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NTIS POLICY BRIEF

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Skills, Technology, and the African Transformation Agenda: Massive Open Online Courses (MOOCs) to the rescue?

I. Introduction

One of the major developments of early 21st century, largely uncharacterized as such – was the rapid pace and sustained rate of growth of a majority of African economies - oil and non-oil economies alike. Although growth has slowed considerably across a large swathe of countries, it created new challenges and possibilities and surfaced skills and expertise gap as an important constraint on further growth. Evidence shows that much of this growth is due to factor accumulation, not to growth in total factor productivity (TFP)[1],[2].

In several issues of its flagship report, **Economic Report on Africa (ERA),** the United Nations Economic Commission for Africa (ECA) provides evidence to show that much of Africa's recent growth has not been accompanied by significant job creation and poverty reduction[3]. But growth

[1] United Nations Economic Commission for Africa (ECA) (2016) "Innovation, Competitiveness and Regional Integration: Assessing Regional Integration in Africa (ARIA) VII

[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 ARIA VII, Addis Ababa: Economic Commission for Africa

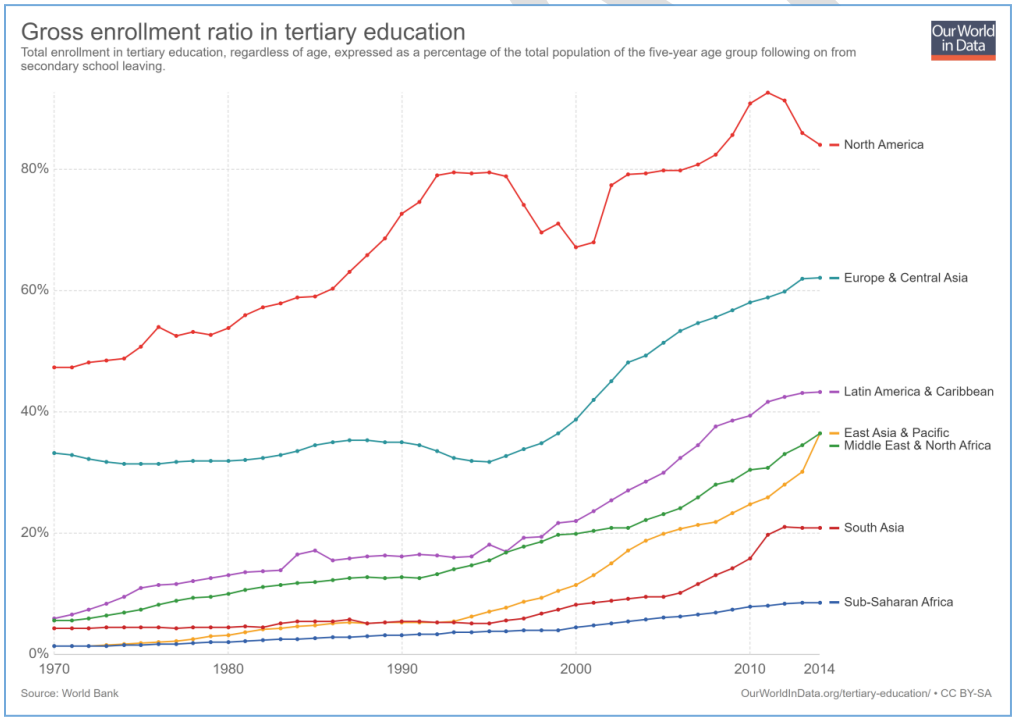
[3] This "jobless growth" (as it is often described) at a time when Africa has a huge youth bulge and the number of young Africans completing secondary education and seeking admission into post-secondary institutions is rising at an increasing rate raises a number of policy concerns.

with limited job creation is better than no growth at all. In any case, the continued economic expansion, undergirded by rapid rate of diffusion of information and communication technologies (ICT), is emboldening brave and innovative experiments by Africans and their governments to transform their societies; it also inspired new continental visions such as the African Union's long-term perspective plan *"The Africa we Want – Agenda 2063"* and the realization of earlier visions such as the Continental Free Trade Area (CFTA). It also raises hope about the possibility of most African countries meeting the targets of the United Nations Sustainable Development Goals (SDGs) by the end date of 2030 and realizing the Aspirations of the AU's Agenda 2063.

