Higher Education and Economic Growth in Africa

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Abstract

Enrollment rates for higher education in Sub-Saharan Africa are by far the lowest in the world at 6%. Yet because of conventional beliefs that tertiary education is less important for poverty reduction, the international development community has encouraged African governments' relative neglect of higher education. This article challenges beliefs that tertiary education has little role in promoting economic growth and alleviating poverty. First, we review recent evidence that higher education can produce significant public and private benefits. Next, we analyze the relationship between tertiary education and economic growth. We find evidence that tertiary education improves technological catch-up and, in doing so, may help to maximize Africa's potential to achieve more rapid economic growth given current constraints. Investing in tertiary education in Africa may accelerate technological diffusion, which would

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in turn decrease knowledge gaps and help reduce poverty in the region. We also review new developments and trends in the higher education scene in Africa.

Le taux d'inscription dans l'enseignement supérieur en Afrique subsaharienne est de loin le plus faible du monde, atteignant seulement 6%. Pourtant, parce que l'enseignement supérieur est perçu comme moins important que les enseignements primaire et secondaire pour lutter contre la pauvreté, la communauté internationale a encouragé les gouvernements africains à moins y prêter attention. Cet article conteste l'idée que l'enseignement supérieur joue un rôle peu important dans le développement économique et la lutte contre la pauvreté. Tout d'abord, nous nous intéressons à de récents résultats qui montrent que l'enseignement supérieur crée des bénéfices publics et privés. Ensuite, nous analysons la relation entre l'enseignement supérieur et la croissance économique. Nous montrons que l'enseignement supérieur permet de rattraper le retard technologique et, ce faisant, pourrait aider l'Afrique à maximiser sa capacité à accélérer sa croissance économique dans les conditions actuelles. Investir dans l'enseignement supérieur en Afrique pourrait permettre une diffusion plus rapide des avancées technologiques, qui pourrait à son tour réduire la disparité de savoir et participer à la réduction de la pauvreté dans la région. Nous passons aussi en revue les nouveautés et tendances dans l'enseignement supérieur africain.

Introduction

Education is widely accepted as a leading instrument for promoting economic growth. For Africa, where growth is essential if the continent is to climb out of poverty, education is particularly important.

For several decades, development agencies have placed relatively great emphasis on primary and, more recently, secondary education. But they have tended to neglect tertiary education as a means to improve economic growth and mitigate poverty. The Dakar summit on "Education for All" in 2000, for example, advocated only for primary education as a driver of broad social welfare, leaving secondary and tertiary education in the background.

Part of the reason for the lack of attention to higher education in development initiatives lies in the shortage of empirical evidence that it enhances economic growth and reduces poverty (Tilak, 2005). To date, much of the significant economic analysis in this area has been theoretical. After World War II, several economists, including Milton Friedman, Gary Becker, and Jacob Mincer, developed a theory of "human capital"

to examine the benefits of education for individuals and society. Friedman and his wife, Rose, originally took the position that there was no evidence to suggest that "higher education yields 'social benefits' over and above the benefits that accrue to the students themselves." On the contrary, they hypothesised that higher education may promote "social unrest and political instability" (Friedman & Friedman, 1980, p. 34).

In contrast to this early view, more recent evidence suggests that higher education is a determinant, as well as a result, of income and can produce both public and private benefits (Bloom, Hartley, & Rosovsky, 2006). On the public side, higher education may create greater tax revenue, increase savings and investment, and lead to a more entrepreneurial society with more engaged citizens. With regard to the benefits of higher education for a country's economy, many observers attribute India's leap onto the world economic stage as resulting from its decades-long success in providing high-quality, technically oriented tertiary education to a significant number of its citizens. (See "The Supporting Evidence" below for more recent evidence linking higher education and economic growth.)

A promising signal is that development perspectives on higher education are now trending toward a revived interest in tertiary education. The World Bank has funded two regional conferences—the Africa Regional Training Conference on Tertiary Education (2003) which highlighted problems Africa faces in higher education and documented innovative solutions (World Bank, 2004) and, in 2006, "Costs and Financing of Higher Education in Francophone Africa," held in Ouagadougou, Burkina Faso, which considered methods of improving both the quantity and quality of higher education (Brossard & Foko, 2008; Gioan, 2008).

On a regional level, interest is also growing in higher education. In 2004, the Accra Declaration on GATS and the Internationalization of Higher Education in Africa highlighted the importance and value of higher education in effecting social, political, and economic development and renewal (Association of African Universities & World Trade Organization, 2004). In the 2006 Maputo Declaration of the Second Decade of Education for Africa, African education ministers emphasised the importance of revitalizing higher education to spur economic growth (African Union, 2006).

