ECA POLICY BRIEF

Skills, technology and the African transformation agenda: massive open online courses to the rescue?

I. Introduction

One of the major developments of the early twenty-first century, largely not fully characterized and understood, was the rapid pace and sustained rate of growth in a majority of African economies, oil and non-oil economies alike. Although growth has slowed considerably in a large number of them, it created new possibilities and challenges, including the challenge of a widening gap, relative to advances in technology and the needs of the economy, in skills and expertise. Put differently, inadequate skills, including under-supply of required skills, is becoming as important a constraint on further growth as foreign exchange. Evidence shows that much of Africa's recent good growth performance is due to factor accumulation, not to growth in total factor productivity[1,2].

In several issues of its flagship *Economic Report on Africa*, the Economic Commission for Africa (ECA) has provided evidence to show that much of Africa's recent growth

has not been accompanied by significant job creation and poverty reduction.[3] Nevertheless, growth with limited job creation is better than no growth at all. In any case, the continued economic expansion, undergirded by the rapid rate of diffusion of information and communication technology (ICT), is emboldening brave and innovative experiments by Africans and their Governments to transform their societies. It is also inspiring new continental visions such as the African Union's Agenda 2063: The Africa We Want and the realization of earlier visions, such as the Continental Free Trade Area. Continued economic expansion also raises the possibility that most African countries will meet the targets contained in the Sustainable Development Goals by 2030 and realize the aspirations contained in Agenda 2063.
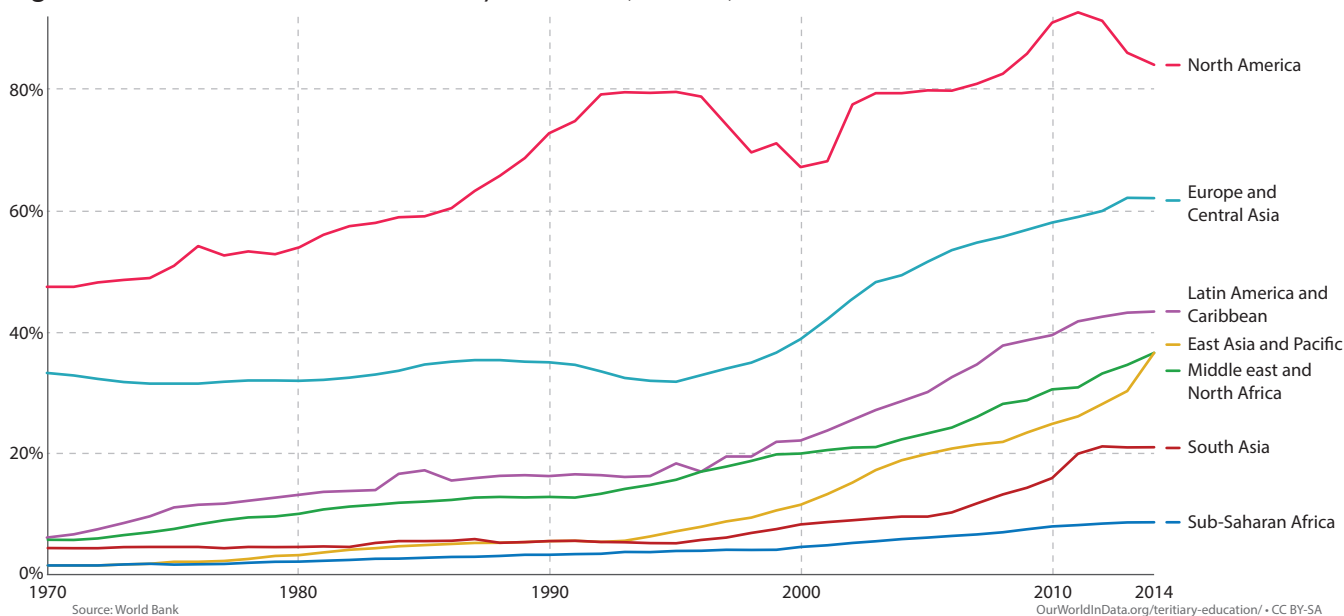
II. Africa's skills gap

In other to sustain the rapid rate of economic expansion, African countries must address a well-recognized constraint, namely, the gap between the demand and supply of skills. Unskilled labour needed for construction is readily met. A modern, rapidly expanding economy, however, requires increasingly sophisticated skills. This gap is becoming an increasingly visible constraint on growth and a major barrier to job creation, wage growth and poverty reduction.

