TVET does not prepare them for work – half said they found it difficult to get a job in their chosen sector. Nearly all education trainers and specialists interviewed felt the SE/TVET curricula needed reforming to ensure students had the skills needed for current and future work, especially in the context of the 4th Industrial Revolution (4IR). Interestingly, most respondents still felt the education system delivers the reading and writing (and communication) skills needed for current and future work. Most firms interviewed felt SE was effective at developing skills in ICT and Science, Technology, Engineering and Mathematics (STEM) and that TVET was effective at developing a range of skills needed for work – though not business and entrepreneurial skills. This may reflect relative optimism about the government's reforms to the TVET system, but further investigation is needed to understand the discrepancy between these results and survey data from other sources, cited above.

These findings point to a disconnect in perceptions and actual learning outcomes, suggesting that close engagement with stakeholders – to build the case for change – is crucial for implementing education reforms successfully. Stronger collaboration between stakeholders may also be needed given that only 15 percent of education professionals felt current collaborative efforts between stakeholders in designing and implementing programmes was “high” versus “moderate” or “low”.

Actions for SE and TVET reform

As with all countries, the education system should reflect the local context and economic priorities. The implications of the analysis of the current context, including government actions already underway or planned, suggest a number of actions that must be taken in Senegal to ensure young people can gain productive employment – and retain employment under 4IR. A priority is to continue to improve access and completion rates in basic education, especially for disadvantaged groups as well as improving the quality and relevance of learning. That includes continued action to ensure children in *daras* learn foundational skills⁸⁴. The quality and relevance of upper secondary education and TVET, including measures to improve the uptake of STEM related subjects, needs strengthening before gradually improving access, internal efficiency and completion rates.

Improving general education quality and access

According to the World Bank, the key to driving better learning outcomes and efficiency in Senegal's education sector is a stronger accountability system. The government, with the World Bank, introduced performance-based contracts between regional education authorities, district education authorities and primary and middle schools. They are now extending this to include contracts between the ministry and regional level as evidence showed stronger accountability and decentralisation led to better outcomes. It's also organising and training local communities to contribute to the improvement of school management (World Bank, 2013).

84: The government is upgrading non-formal schools, such as community-run schools and *daaras*, to provide a modernised curriculum. Based on the latest results, a project with the World Bank that uses performance-based contracts to improve the quality of 100 *daaras* schools, soon to be scaled up to 500, is working. (World Bank 2018).

Along these lines, Senegal needs to address several integral school inputs and learning conditions to improve general SE quality and access:

Teacher skills and capacity. More high-quality teachers, trained in effective pedagogical techniques and the latest curriculum, are needed, particularly in rural areas⁸⁵. The government is taking steps in this direction by developing teacher-based performance standards that underpin training, reforming pre-service training to focus on pedagogy and upping the minimum-level qualification requirement for becoming a teacher (to the Bacc level) (World Bank, 2013). It is also working with the Regional Centres for Training of Education Staff to develop in-service training at all levels (World Bank, 2018).

A larger and more diverse school supply. Increasing the diversity of providers and educational choice could improve access and quality when used in tandem with other reforms, such as a strong accountability system (SABER, 2016). To help promote diversity of supply⁸⁶, SABER recommended publishing clear registration guidelines to ease market entry for new providers; ensuring certification standards (such as for land and facilities) are linked to education outcomes; and giving government-funded private schools access to start-up funding or government facilities.

Improving TVET quality and access

A variety of factors contribute to the low quality and relevance of TVET in Senegal, such as weak links with the private sector, including the informal sector (Kingombe, 2012) and outdated training for TVET trainers. For example, mechanics are trained in basic skills, so they are not taught how to repair modern cars that use computers and advanced electronics. TVET trainers themselves also often have poor vocational training and weak academic credentials, further limiting programmes.

85: Nearly a third of lower secondary education teachers don't have a diploma. In the 1990s, Senegal introduced a contractual and volunteer hiring policy to reduce costs and meet teacher shortages - contract teachers are paid a lot less and don't receive the same benefits as permanent teachers. Unqualified teachers can take an exam to become a civil servant, but places are limited. In 2015, over a half of lower secondary education teachers were contract staff and nearly 60 percent were waiting to transfer to civil servant status (l'annuaire statistique 2015. Less than 50 percent of secondary teachers were trained and the pupil to trained teacher ratio was 42 (UNESCO 2017).

86: The majority of schools are publicly owned and run, but around 26 percent of enrolments at senior secondary schools are in private providers, the majority of which are secular.

Senegal has a national strategy for TVET, that aligns to the overall ESP development plan and aims to improve access, quality and relevance and governance of TVET (Annex B). In addition, it plans to integrate the traditional apprenticeship system into the TVET system to provide 300,000 TVET students (compared to around 1.1 million secondary students, UIS 2015) the opportunity to get on-the-job, practical experience. The government is also introducing certified, short duration training for young people who are excluded from the education system, lack relevant qualifications to get a job or work in professions that have significant responsibilities but lack regulation, such as taxi drivers. This is an important policy innovation in Senegal because of the high school exclusion rates and relatively low primary and lower secondary completion rates (UNESCO, 2017). However, in line with the main paper's recommendations, the long-run goal should be to ensure all students achieve a high-quality lower secondary education, before moving into any form of TVET.

The work programme outlined above should, if successful, be scaled up and include reforming the technical baccalaureate so it encompasses the relevant cognitive, technical and non-cognitive skills needed for work in the ESP growth sectors. Stronger incentives are needed to ensure young females gain skills needed for future work instead of dropping out of secondary education, while all students need more freedom to move between the general education and TVET routes so they are not constrained by early choices and are able re-engage with the education system if needed. Finally, more details underpinning Senegal's TVET reform strategy, including a transparent implementation timetable and prioritisation across policies, are needed to avoid delays. The still relatively new TVET ministry will need sufficient resource capacity and capability to implement the strategy successfully.

Improving STEM uptake

Senegal has taken steps to improve the uptake and performance of STEM related subjects, including the "Festival of Science and Innovation in Senegal", a two-week event featuring workshops, experiments and laboratory visits. The government also created new research-intensive universities to boost STEM uptake at the tertiary level and to increase the number of STEM teachers. However, more concerted action is needed, particularly for female and disadvantaged students (World Bank, 2017).