The Eighth African Union Summit in February 2007 stressed the need to strengthen training, especially in science and technology, to promote Africa's well-being (International Institute for Sustainable Development, 2007). The Nyerere Programme, launched in 2007 and supported by the European Union, was developed to increase access to and promote the intra-African integration of students through

scholarship and mobility initiatives. The Pan-African University began functioning in 2011 as a postgraduate training and research network of university nodes in five regions, supported by the African Union. The African Higher Education Harmonisation and Tuning Project, which began in 2011 and is part of the Africa-EU partnership, has the goal of enhancing degree comparability, graduate mobility, and graduate employability across Africa. The Association of African Universities held its 13th general conference in the summer of 2013 to address the increasing demand for higher education in Africa.

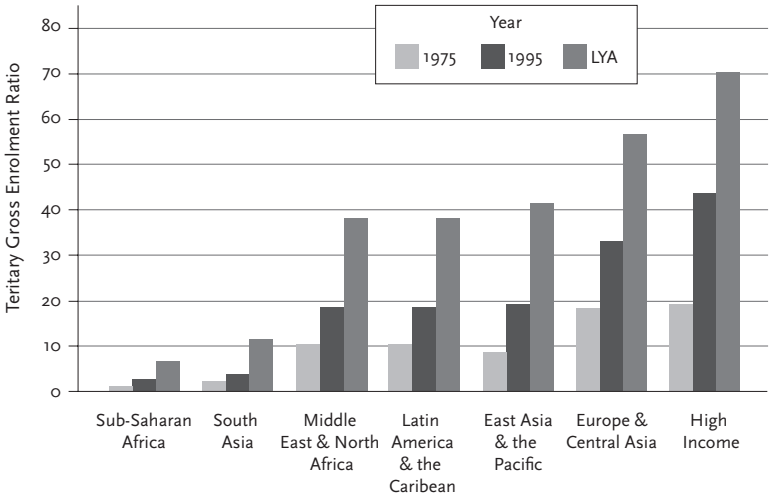
As former U.N. Secretary-General, Kofi Annan, upon receiving an honorary degree from the University of Ghana in 2000, urged the audience of college students:

> The university must become a primary tool for Africa's development in the new century. Universities can help develop African expertise; they can enhance the analysis of African problems; strengthen domestic institutions; serve as a model environment for the practice of good governance, conflict resolution and respect for human rights; and enable African academics to play an active part in the global community of scholars. (United Nations Information Service, 2000)

This article strengthens the connection between tertiary education, improved economic growth, and reduced poverty by first reviewing earlier studies. We next highlight the history of higher education in Sub-Saharan Africa, resulting in a decade-long funding drought during the 1990s. The second section presents a conceptual framework showing the relationship of tertiary education to economic growth, followed by an evaluation of the evidence supporting links between higher education and economic growth. It also presents a panel data model using an aggregate production function to assess the strength of these links. The final section summarises our conclusions and offers a postscript that looks to the future.

We recognise that African countries differ significantly from one another in characteristics that influence how higher education may affect economic growth. The policy environment, for example, which is critical in allowing the fruits of higher education to benefit an economy, varies across countries. Some policies can impede the mechanisms by which increased higher education could lead to faster economic growth, a significant negative effect. Similarly, the diverse political and economic histories and geographical circumstances of African countries have created a wide array of environments in which higher education institutions must operate. These factors have also led to differences in short-term economic possibilities. The conclusions that we

Figure 1. Sub-Saharan Africa falls further behind.



Note: These data are the most recent available for each country, a range between 2005 and 2010, with most countries supplying data for 2010. We then aggregated these data for region.
Source: World Bank (2013).

draw in this article about higher education's potential in influencing economic growth must be tempered by recognition of the many differences between countries. Even so, we believe that some conclusions may apply broadly, and we have tried to focus on these in our analysis.

The State of Higher Education in Africa

Basic Facts

Enrolment rates in higher education in Sub-Saharan Africa are by far the lowest in the world. Sixty years ago, the gross enrolment ratio stood at just 1% in 1965 (The Task Force on Higher Education and Society, 2000). The most recent figures show an improvement—but it is still only 6% (UNESCO Institute for Statistics, 2012).[1] This average masks wide disparities between countries. For example, Central African Republic, Malawi, Chad, Niger, and Tanzania had enrolments in tertiary education that reached only 2% or less in 2010. Figure 1 shows that the region's progress has been dwarfed by rapid gains in other

1. This figure is our calculation based on the World Bank, *World Development Indicators* (2013) and on the data tables compiled by UNESCO Institute for Statistics (2012), stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=167.

regions. Enrolment rate growth has been slow in Sub-Saharan Africa, and the absolute gap by which it lags behind other regions has increased rapidly. The region's present enrolment ratio is in the same range as that of other developing regions 40 years ago.