The argument is increasingly made that the capacity constraint can be attenuated through the application of technology in education to increase, in particular, tertiary enrolment rates. As the figure below shows, sub-Saharan

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1   Economic Commission for Africa (2016). *Assessing Regional Integration in Africa VII: Innovation, Competitiveness and Regional Integration*. Addis Ababa.
2   Nwuke, K (2015). Science, technology and innovation policy in Africa in the age of brilliant and disruptive technologies: an analysis of policies at the national, regional and continental levels. Background paper for *Assessing Regional Integration in Africa VII: Innovation, Competitiveness and Regional Integration*, Economic Commission for Africa

3   This "jobless growth", as it is often described, occurs at a time when Africa has a growing population of young people and a rising number of young Africans completing secondary education and seeking admission into post-secondary institutions, which are raising a number of policy concerns.

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Figure 1: Gross enrolment ratio in tertiary education (Per cent)

Source: World Bank   OurWorldInData.org/teritiary-education/ • CC BY-SA

Note: Total enrolment in tertiary education, regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.

Source: Roser and Ortiz-Ospira (2018).

Africa has the lowest tertiary education enrolment rate in the world.

It is important to note from the figure that the differences in the enrolment rates between sub-Saharan Africa and other developing regions was not significant in 1970. By 2014, however, those other regions had left sub-Saharan Africa behind. The region's current ranking affects innovative capacity and global competitiveness on the African continent. Urgent policy action is therefore required to improve tertiary enrolment rate in African countries.

One possible policy option available to African Governments is to use technological innovations to expand access to higher education and, to the extent possible, other forms of learning. African countries lack adequate resources to expand the capacity of their higher education systems and to maintain existing higher education institutions. ICT, through distance and online courses, can be used to reduce the constraints on capacity in existing institutions and provide opportunities to address associated or related policy issues such as affordability and the observed mismatch between academic curricula and the requirements of the marketplace[4].

This policy brief, based on a paper[5] presented of the same title explores these issues. It discusses available evidence and presents a number of recommendations for consideration by African governments and stakeholders in African higher education exploring the feasibility of MOOCs as an additional instrument for bridging the continent's skills gaps.

III.   Policy responses

African Governments have responded to the skills gap/skills inadequacy policy in a variety of ways. They have increased the public provision of higher education either by expanding the capacity of existing higher education institutions or building new higher education institutions, or both. In tandem with this, the private provision of higher education has expanded rapidly in almost all African countries. Egypt, Ethiopia, Kenya and Nigeria have seen a rapid expansion in the private provision of higher education during the past 15 years, a development that has expanded access to higher education and reduced financial and political pressure on Governments.

In addition, countries such as Nigeria and the United Republic of Tanzania have introduced distance education

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4   Nwuke, K. (2003). Higher education, economic growth and information and communications technology in Africa: some issues and challenges. In AfricaDotEdu: IT Opportunities in Higher Education in Africa, M. Beebe, K. Kouakou, B. Oyeyinka-Oyelaran and M. Rao, eds. New Delhi: Tata McGraw Publishing Company Ltd.

5   Nwuke, K (2014) "Skills, technology and the African transformation agenda: massive open online courses to the rescue? Paper delivered at the ninth International Conference on ICT for Development, Education and Training in Africa. Kampala, May, 2014.

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through an open university system. The direct foreign provision of higher education in Africa is also rising. Carnegie Mellon University in the United States of America opened a campus in Kigali and the University of Lancaster in the United Kingdom of Great Britain and Northern Ireland opened a campus in Accra. Foreign institutions such as Australia's Monash University and the United Kingdom's Open University provide distance education. ICT is central to these efforts.

African countries are also taking a collective approach to address the skills gap. The African Union, in its Agenda 2063, identified human resources development and science, technology and innovation as two of the four pillars of the African transformation agenda. The African Union has established a number of pan-African universities and centres of excellence. The Continental Free Trade Area currently under negotiation will include the trade in services, thus providing for a continent-wide trade in higher education services.

Notwithstanding these responses, the skills gap remains and, in some cases, is widening. Radical innovations are required if the gap is to be closed.