Senegal aims to tackle the gender imbalance through awareness campaigns, performance-based contracts targeting females within the science and technology

labouratory blocks and teacher training to encourage females to pursue science and math tracks. It also is establishing two model high schools with a focus on science and math, with a 50 percent target female enrolment. This policy has been introduced in other countries, such as Burkina Faso, but have struggled to work because of implementation and monitoring challenges. The project will need narrow objectives with performance indicators; strict oversight (however, the model high school autonomy should also be guaranteed); and an agreed framework for financing, implementation and evaluation that also allows the possibility of upscaling for it to be successful.

Utilising technology

Senegal was an early pioneer of ICT in education and has made progress in developing digital learning resources for teachers, including a digital platform for teachers to collaborate and engage with each other and experts. It also has developed an Education Management Information System to collect better data. But despite having a favourable policy environment for ICT in education, such as necessary bandwidth and connectivity, Senegal has yet to see significant ICT-related impacts in its education outcomes (World Bank 2012). For example, there are initiatives to build the ICT capacity of teachers, but they focus on computer literacy rather than pedagogy around ICT in teaching. A more comprehensive range of policies are needed to improve the digital literacy of students and realise the potential opportunities of ICT in education.

Improving the link between education and work

The focus group discussions for this case study highlighted the need for career guidance, mentoring and access to information on job opportunities through mediums such as social media. Projects like *the Projet de l'amélioration des performances de travail et d'entreprenariat (APTE-Senegal)*, which provides students with career counselling and transition to work services, including entrepreneurship coaching and mentoring, job shadowing, internships and job placements, will help. The initiative is expected to train 1,575 Senegalese teachers to roll out the "Work Ready Now!" curriculum, a programme sponsored by the Education Development Centre that helps young people in emerging economies develop the skills they need to succeed in the workplace or in a livelihood.

Conclusion

Improving the quality, access and relevance of secondary and technical and vocational education in Senegal is essential for young people to be able to gain productive employment, particularly in the key sectors targeted by the government for job creation and within the 4IR context. A priority should be ensuring all students achieve a high-quality lower secondary education so that students have a good set of foundational skills (cognitive and non-cognitive) that will enable them to get productive work or continue their studies. Students will also need to master at least one international language, which should be included in the curriculum through secondary education and TVET.

The TVET and upper SE systems (and beyond) need to meet evolving labour market needs, before gradually expanding in line with demand. The government has ambitious reform plans and has started to strengthen the accountability system alongside decentralisation, which should help drive better value. However, ruthless prioritisation of evidence-based policies alongside effective coordination and sufficient capacity and capability within government will be needed if the reforms are to be implemented successfully.

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Annex A

We conducted individual surveys as well as focus group discussions to get an insight into how customers of the education system in Senegal viewed its performance in terms of preparing young people for work now and in the future under the fourth industrial revolution.

Individual surveys

We surveyed approximately 200 individuals from different population groups:

1. Firms/Employers and Representative Groups (38 respondents)
2. Teacher Training Directors and Teacher Training Specialists (Education and TVET Training Institutions) and Directors at Education Ministries and TVET Ministries (60 respondents)
3. Young people (unemployed, employed and at SE or TVET) (87 respondents).

Focus group discussions

Five focus group discussions were conducted in Thies (2), Mbour (1) and Dakar (3) which were moderated by a lead researcher with assistance from two research assistants. The focus group discussants were:

The focus group discussants

Type of FGD Participant		Number
1.	Employed Educated Youth (w/degrees/certificates)-Formal Sector	24
2.	Employed 'uneducated' youth-Informal Sector	18
3.	Unemployed Educated Youth	16
4.	Unemployed Uneducated Youth	17
5.	School drop outs (male)	5
6.	School Drop outs (female)	7
7.	Representatives High Schools (Lycée)	9
8.	Teacher Training College representatives (Univ. Of Thies, UCAD, FASTEf)	5
9.	University Representatives (ISM Mbour, UCAD, Univ. of Thies)	6
10.	Private Sector company Representatives (Industry, Hotels, agribusiness, banks)	5
11.	Chamber of Commerce representatives	1
12.	Government Representatives (Ministry of education)	2
TOTAL		115

Source: ACET 2018 focus group discussions

Annex B

TVET Provision in Senegal

The formal TVET sector mainly consists of private providers, who make up 65 percent of the total provider base, although enrolment is almost evenly split between public and private providers (World Bank, 2014). Public TVET consists of the technical route or the vocational route:

- **Secondary technical education/Lycees techniques** - the programme lasts three years, culminating in the Technical Baccalaureate and prepares graduates for work or for tertiary level TVET. Students can choose between four series: (1) S and (2) F, which relate to science, technology and agriculture; (3) T, which consists of mechanical manufacturing and electronics; and (4) G, which focuses on the quantitative elements of economics and management. In 2013, 84 percent of technical education secondary students enrolled in the G stream (Agence Nationale de la Statistique et de la démographie, situation économique et sociale du Sénégal en 2014 (2017)). Overall, 50 percent of students pass the Technical Baccalaureate (ibid).
- **Secondary vocational education** - programmes can lead to a Certificat d'Aptitude Professionnelle (CAP: 2-3 years), Brevet d'Etude Professionnelle (BEP: 2 years), which are intended as a route into entry level work or self-employment. The Brevet

de Technicien (BT, 3 years) programme prepares graduates for work or for tertiary vocational education. Again, the success rate is around 50 percent for vocational courses (ibid).

The non-formal and informal sectors play a key role in TVET provision. Non-formal TVET programmes are offered by a range of providers, including professional organisations in the private and public sectors, nongovernmental organisations and religious schools. Various ministries also provide apprenticeships and TVET programmes.

TVET national strategy

The government has a national strategy for TVET, that aligns to the overall ESP development plan and aims to improve access, quality and relevance and governance of TVET.

- **To improve access:** expanding the network of TVET related institutions in rural areas, including mobile training centres; increasing the use of training centres for training teachers in traditional language; and using incentives to promote female uptake of industry related programmes. By 2025 the government aims to have at least 30 percent of students exiting basic education into TVET institutions.
- **To improve quality and relevance of TVET:** Build partnerships with sectors to help design and deliver TVET; increase provision in key sectors; use

planning studies (sectoral) to guide policy action; introduce a competency-based curriculum backed by teacher training; strengthen the qualification of trainers and implement quality controls for providers.

- **To improve governance:** strengthening management and co-ordination systems by, for example, supporting the establishment of an information system concerning the labour market in collaboration with the Directory for Employment (Direction de l'emploi); better guidance on TVET programmes, pathways and entry requirements; improving the management of HR, for example, by allocating teachers and trainers based on demand.