A further discouraging pattern is the traditional disparities in gender. Despite significant progress in the last two decades, the gender gap in enrolment remains large. In fact, the ratio of female to male tertiary enrolment in Sub-Saharan Africa has trended slightly downward, decreasing from 66% in 2000 to 63% in 2010.

In addition to low enrolment figures, Africa's universities lag beyond the global pattern in terms of research volume and academic publication. A review of the Thomson Scientific Citation Indexes, which includes the Science Citation and Index and the Web of Science, showed that Africa's contribution to the world's scientific literature, as defined by having any author from an African-based institution, decreased from 1.0% in 1987 to 0.7% in 2004 (Tijssen, 2007). Approximately half of the articles are internationally co-authored, implying that much of the research involves individuals from outside Africa working with African partners. Furthermore, the articles have a citation level 10% below the world average.

Influence of the World Bank on Allocating Funding

In the 1990s, the international development community focused the attention of African governments on primary education, thus fostering an attitude of relative neglect of higher education. The World Bank, which exercises significant influence over governments in developing countries, long took the position that primary and secondary schooling is more important than tertiary education as a means of reducing poverty. This policy stemmed from two important considerations: first, repeated studies appeared to show that the returns to investments in primary and secondary education were higher than those to higher education, and second, equity considerations favored a strong emphasis on widespread access to basic education. From 1985 to 1989, 17% of the bank's worldwide education-sector spending had been on higher education; but in 1990, the Jomtien World Education Conference swung the policy to a pro-primary emphasis. By 1999, the proportion allotted to higher education declined to just 7% (Bollag, 2003).

Encouragingly, after this decade-long experiment, the World Bank has moved to increase funding for tertiary education. Tertiary funding constituted 30% of all of the World Bank's education-sector commitments from 2004 to 2008 (World Bank, 2008a). However, large projects supporting higher education remain fairly rare. Between 2002 and 2006, only three countries in Africa received grants larger than US$15 million (OECD, 2009). Current public expenditure on higher education as a share of all public expenditure on all levels of education in Africa is approximately 20% and accounts for 0.78% of GDP (World Bank, 2010).

Developments in the 1990s

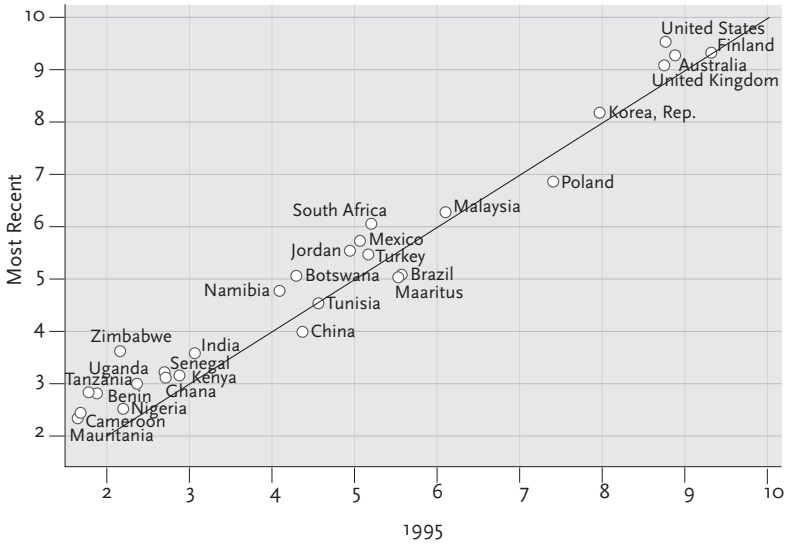
As suggested by the pattern described above, beginning in the late 1990s, the international policy community's attitude toward higher education began a shift that is still continuing. Key organizations such as the World Bank and major donor governments are seeing a clearer relationship between tertiary schooling and economic development. It is safe to say that donors now accept that, in a multi-pronged development strategy, all levels of education are important.

UNESCO and the World Bank in 1998 jointly convened a Task Force on Higher Education and Society, which brought together experts from 13 countries to explore the future of tertiary education in developing countries. The task force report, *Higher Education in Developing Countries: Peril and Promise* (2000), argued that higher education is essential to developing countries if they are to prosper in a world economy where knowledge has become a vital area of advantage. "The quality of knowledge generated within higher education institutions and its availability to the wider economy," the report stressed, "is becoming increasingly critical to national competitiveness" (p. 9).