IV. Innovations in higher education: massive open online courses

One innovation in higher education that has caught the attention of policymakers and economists is massive open online courses. They are online courses provided free of charge with an unlimited number of participants. It is a new development in the online provision of higher education and e-learning because it is free and is contrary to the widely held view of intellectual property rights in higher education. In that sense, massive open online course are a ground-breaking, ICT-driven innovation capable of changing the way in which higher education is organized and delivered. In general, students can audit courses for free and receive no certificates for them or they can choose, for a small fee, to receive a verified certificate.

Three things are required to take a massive open online course: hardware (a computer or tablet or smartphone), affordable broadband services and motivation/discipline. The courses are a response to the challenges in enrolment expansion, revenue and the inability to raise tuition fees faced by traditional universities. They are also a response to the educational needs of a young people hungry for skills and education in order to become productive members of

society. The courses are also a response to the shifting demands of the private sector for skilled workers.

There is a lot of enthusiasm about massive open online courses around the world. The magazine Time declared 2012 the year of massive open online courses. A number of analysts present online education in general, and these course in particular, as an additional instrument that African countries can use to close the enrolment and skills gap. The United Nations Educational, Scientific and Cultural Organization[6], for example, has argued the view that the digitalization of learning can be a means of accelerating progress towards the achieving the targets of the Sustainable Development Goals, in particular Goal 4, in developing countries. The World Bank, in collaboration with the Government of the United Republic of Tanzania, is opening a massive open online course-type institution in Dar-es-Salaam, and the organization's private sector arm, the International Finance Corporation, has some equity in one of the most well-known courses, namely, Coursera of Stanford University in the United States.

Massive open online courses represent another effort to deploy ICT to advance higher education. The present policy brief, which is based on an earlier paper on the same topic, and ongoing work at ECA on new technologies and innovations explores the technological, economic, social and legal factors driving the provision of these courses and offers proposed policy actions that could, if adopted, help African countries to leverage the courses to bridge their skills gaps and shortages, address the rising demand for higher education by Africa's millions of young people and improve the continent's global competitiveness.

V. Drivers of the provision of massive open online courses

Under the Trade-Related Aspects of Intellectual Property Rights agreement of the World Trade Organization, learning and educational resources are considered key research intellectual property, reflecting the accepted fact of the competitiveness of higher education. Nevertheless, many universities and institutions are choosing to provide digital learning resources over the Internet openly and for free. Four major factors help to explain this development and are discussed below.

6   Roser, M., and E. Ortiz-Ospira (2018). Tertiary education. Our Would in Data.org. United Nations Educational, Scientific and Cultural Organization (2016). Moving forward the 2030 Agenda for Sustainable Development. Paris.

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Technological drivers

Massive open online courses take advantage of increases in broadband availability, computing power (hardware (increased hard drive capacity and processing speed) and software (rise of technologies to create, distribute and share content)) and reductions in cost and increases in the quality of consumer technology.

Economic drivers

The major economic drivers of massive open online courses include globalization, low entry barriers; profit (Africa's large number of young people seeking university admission or seeking to obtain new skills or better resumes present a profit opportunity that entrepreneurs and universities looking for new revenue streams cannot ignore) and improvements in ICT infrastructure, including submarine cables, which are gradually lowering the cost of broadband Internet services on the continent, thus reducing the cost of access. Increases in the affordability of broadband services is occurring in tandem with increases in the penetration of smartphones on the continent and the continued decline in the price of computers.

Other economic factors include the existence of significant monetary incentives for sharing online content and the emergence of new models of cost recovery, such as certification fees, recommendations, attestations and course material licensing. Elite universities are using massive open online courses to further enhance their reputation and to take advantage of economies of scale and scope. Another economic driver is the fact that knowledge is a public good (as non-rivalrous and non-excludable in consumption, with zero marginal cost of delivery.)

Social drivers

The social drivers of massive open online courses include altruism on the part of providers and self-interest in the form of reputational enhancements or "warm glow" effects. Other important social drivers are network effects (and "follow the leader" behaviours by institutions) and the desire to interact with a community much larger than that of the university. The Massachusetts Institute of Technology in the United States, for example, is able, through its massive open online courses, to interact with and learn and profit from a community far larger than it has in Cambridge, Massachusetts.