The World Bank and French Development Agency are working with the government to help implement its TVET strategy. For example, they are improving the infrastructure and introducing performance-based contracts to improve the quality of service delivery⁸⁷ in selected technical secondary schools. They are also establishing a cluster of training centres focused on meeting skills needs in the agriculture (poultry farming and horticulture) and tourism sectors. The objectives are to improve the level of expertise of trainers and the qualification of workers through public-private development of training provision and creating new competencies needed for each of the sectors.

87: A tertiary project with the World Bank in Senegal suggests performance-based contracts are useful tools for improving the management of training institutions by creating a culture of accountability and planning (World Bank 2014).

Pre-university education in Senegal comprises four cycles intergrating academic education with vocational and technical training

Age groups	Level	Class	
3 – 5 years	Preschool	Petite section Moyenne section Grande section	
6 – 11 years	Primary	Cours d' Initiation (CI) Cours Préparatoire (CP) Cours Élémentaire Première Année (CE1) Cours Élémentaire Deuxième Année (CE2) Cours Moyen Première Année (CM1) Cours Moyen Deuxième Année (CM2)	
12 – 15 years	Lower secondary	Sixième (6 ^e) Cinquième (5 ^e) Quatrième (4 ^e) Troisième (3 ^e)	Technical and Vocational Education and Training – TVET (12years and more)
16 – 18 years	Upper secondary	Seconde (2 ^{nde}) Première (1 ^{ère}) Terminale (Tle)	

Unit 2014, compulsory schooling was for the age group 7-16 years; since 2014 the legal age of schooling at CI has been reduced to 6 years

Source: Senegal Ministry of Education Policy Document

Source: International Telecommunications Union (ITU)

APPENDIX 3

Ghana – Country Case Study

This case study was based on desk research and a primary survey of firms, industry body representatives, education professionals and young people. It also reflects findings from a focus group discussion with education professionals, including officials from the government and a multi-stakeholder platform event involving youth groups, academics and government officials in Ghana, held in April 2018. More detail on the survey and focus group is given in Annex C. More detail on the education system in Ghana is given in Annex D.

Economic and labour market context

Ghana's working age population is projected to grow from nearly 18 million in 2017 to 24 million in 2030⁸⁸. The median age is around 20 and the population is urbanising quickly – the percentage of the population living in urban areas is projected to be just over 60 percent by 2030 (UN Department of Economic and Social Affairs (UNDESA, 2017⁸⁹), while the rural population remains broadly stable.

Ghana's economy has seen impressive growth in the last decade, driven largely by higher commodity prices. According to the Ghana Statistical Service, real GDP growth peaked at 14 percent in 2011, before falling to below 4 percent in 2016 as commodity prices fell. Poverty has fallen, underpinned by rural development and rapid urbanisation (Darvas et al, 2017). The services sector is the largest in the economy - strong growth over the last decade led to an increase in its share of value added, from 50 to 57 percent. The industry sector output share also increased, from 20 to 25 percent, driven by construction, mining and quarrying, although the share of manufacturing declined. Agriculture is now the smallest sector (less than 20 percent of the economy)⁹⁰.

88: UN projections downloaded from ILOSTAT June 2018

89: See Ghana's profile in <https://population.un.org/wup/Country-Profiles/>

90: See: http://www.statsghana.gov.gh/docfiles/GDP/GDP2018/2017%20Quarter%20and%20annual%202017%20GDP%20publications/Annual_2017_GDP_April%202018%20Edition.pdf. Since 2007, growth in the services and industry sectors has outpaced that in agriculture and manufacturing. There is concern that this may be a symptom of the "Dutch disease" where the discovery of oil leads to growth in the oil and non-tradeable sectors such as services, while non-oil tradeable sectors decline. It can be triggered by a real appreciation in the currency – the real effective exchange rate fell from 100 in 2000 to 79 in 2017 (see Sparreboom and Gomis 2015 for more discussion).

The labour market picture is challenging. Agriculture still accounts for 45 percent of employment (GLSS, 2016), around twice its output share, highlighting its low productivity. Vulnerable employment, a measure of low job quality, is widespread, at around 66 percent (ILOSTAT, 2017). Ghana's labour market is segmented – the share of informal employment⁹¹ is 90 percent (LFS, 2015)⁹² and mobility is difficult between the informal, low-skill and higher-skill, higher-wage formal segment (Darvas and Palmer, 2014). Micro and small enterprises, with typically low productivity and high failure rates, also dominate the economy. Underemployment is around 9 percent, but there is significant regional variation, with underemployment reaching 46 percent in the Upper East region (LFS, 2015). The proportion of working poor⁹³ is relatively low, at around 10 percent, compared to nearly 40 percent on average in Sub-Saharan Africa (ILOSTAT, 2017).

Young people and females are particularly disadvantaged in the labour market. Female unemployment is higher than male unemployment and females are more likely to be vulnerably employed than men (LFS, 2015). Youth unemployment was nearly 26 percent in 2015, more than twice the national rate (12 percent). The unemployment rate for young people generally rises with education – the unemployment rate of young tertiary graduates is nearly 40 percent and around 30 percent for those with lower or junior secondary education (LFS, 2015). Both tertiary and secondary school graduates hold out for a job in the formal sector, but the jobs typically go to those with tertiary education. Those who don't get a formal sector job end up unemployed, in self-employment or work in the informal sector (Darvas et al, 2017).

91: The Ghana labour Force Survey (LFS) defines informal employment "as employment in an establishment where workers were not entitled to paid holidays or leave, sick or maternity leave and where there was no verbal or written contract at the time a person started to work. Any one the three conditions had to be fulfilled in order for a person to be classified as working in informal employment." http://www.statsghana.gov.gh/docfiles/publications/Labor_Force/LFS%20REPORT_fianl_21-3-17.pdf

92: Since the early 1990s, formal wage employment has increased at a faster rate than the growth in the labour force, but the lowest paying jobs have seen the most significant increase (Darvas and Palmer 2014).

93: Working poor – earning below \$1.90 (purchasing power parity) per capita

Education context

Access to basic education increased substantially over the last two decades. Young people aged 20-24 have 2.6 years more schooling than adults in the 45-64 age cohort and nearly 40 percent of 20-24 year-olds have completed SHS (Senior High School or upper secondary school) compared to 13 percent in the older age group. (Darvas et al, 2017) The proportion of students completing SHS is expected to increase further given the recent introduction of the free SHS policy (Duflo, Dupas and Kremer, 2017⁹⁴). The proportion of young people aged 6-14 not in school fell from 30 percent in 2003 to 17 percent in 2014 (Leclercq, 2017a). Gender parity in enrolment up to lower secondary has been achieved and has nearly been reached in SHS (Leclercq et al, 2017a).