A year after the task force met, the World Bank (1999) published *World Development Report: Knowledge for Development*, a report that considered how developing countries could use knowledge to narrow the income gap with rich world economies. It showed a correlation between a nation's providing education in mathematics, science, and engineering and that nation's improved economic performance. It also showed that the private rate of return to tertiary education, reported to be 20%, was similar to that for secondary schooling. The report recommended that developing countries train teachers using distance learning and create open universities, delivering courses by using satellite transmissions and the Internet (World Bank, 1999).

A subsequent World Bank (2002) report, *Constructing Knowledge Societies: New Challenges for Tertiary Education*, generated further momentum for higher education. This work stressed the role of tertiary schooling in building technical and professional capacity and in bolstering primary and secondary education. Although the report recommended that the bank maintain its emphasis on primary and secondary schooling—and set 20% as the maximum figure that ter-

Figure 2. Knowledge Economy Index.



Source: World Bank (2012).

tiary education should receive in a country's total education budget—it also urged that the state should create enabling frameworks to encourage tertiary education institutions. Countries, it recommended, should not focus only on rate-of-return analyses, but also take account of the "major external benefits" of higher education.

To monitor this new emphasis on knowledge, the World Bank created a Knowledge Economy Index that benchmarks a country's performance on four aspects of the knowledge economy: (a) the favorability for knowledge development within the economic and institutional regime; (b) education; (c) innovation; and (d) information and communications technology. As Figure 2 shows, most African countries languish near the bottom of this index, having made little progress since 1995. Botswana, Mauritius, and South Africa record scores near the middle, but Benin, Cameroon, Nigeria, and others have struggled, scoring less than three out of a possible 10 points.

The clearest signal yet that the international community now recognises the value of higher education in economic development and poverty reduction is found in two reports of the Commission for Africa (2005, 2010). In its 2005 report, the commission recommends that donors increase investments in Africa's higher education systems, particularly in science and technology. The report does not hesitate to term Africa's tertiary education system as in a "state of crisis" and urges the

international community to provide $500 million a year to strengthen the region's universities and up to $3 billion over 10 years to develop centers of excellence in science and technology. Despite these strong and clear recommendations, however, the 2010 report notes that donor funding to higher education continues to be low. Despite positive steps in some areas, the years between 2005 and 2010 showed little progress overall and no striking improvement in coordinated donor funding to Africa's science and technology capacity.

The World Bank (2008a) has also emphasised the role of tertiary education in *Accelerating Catch-Up: Tertiary Education for Growth in Sub-Saharan Africa*. The report argues that human capital gains from tertiary education can increase allocative and technical efficiency, spur innovation, and improve export competitiveness. Countries can also use information and communication technology to promote higher-skilled jobs and add value to exports. The report argues that it is insufficient merely to increase the number of graduates; a corresponding improvement in quality is required as well.

The report also makes six recommendations that will facilitate tertiary education growth in Sub-Saharan Africa: (a) create a human resource development strategy; (b) make creative financial arrangements that enhance policy goals and ensure that institutions can create long-term plans; (c) allow institutions to make their own decisions, but create accountability mechanisms; (d) encourage practical "real-world" learning opportunities; (e) create national and regional postgraduate training programs; and (f) find alternative ways to provide lower-cost tertiary care, including distance education.

In a follow-up report, *Financing Higher Education in Africa* (2010), the World Bank appraises current practices, noting with dismay that enrolment in higher education has grown faster than financing capabilities, and warns that the lack of resources may lead to a severe decline in the quality of instruction. To fill the burgeoning demand for higher education, private institutions have grown rapidly. Many universities have implemented cost-sharing programs, accompanied by student loans and financial aid for low-income students. Higher education is being diversified to offer lower cost and more effective delivery alternative, and governments are increasingly adopting more effective budget management practices.

The African Response

Some African countries have begun to respond to this shift in global thinking and to act on their commitments to higher education. The following are examples or indicators of the progress that has been made:

- Despite relatively low enrolment compared to other regions, absolute enrolment in tertiary education has grown rapidly in Sub-Saharan Africa over the last four decades—from fewer than 200,000 tertiary students in 1970 to almost 6 million in 2010, close to a 30-fold increase. The gross enrolment ratio (GER) for tertiary education grew at an average rate of 8.6% between 1970 and 2008, almost double the global average over the same period (OECD, 2010). Impressive though these figures are, however, the challenge is enormous in terms of sheer numbers. Only 6% of the tertiary education age cohort was enrolled in tertiary institutions in 2008, compared to the global average of 26%.
- While tertiary enrolment has increased very rapidly over the last 15 years, Africa's public investment in higher education has not kept pace, allocating approximately 0.78% of its gross domestic product (GDP) and around 20% of its current public expenditure on education. Concerns are growing that the decline in public expenditure per student is adversely impacting the quality of the education they receive, but these countries have limited options to acquire additional resources. To meet this need, several countries have adopted more innovative budgetary practices. For example, Ethiopia, Ghana, Mozambique, and South Africa supplement the core budgets of universities with competitive funds to stimulate qualitative improvements, research, and partnerships (World Bank, 2010).
- A UNESCO report in 1997 states: "Although the number of public tertiary education institutions has increased, supply still trails the growth in demand" (p. 80). As a result, private higher education has responded to the need with spectacular growth. Public universities doubled from 100 to 200 between 1990 and 2007; but during the same period, private tertiary institutions increased from 24 to 468. In 2006, private tertiary education accounted for 22% of higher education students on the continent, ranging from about 4% in Ghana (2001) to 43% in Rwanda (2004). One in five students is enrolled in a private institution, and approximately one-third of the thousand-plus universities currently operating across Sub-Saharan Africa are privately funded (Brossard & Foko, 2008; Devarajan, Mongab, & Zongoc, 2011). However, such institutions rarely meet national standards for curriculum and quality assurance. Many have established themselves as credible alternatives to failing public institutions, while others have become profit-driven businesses which offer low-quality education despite their high levels of tuition (Devarajan et al., 2011).

- The Ethiopian Parliament's Higher Education Proclamation in June 2003 launched major reforms, including: (a) giving more autonomy to universities by allowing them to choose their own staff at all levels; (b) encouraging the development of private universities; (c) introducing new degree courses that better fit the country's economic needs; (d) establishing a national Quality and Relevance Assurance Agency; (e) launching a new capacity-building programme for information and communication technologies; (f) increasing higher education's share of the education budget; and (g) enabling students to repay the cost of university education to the government by way of a tax deducted from their income after graduation (World Bank, 2003). As a result of these reforms, Ethiopia's public universities increased from two to eight, and at present, 71 private universities offer a diploma while 34 offer a degree. These two types of private institutions jointly enroll 23% of the country's higher education students. Undergraduate student enrolment increased from 87,000 to 420,000 between 2004-2005 and 2009-2010. Graduate enrolment, while considerably lower in numbers, also increased dramatically from 3,600 to 14,300 during the same period (Ethiopian Ministry of Education, 2011). Nonetheless, many of the provisions in the Higher Education Proclamation, in particular effective institutional autonomy, are yet to be fully implemented. While infrastructure and enrolment goals will likely be reached, achieving the desired level of quality remains problematic (Saint, 2004; Tessema, 2009).
- Mozambique's higher education system has grown rapidly over the past decade and a half. Its decision in 1997 to emphasise postsecondary education led to a national commission and to the creation in January 2000 of the Ministry of Higher Education, Science, and Technology (Brito, 2003). Mozambique recognised an opportunity—helped by debt relief, significant Southern African cooperation in higher education, and high interest from the business community, multilateral agencies, and donors—in improving higher education. In May and June 2000, the newly established Ministry of Higher Education, Science, and Technology organized 10 regional consultations with higher education institutions, students, businesses, regional governments, and civic associations. These consultations led to a *Strategic Plan for Higher Education in Mozambique 2000–2010*, and then to a new higher education law in November 2002 (Bollag, 2003). Mozambique has used both a US$60 million World Bank credit in 2002 and a US$15 million credit for its Higher Education Project to

improve scholarships, create the "Quality Enhancement and Innovation Fund," and develop a National Research Fund. By 2008, the quality fund had disbursed US$3.8 million to Mozambique's higher education system (Brouwer, Pimpão, Souto, & Valente, 2008). Currently, Mozambique has 44 institutions (18 public and 26 private) across all of its provinces that collectively enrol more than 101,000 students (Miuanga et al., 2013.) However, the Ministry of Higher Education, Science, and Technology was dissolved in 2005 and subsumed under the Ministry of Education, a move that some scholars consider a step backward (Brito, Brouwer, & Menezes, 2008).