Legal drivers

Equally important are legal drivers and the trend towards the open sharing of software and research outcomes. Changes in intellectual property rights under the Trade-Related Aspects of Intellectual Property Rights agreement tightened the restrictions on the use of knowledge outputs, including papers and articles This has spurred the emergence of free licences and new legal means to create open content such as Creative Commons, GNU general public licences and the free software movement. Other policy drivers include the need to obtain the most value out of public resources (in the context of the provision of massive open online courses by publicly owned universities) and meeting the socially attractive goal of expanding access to higher education, independent of income and social class or ethnicity or race.

In some African countries, the main economic argument for massive open online courses is that they could be a relatively inexpensive instrument to deal with the three crises in African higher education mentioned above, namely, rising costs, the rising demand for higher education due to demographic changes and the rising skills shortage (and poor quality of skills) due to structural changes in the economy and society and the emergence of the knowledge economy. For some countries, there is also an opportunity for profit.

VI.   Providers of massive open online courses

Massive open online courses first emerged from the open educational resources movement (Organization for Economic Cooperation and Development, 2007). Nevertheless, it has changed considerably during the past decade. Increasingly, the main providers of these course are elite universities in English-speaking developed countries, mainly the United States (e.g., Stanford University, Harvard University, the Massachusetts Institute of Technology and the University of California at Berkeley), leading non-profits (e.g., the Bill and Melinda Gates Foundation, the MacArthur Foundation and the National Science Foundation) and the private sector (e.g., Google and book publishers). In Africa, the University of Cape Town and the University of Witwatersrand in South Africa are major providers of these courses.[7]

Coursera, developed by Stanford University professors, is the leading provider. A consortium led by the Massachusetts Institute of Technology and Harvard has produced more than 2,000 massive open online courses. Chinese, French and Japanese universities are also active on this front. There are more than 1.45 million course enrolments per month in a variety of subjects offered by

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7   Other major providers include Udacity, Khan Academy, and edX.

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Coursera in partnership with several other universities. There are no courses in an African language. Language, however, is not only more than a communication tools, but also the custodian and repository of a people's sense of self[8].

Massive open online courses, however, may not address the access gap in many African countries. In addition, they will not provide the certificates that those who enrol will need to acquire a job. Evidence suggests that most of those who enrol in the courses have at least a university degree and are seeking to enhance their knowledge and labour market prospects by taking courses provided by elite schools. This is the Matthew principle, namely, to those who have more will be given and from those who have not, more will be taken.

VII. Provision of massive open online courses in Africa

Not much is known about the provision of massive open online courses in most African countries. For this reason, it has not been an important policy issue[9]. Nevertheless, this might soon change. Technology companies and providers of online learning are increasingly seeking to sell the idea to African Governments as an important intervention to bridge the skills gap and improve national economic competitiveness. The success of mobile money (mobile banking) suggests that the course can succeed in Africa, notwithstanding the considerable technological challenges. As noted earlier, the University of Cape Town and Witwatersrand University are already providing these courses. In 2016, Egypt's Ministry of Communications and Information Technologies launched a tender for local firms to provide such course under the Ministry of Higher Education and Scientific Research[10]. The International Finance Corporation recently made an equity investment in Coursera and is developing an open system in the United Republic of Tanzania. Rwanda has created what looks appears to be a massive open online course. Given the Bank's involvement in these course, it is very highly that e-learning through them will begin to feature in policy discussions between African countries and the Bank.

This creates an impetus for greater government attention to the provision of massive open online courses. An important part of the transformation strategy of all African countries is the scaling up of investment in human capital through the provision of better education and skills. This implies, among other things, a significant widening of (nominal) access to higher education. The skills component of the strategy implies lifelong learning.

While massive open online courses can be an important component of the strategy, results of learning outcomes of online instruction are not very encouraging The evidence suggests that less than 13 per cent of those who enrol in these course complete them. Given this very low completion rate, it is very doubtful that the course can be the panacea to Africa's skills gap problems. African countries may have to continue to rely on tested and proven methods until more effective models of the online provision of higher education emerge. The traditional, on-residence provision of higher education not only imparts skills, but also provides training in, among other things, behaviour and time management that the modern economy needs. It also creates social capital for those who graduate in this manner through the networks that they socialize into and the friendships that they make. Employers of labour in Africa frequently complain of the poor quality, poor work attitude and low productivity of labour in Africa. A pedagogical system (online system) that is limited in its emphasis on thinking, discipline, behaviour and time management may be incapable of producing a workforce that can compete with the very best in the world. In addition, there is the problem of assuring the quality of these courses. Most universities that offer them do not award degrees, and the certificates that they award cannot count towards credit.