II. Africa's Skills gap

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

The argument increasingly made is that the capacity constraint can be attenuated through the application of technology in education to increase tertiary enrolment rates in particular. As the Figure below shows, sub-Saharan Africa has the lowest tertiary education enrollment rate among all regions of the world.



Source: Roser, M and E. Ortiz-Ospira "Tertiary Education" available at https://ourworldindata.org/tertiary-education/

It is important to note from the figure that the enrollment between sub-Saharan Africa and other developing regions of Latin America and the Caribbean, South Asia, East Asia etc was not too wide in 1970. However, by 2014, these other regions had left sub-Saharan Africa behind. This gap affects Africa's innovative capacity and global competitiveness. Urgent policy action is 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, to 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 attenuate the constraint of 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 market place[4].

III Policy Responses

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

In addition, countries such as Nigeria and Tanzania have introduced long distance provision of higher education through the Open University System. Direct foreign provision of higher education in Africa is also rising. Carnegie Mellon University opened a campus in Kigali, Rwanda and the UK's University of Lancaster opened a campus in Ghana. Foreign institutions such as Australia's Monash University and the UK's Open University provide long distance education. ICT is central to these long distance efforts.

African countries are also taking a collective approach to address the skills gap. The African Union (AU) 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 (CFTA) currently under negotiation will include trade in services, thus providing for a continent-wide trade in higher education services.

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

[4] Nwuke, K (2003) Higher education, economic growth and information and communications technology in Africa: Some issues and challenges in Beebe, M; Kouakou, K; Oyeyinka-Oyelaran, B; and Rao, M (eds) **AfricaDotEdu: IT opportunities in higher education in Africa**, New Delhi: Tata McGraw Publishing Company Ltd

IV Innovations in higher education - Massive open online courses (MOOC)

One innovation in higher education which has caught the attention of policy makers and economists is massive open online courses or MOOCs. A MOOC is an online course provided free of charge with an unlimited number of participants. It is a new development in online provision of higher education and e-Learning because it is tuition free and is contrary to the widely held view of intellectual property rights in higher education. In that sense, MOOCs are a disruptive, ICT-driven innovation capable of changing the way higher education is organized and delivered. In general, students can audit courses for free and receive no certificates for the audited courses, or they can choose, for a "small" fee, to receive a verified certificate." Three things are required to take a MOOC: a hardware (a computer or tablet or Smartphone), affordable broadband services, and motivation/discipline. MOOCs are a response to the challenges faced of enrollment expansion, revenues, and 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. MOOCs also respond to the shifting demands of the private sector for skilled workers.

There is a lot of enthusiasm about MOOCs across the world. Time Magazine declared 2012 the year of MOOCs. A number of analysts present online education in general and MOOCs in particular as an additional instrument that African countries can use to bridge the enrollment and skills gap. UNESCO, for example, has argued the view that the digitalization of learning can be a means of accelerating progress towards the targets of the Sustainable Development Goals (SDGs), particularly Goal 4, in poor countries[5]. The World Bank in collaboration with the Government of Tanzania is opening a MOOCs-type institution in Dar-es-Salaam and its private sector arm, International Finance Corporation has some equity in one of the most well-known MOOCS – Coursera of Stanford University.

MOOCs represent yet another effort to deploy information and communication to advance higher education. This policy brief, based on an earlier paper with the same titled, and ongoing work at ECA on new technologies and innovations, explores the factors-technological, economic, social and legal-driving the provision of MOOCs and proposes policy actions that could, if adopted help African countries to leverage MOOcs to bridge their skills gaps and shortages, address rising demand for higher education by Africa's billions of young people, and improve the continent's global competitiveness.