- In Namibia, the Education and Training Sector Improvement Programme, launched in 2006, was a five-year programme financed by the government, educational institutions, international development partners, and the World Bank. It is part of a 15-year strategic plan that aims to develop the education and training sector's capacity to provide labor for knowledge-driven growth (World Bank, 2007).
- Efforts to achieve gender equity in higher education have focused on affirmative action policies. Ghana, Kenya, Nigeria, Tanzania, and Uganda have lowered admission cut-off points for women candidates (Bunyi, 2003), with the result that the region has made significant progress towards gender parity in terms of access to tertiary education. From 1970 to 1990, the gross enrolment ratio for women stagnated, amounting to less than one-half of the ratio for men. Female enrolment has climbed in many countries, reaching 40% in Nigeria, 53% in South Africa, 24% in Tanzania, and 34% in Uganda (Gunawardena, Kwesiga, Lihamba, et al., 2006). At Dar es Salaam University, female enrolment grew from 19.5% to 31.3% between 1997 and 2003. Many universities have also introduced bridging courses to help women transition from secondary to tertiary schooling. Others, such as Uganda's Makerere University, have established gender units to conduct research on female education and equity. In 2010 the tertiary female gross enrolment ratio in Sub-Saharan Africa for women was 4.8%, compared with 7.3% for men.
- Makerere University has also improved its financial situation. By encouraging privately sponsored students—70% of students now pay fees—it has reduced its dependency on state funds and generates 30% of its running costs. Yet demand is still high. Of the 35,000 private applicants who qualified for admittance in 2008, only one-third were accepted, due to constraints on space, equipment, and teaching faculty (Kagolo, 2008).

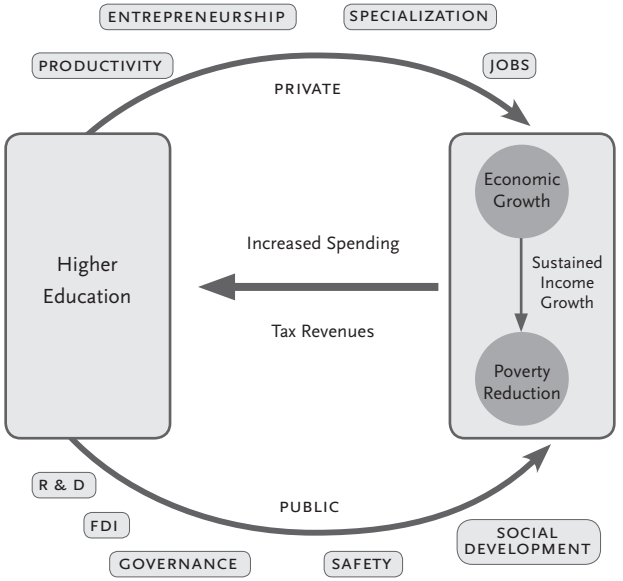
- Rwanda has placed a significant emphasis on increasing funding for higher education. Between 1990 and 2003, higher education's share of the overall education budget increased from 15% to 35% (Brossard & Foko, 2008). Since the formation of the Higher Education Council in 2007, the education scene has significantly changed. New institutions have been established, and new government policies have altered university admissions practices and student funding programs. Rwanda's higher education system currently consists of 29 institutions, 12 of them private (Schendel, Mazimhaka, & Ezeanya, 2013). The government has particularly prioritised the development of science and technology in higher education. The Kigali Institute of Science, Technology and Management (KIST), has increased the number of technology graduates in Rwanda. When the university opened in 1997, the country had fewer than 50 technology-trained professionals; KIST (2014) is now graduating over 800 students every year. Of late, all these institutions, including KIST, have come under the University of Rwanda, becoming fully operational in the 2013-2014 academic year.[2] Partnering with the Rwandan government, Carnegie Mellon University established a branch campus in Rwanda in 2012, making it the first American university to operate a full campus in Africa.
- Tanzania has pushed forward with improving its higher education competitiveness through the Sciences and Technology Higher Education Programme (STHEP). It received a US$100 million credit from the World Bank in 2008 to create modern science, technology, and engineering facilities (World Bank, 2008b). The country also recently introduced a computerised application system, which reportedly reduces university application fees from as much as US$709 to US$40 per applicant. The system allows students to apply to universities in various regions without having to travel there in person, a practice that is costly and can be especially limiting for women, who may find it difficult to travel long distances (World Bank, 2012).
- The spread of distance-learning institutions in Sub-Saharan Africa has accelerated in recent years. The oldest organization of this type is the African Virtual University (AVU), founded in 1997. The five original participating countries were Côte d'Ivoire, Kenya, Mali, Mauritania, and Senegal, supported by the World Bank, CIDA

2. University of Rwanda website http://ur.ac.rw/index.php?option=com_content&view=article&id=103&Itemid=435 (last accessed February 27, 2014).

(Canada), DfID (UK), and AusAID (Australia). AVU provides distance and e-learning opportunities to enhance tertiary institutions' teaching capabilities. It brings together instructors in developed countries, who present video lectures and seminars, with students in developing countries, who can ask questions and interact with students in other countries. Currently, 53 partner institutions in 27 countries are serving more than 43,000 students who have been part of AVU (African Virtual University, 2012).