However, access is unequal and there is inefficiency in the system. Out of school rates are higher in the north, rural areas and poorer households. This is partly due to greater distances to school in rural areas (in the northern region more than a third of students live more than 6km away from their nearest Junior High School, (JHS)) and high opportunity costs (Leclercq et al, 2017a). Gender parity at basic education hasn't been achieved in the northern and western regions; girls are more likely to repeat grades or drop out from JHS onwards and less likely to participate in TVET (only a quarter of TVET students are girls) and tertiary education (40 percent are girls) than boys. Girls also have lower learning outcomes in secondary school (Leclercq et al, 2017a). Disabled students are also underrepresented at school (Leclercq et al, 2017a). Over-age enrolment is high: around 45 percent of primary school children are over-age by 2 or more years. In 2016/17, nearly a half SHS and two-thirds of TVET students were over-age (Leclercq et al, 2017b).

Overall education attainment is low. Only around 55 percent of the adult population is literate (GLSS6). Less than 40 percent of first year primary students go on to complete SHS (MoE, 2018) and many students don't attain a good education whilst at school. The 2016 National Education Assessments (NEA)⁹⁵ showed only a minority of students in the fourth and sixth years of primary school were proficient in English or mathematics. In 2016/17, less than 60 percent of students passed the WASSCE exams in English, Maths (less than 40 percent), Social Studies or Sciences (Leclercq et al, 2017). Further, STEM uptake in SHS is low (MoE, 2018).

94: Previously providing scholarships for SHS increased secondary school completion by 30%, while also leading to significant gains on cognitive scores. The impact of the scholarships was particularly pronounced for girls.

95: Carried out bi-annually since 2005

Young people from poorer families, rural areas and deprived districts have lower learning outcomes.

As a result, they often end up in unskilled, sometimes unpaid jobs and little chance of upgrading their skills (Darvas and Palmer, 2014). For example, the difference in BECE pass rates between the north and south is around 60 percent (Darvas et al, 2017). Many schools lack resources and infrastructure needed for children to attend school and learn – access to water and electricity has a significantly positive impact on test scores, but around a third of primary schools lack potable water and a tenth don't have toilets (Leclercq et al, 2017b).

The large TVET sector is fragmented and low quality.

Most young people acquire technical and vocational skills through informal apprenticeships, with 10 times more students enrolled in apprenticeships than in formal TVET. Only 5-7 percent of lower secondary graduates get a place in either public or private formal TVET (Darvas and Palmer, 2017⁹⁶). The quality of training in formal TVET and apprenticeships is low, with trainers often relying on outdated equipment and training. Formal TVET has weak links with the private sector, particularly the informal sector and is seen as a poor option for students, who are looking to work in the formal sector. Trainers lack practical and up to date skills as salaries make it hard to recruit and retain qualified teachers. Trainer in-service training is infrequent and promotion is not linked to development, but rather getting higher academic related qualifications (Darvas and Palmer 2014). As a result, Ghana is failing to develop a workforce with the technical skills that are needed to help drive economic transformation.

Formal TVET is often small scale, often low quality⁹⁷ and has limited access.

Attendance is skewed towards higher income households as high entry requirements, opportunity costs (courses are often three years and can not be combined with work) and few government incentives for students from poor households, widen inequality. Most providers are in urban areas and in rural areas public provision is so sparse that there is no competition. Enrolment of students with a disability is also very low (MoE, 2018). TVET providers have high unit costs yet equipment is outdated or non-existent. Funding is based on inputs not outcomes, while there is no accountability framework to help drive outcomes and institutions lack autonomy (Darvas and Palmer, 2014). Curricula

96: Private TVET institutions also enrol around 1.5 times more students than public institutions (Darvas et al 2017).

97: There is little information on outcomes although the World Bank (2017) finds that TVET can help with school to work transitions and gives an earnings premium on average above a secondary school graduates in Ghana. However, there is a lot of variation across subjects, students and institutions, with many not gaining any benefits from TVET relative to secondary education.

are overly theoretical and aimed at work in the small formal sector. Implementation of a new competency-based curricula has been hampered by limited resources and capacity. In a survey of education professionals for this case study, most respondents thought TVET fails to deliver even basic, let alone necessary skills for work and is not well placed to develop the skills needed for work in the future, particularly under the fourth industrial revolution (4IR).

Ghana may be in a low skills equilibrium, which is hampering growth. Some survey results suggest Ghanaian firms may be adopting low-level technologies in response to low skills levels, which in turn means there are relatively few high-skill job opportunities (Darvas and Palmer, 2014). This suggests a low quality TVET (and basic education) is holding the economy back. However, there are conflicting results from surveys about whether there is a skills mismatch. For example, 30-40 percent of the firms surveyed for this case study felt TVET developed cognitive and non-cognitive skills well, but ICT and entrepreneurial skills where the net balance of respondents were less clearly positive. Although, 20 percent of respondents felt TVET is very poor at developing the cognitive and non-cognitive skills for work. This suggests there is a need for skills needs' assessments, especially in key skills sectors to ensure the TVET sector (informal and formal) delivers the skills needed for transformation (Darvas and Palmer, 2014). Indeed, the government has commissioned skills gaps analysis of several key sectors to help underpin its new TVET strategy.

Job prospects in the agriculture, ICT and hospitality sectors

Agriculture

Livestock and crops, including cocoa, are particularly important sub sectors for growth and employment and there are good opportunities in agro-processing, including cotton (eg indigenous fabrics such as kente cloth), oil palm and cassava. However, productivity is low (Maïga and Kazianga, 2016) due to factors such as the land tenure system which makes it difficult to consolidate farming plots into farms that are large enough to make modern commercial farming viable⁹⁸. Farmers, particularly smallholders and females, also face credit constraints and so struggle to buy capital inputs and without working capital, struggle to produce and market their output.

98: In Ghana, 60 percent of farming plots are under 1.2 hectares and 85 percent are under 2 hectares (ACET, 2017)

Continued and assertive action to modernise and improve productivity in agriculture is needed to help drive transformation and so growth and jobs.