VIII. Constraints to massive open online courses in Africa

The providers of massive open online courses in Africa face many constraints. These factors explain the very slow entrance of providers into the massive open online course market, notwithstanding the need for them and the possible profits that can be earned. Some of these constraints are the following:

a) Inadequate human resources at African universities: Many universities are young and are still struggling to accumulate resources and be competitive, and therefore have limited scope to provide such courses;

8   Organization for Economic Cooperation and Development (2007). *Giving Knowledge for Free: The Emergence of Open Educational Resources*. Paris.
9   Noukakis, D. (2014). MOOCs in Africa and emerging countries: a blended learning experiment.
10   Mohamed Alaa El-Din (2016). Local firms invited to apply for establish of 'MOOCs' through Higher Education Ministry. Daily News, 22 March

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b) Regulatory confusion and uncertainty: It is unclear which government agency should regulate the providers of such courses, be it the education or the ICT ministry (if course providers are considered providers of ICT services);

c) Poor infrastructure, especially with regard to electricity;

d) Low ICT skills: the benefit of online courses and e-learning in general is an increasing function of initial skills;

e) Cultural barriers, including high social demand on the limited time of students, which could result in poor completion rates: In some cultures, there could be restrictions placed on women's access to online services;

f) Certificates and the higher education institutions that issue them still matter: Put differently, employers discriminate. Employers know not only that not all bright students attend higher education, but also that traditional campus universities admit most of the most capable students. For an employer, the probability of hiring the best job applicants is thus higher if he or she hires graduates who attend traditional campus universities;

g) Limited broadband penetration: This is not always bad, in view of the high cost of broadband and poor cost-recovery mechanisms.

IX.   Conclusion and policy recommendations

The low tertiary enrolment rate in African countries and the widening gap in tertiary enrolment between Africa and the rest of the world is a serious problem. It suggests that African countries have a serious challenge in bridging the skills gap. Although many analysts hold out hope that massive open online courses can be an instrument for bridging the two gaps (i.e., skills gaps at the national and regional levels and the enrolment gap between Africa and the rest of the world), there is no evidence or suggestions of evidence that these courses can address the skills shortage in terms of quantity and quality in Africa. The courses, such as those on computer programming and software development, are unlikely to provide a firm foundation for national development, as important as they may be. Software development is an unlikely basis for

national development. China's growth, for example, which is centred on manufacturing and engineering, continues.

Policy is about tough choices and decisions among competing claims on limited national resources. There are a number of things that African countries can do. They cannot escape from or avoid massive open online courses and the deployment of new technologies in higher education and other spheres of learning. They must, however, exercise care and make difficult choices. Proposed actions could include the following:

a) Improve ICT infrastructure and reduce the cost of broadband services;

b) Improve digital literacy throughout all geographies and income groups in order to enhance the access of poor people and women to digitalized education;

c) Reinforce and strengthen traditional, on-campus higher education institutions to improve the quality of African higher education as a response to the desire of many for courses produced by elite universities. A strong university system, backed by a strong network of research institutions, constitute a nation's innovation system and the backbone of its competitiveness among nations. While the courses cannot replace traditional systems of learning in Africa, they can complement them;

d) Learn from the rich experience of Africa's many open universities, such as the University of South Africa and Nigeria's National Open University and other African providers of distance learning in Africa that are doing a commendable job in this regard;

e) Exercise due care in the choice of technologies. Not all technologies deliver on their promises. Governments should therefore choose technologies wisely. Mobile banking such as M-Pesa have not replaced traditional forms of banking, and these courses, irrespective of the hype surrounding them, cannot be a substitute for traditional learning systems;

f) Apply light-touch regulation, set policy and guidelines and leave the provision of these courses to higher education institutions (public and private), venture capitalists/entrepreneurs and industry to handle. While improving access to higher education is an important social goal, an outcome that could entrench existing social divides in society may be worse.

This policy brief was contributed by Mr. Kasirim Nwuke, Chief, NTIS.