V. Drivers of provision of MOOCs

Under the TRIPS 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. However, many universities and institutions are choosing to

[5] UNESCO (2016) Moving Forward the 2030 Agenda for Sustainable Development available at http://unesdoc.unesco.org/images/0024/002477/247785e.pdf

provide digital learning resources over the Internet openly and for free. what explains this new development. From research, four major clusters of factors are identified. they are technological, economic, social and legal, discussed *seriatim* below.

- ***Technological drivers***

MOOCs take advantage of: a) increases in broadband availability, b) computing power (hardware: increased hard drive capacity and processing speed) and software rise of technologies to create, distribute and share content), c) reductions in cost and increases in the quality of consumer technology.

- ***Economic drivers***

The major economic drivers of MOOCs include: a) globalization; b) low entry barriers; c) profit - Africa's large number of young people seeking university admission or seeking to get new skills (or better resumes) present a profit opportunity which entrepreneurs and universities looking for new revenue streams cannot ignore; and d) improvements in ICT infrastructure, including submarine cables are gradually lowering the cost of broadband Internet services on the continent, this reducing the cost of access. Increase in the affordability of broadband services is occurring in tandem with increases in the penetration of Smartphones on the continent and 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, course materials licensing etc). Elite universities are using MOOCs to further enhance their reputation and to take advantage of economies of scale and scope. Still 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.)

The social drivers of MOOCs include altrusim on the part of providers; self interest in the form of reputational enhancements or warm glow effects. Also important as social drivers are network effects (and follow the leader-behaviour by institutions) and the desire to interat with a community much larger than the small community of the university. MIT, for example, is able through its MOOC, to interact and learn from a community far larger than it has in Cambridge, Massac husetts and to profit therefrom.

Equally important are legal drivers and the trend towards open sharing of software and research outcomes. Changes in IPR (under the WTO's TRIPS agreement) tightened 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 conten t such as Creative Commons, GNU and the free software movement. Other policy drivers include the need to get the most value out of public resources (in the context of the provision of MOOCs 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, the main economic argument for MOOCs in Africa is that they could be a relatively inexpensive instrument to deal with the three crises in African higher education mentioned above

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– rising cost, rising demand for higher education due to demographic changes, and rising skills shortage (and poor quality of skills) due to structural changes in economy and society and the emergence of the knowledge economy. For some, there is also an opportunity for profit.

VI. Who are the providers of MOOCs?

MOOCs first emerged from the Open Educational Resources (OER) movement[6]. But it has changed considerably in the last decade. Increasingly, the main providers of MOOCs are elite universities in English speaking developed countries, mainly the United States (Stanford University, Harvard University, MIT, the University of California at Berkeley etc); leading non-profits (Bill and Melinda Gates Foundation, the MacArthur Foundation, National Science Foundation); and for-profits/venture capitalists (Google, book publishers). In Africa, the University of Cape Town and the University of Witwatersrand, Johannesburg are major providers[7].

Coursera, developed by Stanford University professors is the leading provider. A consortium led by MIT and Harvard has produced over 2000 MOOCs at last count. Chinese universities are also active as well as Japanese and French. Over 1.45 million course enrolments per month in the variety of subjects offered by Coursera in partnership with several other universities. There are no MOOCs in an African language. Yet language means more than just a communication technology; it is also the custodian and repository of a people's sense of self.

But MOOCs may not address the access gap in many African countries. Neither will they provide the certificates that enrollees need to get a job. Evidence suggests that most of the enrollees in MOOCs already 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 "To those who have more will be given, from those who have not, more will be taken".

VII Provision of MOOCs in Africa

Not much is known about the provision of MOOCs in most African countries and for that reason it has not been an important policy matter[8]. But this might soon change. Technology companies and providers of on-line 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 MOOCs can succeed in Africa in spite of the considerable technological challenges. As noted earlier, two South African universities-University of Cape Town and Witwatersrand University-are already providing MOOCs. In 2016, Egypt's Ministry of Communications and Information Technologies launched a tender for local firms to provide MOOCs under the Ministry of Higher Education and

[6] OECD (2007) Giving Knowledge for Free: The Emergence of Open Educational Resources

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

[8] See for example Noukakis, D (2014) MOOCs in Africa and Emerging Countries: A blended learning experiment" available at https://www.unibas.ch/.../MOOCs_in_Africa-_a_blended_learning_experiment_Basel..