That means securing land rights, easing access to land and protecting the rights of local communities; facilitating the expansion of green revolution technologies to boost productivity as already seen in rice production Ghana's Volta River region; and implementing policies that create a conducive business environment including access to energy, better roads and upgrades to transport (such as Ghana's motor kings - motorised tricycles with small load-carrying capacity have eased access to markets for farmers), investment incentives and efforts to intensify regional integration to open up markets. Technology will also play a key role in transforming the sector and so its use should be supported, which includes ensuring young people develop appropriate ICT skills. For example, eSoko is already providing farmers with updated information on market prices and helping them negotiate prices with traders. Good foundational, entrepreneurial, basic ICT and technical skills (basic to advanced) will be crucial for improving productivity, which includes training in intensive production, value addition and processing as well as skills to enable services such as veterinary services, where there are large skills gaps (Darvas and Palmer, 2014).

The government will also need to incentivise young people into agriculture.

Focus group discussions for this case study) suggest agriculture is an unpopular area of study, which is unlikely to change given rapid urbanisation. One participant commented that "when we were...small girls, anytime you do something wrong, they send you to the school farm or park as a punishment...". A modernised agriculture sector, offering profitable opportunities for young people to make a good living, such as in commercial farming, will go a long way to incentivising young people to the sector.

ICT, including ICT, enabled services

Ghana's ICT sector is made up of the broadcasting industry, the telecommunication industry and the support service providers⁹⁹(NCA, 2017). ICT sector growth has been very strong in the last decade, averaging above 20 percent. The share of ICT in gross value added was just over 3 percent in 2016 (GSS¹⁰⁰)

99: Also includes telecommunications, computer programming, consultancy and related activities, data processing, hosting and related activities, web portals and repair of computers and communication equipment

100: http://www.statsghana.gov.gh/docfiles/GDP/GDP2018/2017%20Quarter%204%20and%20annual%202017%20GDP%20publications/Annual_2017_GDP_April%202018%20Edition.pdf

and the sector currently makes for just 0.4 percent of household employment (GLSS6). Telecommunication and broadcasting - the main sub-sectors - have grown rapidly, although the support services base is also growing as software development and e-commerce increases in importance.

Ghana has yet to tap into the potentially lucrative IT market in West Africa, let alone the massive potential within the wider global market. Ghanaian companies lack regional and international linkages and there is a shortage of ICT skills (GoG, 2003), especially high-level skilled personnel - fewer than 1,000 graduates are produced every year who are capable of high-level IT tasks (World Bank, 2014). Labour costs are relatively high compared to other countries, while the quality of ICT graduates is relatively low. Graduates are not usually “work ready” and firms report they must invest heavily in on-the-job training because training centres do not have problem solving and communication skills. Many secondary schools and TVET institutions lack computers and other resources (Akyeampong, 2010), so are unable to offer ICT as a subject. The focus group discussion for this case study highlighted a lack of ICT equipment in classrooms and practical elements in the curriculum (with too much focus on rote learning) and that the ICT “educators themselves have not had enough hands-on experience to transfer to the children”. Financial constraints also mean that many students choose ‘minimum certification’ - in essence, a basic diploma - to qualify for ICT jobs. There is a gap between “quality” and “work-ready” graduates in the ICT labour market (Ibid.) and the lack of high-quality, low-cost professionals that meet international standards is impeding growth in the sector (Darvas and Palmer, 2014).

Hospitality/tourism

Ghana’s tourism (both business and holiday) sector has high labour absorption potential, given its friendly culture and relative political stability in the region. The sector constitutes around 5 percent of employment (approximately 680,000 jobs) and contributed around 6 percent of GDP in 2017¹⁰¹. Business travelers,¹⁰² nature-based adventure and eco-tourism offer opportunities for future growth - total employment is expected to grow by 1.6 percent per annum over the next decade (WTTC, 2018). However, growth is being hampered by factors such

101: Includes direct and indirect effects such as travel and tourism investment spending (e.g., buying new aircraft) and domestic purchases of goods and services by the sectors dealing directly with tourists (e.g., cleaning services bought by hotels).

102: Business travelers made up around 50 percent of all travelers compared to just 13 percent from leisure travelers in 2016 according to the Ghana Tourism Authority.

as: a lack of capacity and capability in the regulatory and developing agencies to promote and develop the sector; high cost of business; multiplicity of government regulations; high cost of access including high air costs due to lack of competition; and burdensome visa requirements. The quality of tourism infrastructure is also low – it is often poorly maintained and visitor facilities are lacking (World Bank, 2018a). Skills gaps are also limiting the sector’s growth potential. Workers lack up to date ICT skills and an understanding of how to use ICT to enable firms to obtain efficiency in distribution, customer acquisition and services. Young workers also lack practical experience and soft skills, which are crucial in hospitality (Darvas and Palmer, 2014). Tourism training and education are being offered by some institutions (mostly in the private sector) but are limited in the main supervisory programmes, which lack common standards (World Bank, 2018a).

Implications for SE and formal TVET system

The three sectors outlined above offer the potential for strong economic and job growth, but only if there are workers with good foundational, technical and advanced academic skills (particularly in ICT and agri-business). That means improving the quality and relevance of basic and secondary education, which is discussed below.

Improving the quality and relevance of general secondary education

A priority should be improving the quality and relevance of basic education so that students have at least good foundational skills, including ICT and entrepreneurial skills, before going on to TVET or SHS or work. Otherwise, students may progress into SHS and TVET and either spend their time trying or failing to catch up and dropping out. Most firms surveyed for this case study don’t think primary education delivers the skills needed for future work nor does secondary education develop the entrepreneurial, ICT or STEM skills needed for future work, particularly under the 4th Industrial Revolution (4IR). Most of the education professionals surveyed also don’t think the curricula at primary, secondary (or TVET) prepares students well for work in the ICT, agriculture or hospitality sectors, particularly in terms of developing STEM skills. One participant in the focus group felt the education system failed to develop problem solving skills and noted “anytime we want to solve problems in Ghana, we go and bring somebody to come and solve our problems”. More young people surveyed felt the secondary education system didn’t develop their entrepreneurial skills than those who did.

Key to improving the quality of basic education is structured pedagogy, which includes increasing the number of high-quality teachers, particularly at primary level and deploying them effectively. Only 50 percent of primary teachers are qualified¹⁰³ and the proportion of qualified teachers in public schools is 20 percentage points lower in the Upper East region than in Eastern or Ashanti regions. The proportion of qualified teachers in public JHS and SHS is high but population growth alone means a significant net increase in teachers until 2030 is needed to maintain constant pupil to teacher ratios (Leclercq et al, 2017b). Teacher deployment is not effective and exacerbates regional disparities in learning outcomes, for example by deploying teachers to regions where they can not speak the local language (USAID, 2016). Attrition and absenteeism rates are a concern, which are driven by poor infrastructure and services in rural areas (Leclercq et al 2017b; MoE, 2018). Limited accountability may also be a reason behind poor teacher attendance. An accountability framework with stronger teacher deployment policies would help drive outcomes and efficiency, for example, using real-time data and forecasts on teacher supply and demand across schools and speeding up the process by giving more power to schools to hire and fire teachers¹⁰⁴. Stronger incentives for teachers to move to rural areas or disadvantaged urban areas will also be needed.