- New regional partnerships have also emerged. The Southern Africa Regional Universities Association (SARUA) (2014) helps to promote leadership, spread best practices, develop public policy dialogues, and encourage initiatives that respond to regional and continental needs. It has 57 members from 14 countries. The Africa and Malagasy Council for Higher Education (CAMES) was set up in 1968 and now has 19 member nations. An intergovernmental institution for integrating higher education systems, it aims to coordinate and standardise the operations of emerging universities in Francophone countries in Africa. Existing partnerships, such as the Inter-University Council for East Africa and Association of African Universities (AAU) remain active in facilitating cooperation and networking among universities in Africa.
- The Programme de Troisième Cycle Interuniversitaire (PTCI), an interuniversity graduate programme in economics, operates in five institutions in West Africa. Set up to rectify weak graduate-level economics training in Francophone Sub-Saharan Africa, the programme prepares students for the Diplôme d'Etudes Approfondies, or a Master of Advanced Studies degree. The programme has significantly increased the number of Diplôme d'Etudes Approfondies in economics in the region (Kane, 2003). In 2007, under the guidance of the African Capacity Building Foundation, PTCI added a PhD programme in economics to its training activities and, in 2014, changed its name to the Nouveau Programme de Troisième Cycle Interuniversitaire. The African Economic Research Consortium (AERC) was established in 1988 as a public not-for-profit organization with its base in Nairobi, Kenya. The goal of the AERC is to advance economic policy research and training in Africa. AERC has two primary components: research and training. The Research Programme responds to the region's special needs by improving the technical skills of local researchers, allowing for regional determination of research priorities, strengthening national institutions concerned with economic policy research, and facilitating closer ties between researchers and policy makers (AERC, n.d.). The Training Programme augments the pool of economic researchers in Sub-Saharan Africa by supporting graduate studies in economics and by improving the capacity of departments of economics in local public universities. AERC is supported by donor governments, multilateral organizations, private foundations, and international organizations.

Figure 3. Conceptual framework identifying links between higher education and economic development.



The Conceptual Links between Higher Education and Economic Growth

As discussed above, Sub-Saharan Africa's progress in higher education has been slow in comparison to other world regions, perhaps partly due to a failure to understand the positive effects that higher education can have on economic development. In this section, we present a conceptual framework outlining how higher education can exercise this beneficial influence. See Figure 3.

As Figure 3 shows, higher education can lead to economic growth through both private and public channels. The private benefits for individuals are well established and include better employment prospects, higher salaries, and a greater ability to save and invest. These benefits may result in better health and improved quality of life, thus vitalizing a spiral in which life expectancy improvements enable individuals to

work more productively over a longer time, further boosting lifetime earnings. Individual gains also have public benefits. Higher earnings for well-educated individuals raise tax revenues for governments and ease demands on state finances. They also translate into greater consumption, which benefits producers from all educational backgrounds.

With the world moving increasingly toward a knowledge economy, tertiary education can help economies keep up or catch up with more technologically advanced societies. Higher education graduates are likely to be more aware of and better able to use new technologies. They are also more likely to personally develop new tools and skills. Their knowledge can thus also improve the skills and understanding of non-graduate co-workers, while the greater confidence and know-how inculcated by advanced schooling may generate entrepreneurship, with positive effects on job creation.

Tertiary schooling can also have less direct benefits for economies. By producing well-trained teachers, it can enhance the quality of primary and secondary education systems and give secondary graduates greater opportunities for economic advancement. By training physicians and other health workers, it can improve a society's health, raising productivity at work. And by nurturing governance and leadership skills, it can provide countries with the talented individuals needed to establish a policy environment favorable to growth. Setting up robust and fair legal and political institutions, making them part of a country's fabric, and developing a culture that encourages the creation of new businesses and jobs, for example, call for advanced knowledge and decision-making skills. Addressing environmental problems and improving security against internal and external threats also place a premium on the skills that advanced education is best positioned to deliver.

Although none of these outcomes is inevitable, the framework presented in Figure 3 does suggest many possible routes through which higher education can benefit local and national economies. In the next section, we assess the evidence that supports these links, and present new evidence of our own.

Evaluating the Supporting Evidence

The Literature

Conventional rate-of-return analysis shows higher education less favorably than it shows primary and secondary schooling. Psacharopoulos and Patrinos (2004) reviewed 98 country studies from 1960 to 1997 and found that the typical estimates of the rate of return from primary schooling were substantially higher than those for advanced schooling. The average social rate of return for the former was 18.9%, while for tertiary education it was just 10.8%. More recently, Keller (2006) found that primary education is significant in improving economic growth, while public spending on secondary and tertiary education has less overall benefit. However, Keller also found that the higher the share of the population with tertiary education, the more rapid the economic growth. Keller suggested that a possible solution to the insufficient availability of tertiary education is expanding private higher education, subsidised by government loans.