Scientific Research[9]. The World Bank's private sector arm, the International Finance Corporation recently made an equity investment in Stanford University's Coursera. The Bank is also developing an Open system in Tanzania. Rwanda has created what looks like a MOOC. With the WB getting involved in MOOCs, it is very highly that e-Learning through MOOCs 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 MOOCs. An important part of the transformation strategy of all African countries is the scaling up of investments 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.

But while MOOCs 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% of those who enroll in MOOCs complete the course. Given this very low completion rate, it is very doubtful that MOOCs can be the panacea to Africa's skills gap problems. African countries may have to continue to rely on the tested and proven until more effective models of online provision of higher education emerge. Traditional, on-residence provision of higher education not only imparts skills but also provides training in behavior, time management etc that the modern economy needs. They also create social capital for those who graduate from them 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, behavior and time management may be incapable of producing a work force that can compete with the very best in the word. Further, there is the problem of assuring the quality of MOOCs. Most universities offering MOOCs do not award degrees and the certificates that they award cannot count towards credit.

VIII Constraints to MOOCs in Africa

Providers of MOOCs in Africa face many constraints. These factors explain the very slow entrance of providers into the MOOCs market in spite of the need for MOOCs and the possible profits that can be earned. Some of these constraints are listed, without much discussion, below.

- Inadequate human resources at African universities. Many universities are young and are still struggling to build up resources to provide and be competitive residential universities and have therefore have limited scope to provide MOOCs.
- Regulatory confusion and uncertainty. It is unclear which government agency should regulate providers of MOOCs - the Education Ministry or the ICT Ministry if MOOC providers are considered providers of ICT services;

[9] Daily News March 22, 2016 "Local firms invited to apply for establish of 'MOOCs' through Higher Education Ministry" https://dailynewsegypt.com/2016/03/22/local-firms-invited-apply-establishing-moocs-higher-education-ministry/

- Poor infrastructure (electricity in particular);
- Low IT skills (the benefit of on-line courses and eLearning in general is an increasing function of initial skills).
- 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 to women's access to online services.
- Certificates and the higher education institutions that issue them still matter. Put differently, employers discriminate. Employers know that not all bright students attend higher education but they also know 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 they hire graduates who attend traditional campus universities.
- Limited broadband penetration (but this is not necessarily bad in view of the high cost of broadband and poor cost-recovery mechanisms).

IX Conclusion and policy recommendations

The low tertiary enrollment rate in African countries and the widening gap in tertiary enrollment 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 MOOCs can be an instrument for bridging the two gaps (skills gaps at the national and regional levels and enrollment gap between Africa and the rest of the world) there is no evidence or suggestions of evidence that MOOCs can attenuate the skills shortage (in terms of quantity and quality) in Africa. The courses – computer programming and software development etc the like important though they may be, are unlikely to be a firm undergird for national development. Software development is an unlikely basis for national development. China's growth, premised on manufacturing and engineering, continues to rumble on.

Policy is about tough choices and decisions among competing claims on limited national resources. There are a number of things African countries can do. They cannot escape or avoid MOOCs and the deployment of new technologies in higher education and other spheres of learning. But they must exercise care and make tough choices. Actions that they could take include:

a. Improve ICT infrastructure and reduce the cost of broadband services;
b. Improve digital literacy across 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 HEIs 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 for its competitiveness among nations. MOOCs 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 South Africa's UNISA and Nigeria's National Open University and other African providers of long distance learning in Africa that are doing a great job.

e. Exercise due care in the choice of technologies. Not all technologies deliver on their promises – governments should therefore choose technologies very carefully. Mobile banking of the M-PESA type have not replaced traditional forms of banking and MOOCs whatever the hype cannot be a substitute for traditional learning systems.
f. Apply light-touch regulation, set policy and guidelines and leave the provision of MOOCs to higher education institutions (public and private) and 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.

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