The pupil and teacher training curricula need updating and streamlining, to include practical elements linked to local content and non-cognitive skills. Pre-service teacher curriculum also needs to align with the curricula taught in schools and address the specific needs of learners at different levels. These challenges need to be addressed and more generally, curricula in the secondary phase needs to include practical elements and knowledge linked to key economic sectors, such as the three set out above. The government, with T-TEL, is developing a

new teacher training framework and curriculum¹⁰⁵, underpinned by those standards, which includes a focus on pedagogy and subject knowledge relevant for each education phase. Curricula are being designed in consultation with the sector, but feedback from the focus group discussion for this case study suggests some education professionals don't feel well consulted on reforms (more generally) and so more proactive and interactive engagement with the sector may be needed to help design deliverable policy solutions and implement the government's reforms successfully.

The free Senior High School and TVET policy is already putting pressure on existing resources - the challenge will be, ensuring that doesn't negatively impact on quality and learning outcomes. Students enrolling in SHS with low quality foundational skills will struggle to make progress and so realise the benefits of that education phase. Indeed, a lesson from introducing free basic education in Ghana was that increasing access without also increasing the quality (and capacity) of teaching doesn't lead to better learning outcomes (Okugawa, 2010). Yet Ghana already spends a high proportion of its budget on secondary education compared to other countries. Evidence from other countries suggests savings or cuts to other education budgets may be needed to pay for free SHS¹⁰⁶ (World Bank, 2014) which risks negatively affecting the quality of basic education as a result.

More advanced ICT skills and technical skills for work in the agri-business and ICT sectors will also be needed, which means increasing the performance and participation of STEM subjects at all phases of the education system. That will rely on stronger incentives and innovative delivery approaches, including Public-Private Partnerships, to improve the quality of resources, particularly for STEM and teaching given increasing and competing pressures on the education budget. For example, the government is introducing a teacher and learning portal in 125 schools as part of a secondary education improvement project with the World Bank (2014). The portal will allow teachers and students access to online learning and teaching resources, with a focus on Science and Maths. Teachers will also get support in using ICT to help teach effectively. The portal will also act as a platform for knowledge exchange and discussion in national and international networks.

103: The expansion of basic education has been met by increasing numbers of private schools and so teachers employed in the private sector. Private schools don't typically hire qualified teachers and so whilst the proportion of qualified teachers in public schools increased between 2010 and 2016, the proportion in private schools was unchanged at around 10 percent. This undermines the government's efforts to improve teacher quality (MoE, 2018). The proportion of trained teachers in JHS is higher than primary but it is much lower in Upper East region than south Ghana.

104: The government is proposing to decentralise basic education teacher recruitment to district-level authorities, but national norms for teacher recruitment and deployment by level of education will "remain indispensable to ensure that the education system has sufficient capacity to enrol all children throughout Ghana" (Leclercq et al, 2017b)

105: Until recently, there wasn't a national minimum standard for professional teacher professional development. The Pre-Tertiary Teacher Professional Development (PTPDM) policy was therefore designed and is now being implemented, to ensure that licensing, registration and teacher progression was tied to competencies and standards.

106: Data from UIS in the UNESCO GEM 2017/18 report. Primary spending per pupil as a proportion of GDP per capita is 8.7% compared to 26.9% for secondary education. In Sub-Saharan Africa, the figures are 10.5% and 19.7% respectively.

Improving TVET quality and relevance

Formal TVET provision needs to be demand-driven, to ensure students develop the technical and entrepreneurial skills needed for work in the informal as well as formal sectors. Curricula and standards need to be designed with industry, include relevant practical elements, work experience and better reflect the needs of the informal sector given its relative size. Digital skills are increasingly important, particularly for work in the ICT, hospitality and agriculture sectors and so should be included in all TVET curricula. The quality of training also needs to improve through strategies to recruit and retain qualified trainers with industry experience as well as updating the resources and equipment used in classrooms.

Ghana has lacked an overarching TVET strategy that brings together all policy positions and is aligned with wider economic development priorities and defined objectives, timelines, targets and indicators.

The current government is preparing a wide ranging TVET strategy that will be published soon. Most Ghanaian firms and industry bodies that were surveyed for this case study are optimistic about the (and wider education) reforms and so expect to increase the proportion of their hires directly from TVET institutions in the future, rather than more experienced workers. However, the scale of the challenge in reforming TVET is vast given the relatively low starting position. It will be important to ruthlessly prioritise reforms, based on a much better understanding of current and future skills gaps and TVET provision in the informal and formal sectors. It may mean prioritising sectors in which to test and evaluate approaches first to ensure quality and relevance, before expanding access. This is particularly important given the current weak state of the TVET sector overall and relatively limited evidence base on TVET reform in lower income countries. Priority should be given to developing good technicians (secondary and tertiary level) in key economic sectors that could help underpin economic transformation, such as in agri-business, who are needed to modernise the sector as well as in ICT and hospitality.

More effective co-ordination of responsibility and accountability for TVET provision is needed.

TVET provision is fragmented, with responsibilities sitting across several ministries. COTVET (Council of TVET) was established in 2006 to co-ordinate and oversee all aspects of TVET. However, conflicting and overlapping legal mandates and inflexible traditional lines of political authority have hampered integration across the system. The government plans to bring all TVET institutions under the Ministry of Education and create a TVET Education Service (delivery agency) to help improve the quality, efficiency and coordination

of delivery. However, COTVET still faces challenges, such as co-ordination across tertiary institutions, which have their own laws and governance (MoE, 2018). All TVET responsibilities, accountabilities and resources would ideally be aligned to enable COTVET to fulfil its mandate.

TVET reform will require resources: financial and (enough) people with the right skills throughout the system. For example, COTVET will need to bolster its capacity and capability to design effective policies and drive implementation of reforms in tandem with the private sector or consider outsourcing certain functions where it lacks capacity, such as accreditation of institutions. It will also require patience and long-term political commitment. For example, data collection and analysis to better understand the TVET sector (providers and the quality of outputs) as well as current and future skills gaps is an important first step, which will take time.

Education expenditure and efficiency

Education expenditure in Ghana has been relatively high, but recent trends suggest it might be constrained in the future.

For example, Ghana spent about 8 percent of GDP in 2011 and 2012, but only 6-6.5 percent between 2013 and 2015. The share of education expenditure out of total public expenditure also fell from around 37 percent in 2012 to just over 20 percent by 2015 (Leclercq et al, 2017b). Spending has shifted towards secondary and tertiary education in recent years, at the expense of primary education, thus benefiting richer students in Ghana. Greater efficiency in the system will be crucial to meet growing demand and deliver the government's education reform agenda. Given past success with remote distance learning (such as through the Untrained Teachers Diploma in Basic Education (UTDBE)), using ICT to support education delivery could be a cost-effective policy solution.

Greater decentralisation of decision making to districts and schools, which combined with appropriate accountability could drive better learning outcomes and value for money. There currently is not an accountability system for SE/TVET, but the government is developing a sector wide accountability framework¹⁰⁷ and harmonizing

107: An ongoing project to improve secondary education in Ghana with the World Bank has introduced school performance partnership plans (SPPPs) which aim to improve (mutual) accountability between school management and the District Education Oversight Committees and so drive better learning outcomes. The SPPPs include performance indicators tracking performance and targets set by schools and schools can choose between a list of pre-determined activities to address school determined priorities. Funds are disbursed against approved SPPPs.

and strengthening its data collection (and EMIS). The mobile School Report Card system, which collects timely school-level data (below SHS), has been piloted in 20 districts and if expanded, could help identify resource gaps more quickly than traditional pen and paper approaches. Greater decentralisation will also need to be accompanied by policies to strengthen the system's capacity at all levels (government, schools and communities) otherwise it won't have the desired effects (Snilstveit et al, 2016). This is particularly important given the survey results for this case study which showed most respondents thought primary and secondary education developed good writing and reading skills despite assessment data results showing the opposite is true, as highlighted above. Policy implementation will therefore rely on changing attitudes to ensure communities and stakeholders buy in to the problem diagnosis and so be willing to help implement policy solutions.

Conclusion

Ghana has made significant strides towards achieving universal access and completion of primary education, but there are challenges with the quality of education at all levels and large regional variations in learning outcomes. The introduction of free SHS/TVET places will increase access to secondary education for many young people, particularly from poorer backgrounds. However, the quality and relevance of both SHS and formal TVET urgently needs to improve to ensure graduates, the majority of who will move from SHS/TVET into work in the informal sector, have the skills they need to find productive work. That includes developing entrepreneurial, ICT and STEM skills as well as technical skills in demand in key economic sectors, such as ICT, agri-business and hospitality. More advanced technical and STEM skills are also needed to boost productivity in those key economic sectors and so underpin transformation. That will require stronger incentives, particularly for females, to engage in STEM subjects early on and then choose these subjects at SHS. Measures are also needed to increase retention of girls at JHS and participation in SHS and tertiary education. For example, recruiting more female teachers and reviewing curricula, particularly TVET, to ensure it is attractive to females.

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Annex C

We conducted individual surveys as well as focus group discussions to get an insight into how customers of the education system in Ghana viewed its performance in terms of preparing young people for work now and in the future under the fourth industrial revolution.

Individual surveys

We surveyed approximately 150 individuals from different population groups:

1. Firms/Employers and Representative Groups (50 respondents)
2. Teacher Training Directors and Specialists (Education and TVET Training Institutions) (35 respondents)
3. Young people (50 respondents).

Focus group discussion

One focus group was held in Accra and included representatives from:

- TVET division of the Ghana Education Service
- Heads of a Senior High School
- Representative of the conference of heads of assisted secondary schools (CHASS)
- Secondary Division of the Ghana Education Service
- TVET institutions
- Council for Technical and Vocational Education and Training (COTVET)

Annex D

Basic education is free and compulsory in Ghana and consists of six years of Primary Education followed by three years in Junior High School Education (JHS). A satisfactory pass of the Basic Education Certificate Examination (BECE) at the end of JHS enables entry into the second cycle which typically lasts three years and consists of general education (senior high school, SHS) and technical/vocational routes. In 2017, the government made SHS and TVET free at the secondary level. Candidates take the West African Senior School Certificate of Education (WASSCE) examination at the end of the senior high school (SHS) and must obtain a good pass to enter the tertiary level. TVET graduates from technical institutions and vocational schools at the secondary level have the option of going to polytechnics (and pre-service training) to gain a Higher National Diploma and then a Bachelor of Technology.

1. **Basic Education** - made up of six years of Primary Education followed by three year Junior High School Education. It is compulsory and free. A satisfactory pass of the Basic Education Certificate Examination (BECE) at the end of this level enables entry into the Second Cycle.
2. **Second-Cycle Education** - this level of education is provided in the following categories of institutions:
 - Senior Secondary Schools (3 years)
 - Technical institutes
 - Vocational Schools/Training Centres
 - Other post-basic educational institutions

Candidates take the West African Senior School Certificate of Education (WASSCE) examination at the end of this level and must obtain credit passes (A1-C6) in six subjects comprising three core subjects, including English Language and Mathematics, plus three relevant elective subjects to enter the tertiary level
3. **Tertiary Education (4 years)** - comprising the following institutions:
 - Public and private universities
 - University Colleges
 - Polytechnics
 - A number of pre-service training institutions that are primarily career or work-oriented e.g. Nurses' Training Colleges, Agricultural Colleges, Forestry School, Veterinary School and Teacher Training Colleges (some offer technical subjects).

Table 1: Formal TVET and Academic Education System in Ghana (Ministry of Education)

Formal TVET and Academic Education in Ghana						
INSTITUTIONS	LEVELS/EXAM	SUBJECTS		GRADING CRITERIA	COMMENTS	
TERTIARY Universities and University Colleges	Doctorate Degree (Universities)	Cognate and Non-Cognate Programmes		Institution Specific Pass/Fail		
	Master's Degree (Universities)	Cognate and Non-Cognate Programmes		Institution Specific Pass/Fail		
TERTIARY (Universities, University Colleges and Polytechnics)	Bachelor's Degree (Ages 18-21)	SHS streams can and often do determine what programmes can be pursued at bachelor's level		Institution Specific (Usually British Degree Classification System - though some institutions use the USA GPA system)		
TERTIARY (Polytechnics and Pre-Service Training)	Higher National Diploma (HND)	Tertiary level courses in: Manufacturing, Science & Tech, Applied Arts, Applied Social Science, Business, Technical Programmes for direct employment			Some Polytechnics have introduced Bachelor of Technology programmes (require an HND and some work experience to apply). Estimated enrolment of TIs, TUs and Polytechnics together = 36830	
SECOND CYCLE Technical Institutes (TI) Vocational Schools (VS) and Training Centres (TC)	- Craft certification (3 levels – I, II, III) - Technician certification (3 levels – I, II, III)	Emphasis on practical skills to produce technically qualified individuals for direct employment and entrepreneurship. Leads to production of artisans, craftsmen, technicians and other middle-level personnel in commerce, agriculture, technology, science and industry for direct employment and/or entrepreneurship			Level II Technicians qualify to enter polytechnics	
SECOND CYCLE Senior High Schools (SHS) (Ages 15-17)	SHS1 - SHS3 WASSCE exam for entry into Tertiary Education	Core subjects - Maths, English, Integrated Science, Social Studies. Students can also choose 3 or 4 elective subjects from one of five streams		Grades A1 to F9. A being 'excellent', F being 'fail'. Everything else is a pass. C is a credit grade.	Students who pass the WASSCE may enter university*, polytechnics, technical institutes, or workforce. TVET students opt for the vocational, agriculture or technical streams. *The minimum university standard for admission to post-secondary education is a 'C-' average on the SSSCE or WASSCE, with credits (A-D or A1-C6) in all subjects	
		SHS Business (Accounting or Secretarial)	SHS Agriculture	SHS Vocational (Home Economics or Visual Arts)	SHS Technical	SHS General (Science or Arts)

Continued Table 1: Formal TVET and Academic Education System in Ghana (Ministry of Education)

Formal TVET and Academic Education in Ghana				
INSTITUTIONS	LEVELS/EXAM	SUBJECTS	GRADING CRITERIA	COMMENTS
BASIC EDUCATION Junior High Schools (JHS) (Ages 12-14)	JH1 - JH3 BECE exam for entry into Second Cycle.	PRE-TECHNICAL AND PRE-VOCATIONAL SUBJECTS Core subjects: Maths, integrated Science (Agric, Biology, Chemistry, Physics), Social Studies, English Language; Optional subjects: Ghanaian Language, French, RME, BDT. After BECE students choose their optional streams (business, agriculture, vocational, technical or general) for entry into SHS.	Grades 1-9 (1-6 is a 'pass', 7-9 is 'fail') Calculation of aggregate score is based on 6 best scores.	General education and basic technical and vocational skills. No ICT and French in most public schools. A bit of Agriculture in Integrated Science beginning in Upper Primary.
BASIC EDUCATION Primary School (Upper Ages 9-11) (Lower Ages 6-8)	Primary 1-6	Maths, English Language, Natural Sciences*, Integrated Sciences^, Local Language, Social Studies, ICT, French, Citizenship Education *Lower primary ^Upper primary		Basic numeracy and literacy skills

Afeti (2018) sets out the TVET landscape in Ghana as follows (See also Tables 1 and 3):

- Formal TVET - institution-based, time-bound, standardised curriculum and learning objectives, examination-driven and nationally recognised certification. Public sector provision in GES technical institutes, NVTI training centres and in privately-owned vocational training institutions.
- Non-formal TVET - skills acquisition outside school system with clear learning objectives, specified training duration but not nationally certified. For example, short courses provided by NGOs and similar organisations for targeted populations and enterprise-based or on-the-job training
- Informal TVET - wide range of flexible, non-standardised skills acquisition programmes that occur in the informal economy e.g. traditional apprenticeship system.

TVET provision in Ghana is fragmented with a variety of public and private actors in the landscape. This makes the tracking of TVET provision extremely challenging in terms of access, enrolment, quality and outcomes.

Table 2: Non-formal and informal TVET Education in Ghana

Non-formal and informal TVET Education in Ghana				
RESPONSIBLE INSTITUTION	PROVIDER	SUBJECTS	QUALIFICATION	COMMENTS
MINISTRY OF ENVIRONMENT AND SCIENCE	GRATIS/ITTU	Upgrade Skills of Vocational and Technical Institutes and SHS leavers for direct employment. It also offers attachment and extension skills training for polytechnic and university students	No formal qualifications offered but certificates of achievement or completion	Enrolment unknown
MINISTRY OF EMPLOYMENT AND LABOUR RELATIONS	Various providers – e.g. National Vocational Training Institute (NVTI, Opportunities Industrialisation Commission (OIC) and Integrated Community Centres for Employable Skills (ICCES)	Wide range of vocational courses for direct employment and entrepreneurship	Trade Certificates, National Craftsman Certificate (NCC)	Estimated enrolment 12,300
MINISTRIES OF: <ul style="list-style-type: none"> • YOUTH AND SPORTS • LOCAL GOVERNMENT • FOOD & AGRIC • GENDER • TOURISM • TRADE & INDUSTRY • ROADS & HIGHWAYS 	Various providers	Wide range of vocational courses for direct employment and entrepreneurship	Skills acquisition which has clear learning objectives with specified training duration but not nationally certified	Estimated enrolment in Youth and Sports, Local Government, Gender and, Trade & Industry ministries schemes – 7820.
REGISTERED PRIVATE TVET INSTITUTIONS	Various providers	Wide range of vocational courses for direct employment and entrepreneurship	Trade Certificate, National Craftsman Certificate	Enrolment unknown

There is also TVET provision in the informal economy where it is estimated that there are about 440,000 apprentices in training - encompasses a wide range of flexible, non-standardised skills acquisition programmes. (Afeti 2018). On average, it takes three years (35 months) to complete apprenticeship training (Ghana Statistical Services, 2014).

Source: Adapted from Ansah & Kissi (2013); Afeti, 2018

Table 3: Numbers of and enrolment in Technical and Vocational Institutes

		2012/13	2013/14	2014/15	2015/16	2016/17
Public institutions	<i>Ghana Education Service</i>	45	45	45	45	47
	<i>Other</i>	62	73	75	64	73
	Total	107	118	120	109	120
Private institutions		74	68	65	55	58
Total institutions		181	186	185	164	178
Public Enrolment	<i>Ghana Education Service</i>	36,830	27,166	32,230	38,459	45,215
	<i>Other</i>	12,015	8,183	6,596	9,897	9,217
	Total	48,845	35,349	38,826	48,356	54,432
Private Enrolment		12,651	5,716	3,687	4,815	4,678
Total Enrolment		61,496	41,065	42,513	53,171	59,110

Source: MOE ESPR, 2018



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