Although studies that find higher returns from primary schooling have had a major influence on international development policy, other studies have cast some doubt on the applicability of their findings (Bloom, Hartley, & Rosovsky, 2006; Task Force on Higher Education and Society, 2000). Traditional rate-of-return analysis focuses solely on the financial rewards accrued by individuals and the tax revenues they generate. It neglects the broader benefits of advanced education manifested through entrepreneurship, job creation, good economic and political governance, and the effect of a highly educated cadre of workers on a nation's health and social fabric. It also ignores the positive impacts of research—a core tertiary education activity—on economies. A series of studies, both in Africa and in the wider global context, have taken into account the broader impacts of higher education:

- In a cross-sectional study, Barro and Sala-i-Martin (2004) found that male upper-level schooling variable levels (secondary and tertiary education) had significant positive growth effects. However, these effects appear to be small, such that a 1.3-year increase in upper-level schooling raises the growth rate by 0.005. They also analyze the quality of education using test scores as a proxy and found a positive impact on economic growth. Oreopoulos and Petronijevic (2013) review the literature on the returns to higher education in an attempt to determine who benefits from college. They conclude that, despite the large degree of heterogeneity across potential college students, the investment appears to pay off for both the average and marginal student. The authors also note important non-pecuniary returns to higher education. For example, controlling for family background and income, college graduates are less likely to be divorced and tend to enjoy better health outcomes.
- In a study by Schultz (2004) on the impact of education on wages, the highest rates of return were in secondary and tertiary education. For example, in Burkina Faso, the rates of return for tertiary education were 18% for men 26% for women in 1998, on par with secondary education, but significantly higher than the rates of return for primary education.

- A study in Taiwan showed that higher education is positively correlated with the country's economic growth (Lin, 2004). It found that a 1% rise in higher education stock (as defined by those who had completed higher education, including junior college, college, university, or graduate school) led to a 0.35% rise in industrial output, and that a 1% increase in the number of graduates from engineering or natural sciences led to a 0.15% increase in agricultural output. This work examined the effects of concentration in different disciplines and concluded that study of the natural sciences and engineering had the strongest positive association with output.
- In examining East Asia's economic benefits, one study showed that countries that were latecomers to widespread higher education and that specialised in first degrees in science and engineering best raise their country's per capita GDP (Matthews & Hu, 2007). The argument is that countries that are far from the production possibility frontier could benefit most by imitating other successful research and development in the world.
- There is also growing evidence of potential productivity gains from the geographical concentration of human capital. The popular press has frequently noted the role of Stanford University and the University of California at Berkeley in fostering the growth of Silicon Valley in California. As another example, Andersson, Quigley, and Wilhelmsson (2009) utilise the spatial decentralization of higher education in Sweden to investigate the effects of university investments on regional productivity and innovation. They find strong evidence that an expansion of university presence in a community, measured by the number of university-based researchers, is associated with increased output per worker in that community and with increases in the patents awarded to inventors in that labor market area.
- In a study of six developed countries, De Meulemeester and Rochat (1995) showed that higher education had a strong causal impact on economic growth in France, Japan, Sweden, and the United Kingdom, but no impact in Australia and Italy. The authors conclude that higher education is necessary for growth but not sufficient. They argue that it is important that the socioeconomic structure and technological level complement the educational system such that graduates are able to harness their accumulated knowledge.
- Bloom, Hartley, and Rosovsky (2006) showed that non-college graduates in U.S. states in which the proportion of college graduates is high earn significantly more than those in states with few college graduates. Similar results are reported by Moretti (2004), who finds that an increase in the share of college graduates raises the wages of both high school drop-outs and high school graduates who have not gone on to higher education. Unfortunately, we know of no comparable study investigating such spillovers in developing countries.

- The same study showed a positive correlation between higher education and entrepreneurship (Bloom, Hartley, & Rosovsky, 2006). The authors used Babson College's Global Entrepreneurship Monitor's Total Entrepreneurship Activity (TEA) Index, which uses information from 17 countries to measure the share of adults involved in new firms or start-up activities. Individuals with higher education levels were more likely to engage in entrepreneurial activity, and more-educated entrepreneurs created larger numbers of jobs than less-educated entrepreneurs.
- Improvement in tertiary education may also lead to improved absorption of new ideas and products. Jordaan and Blignaut (2005) found that a 1% increase in tertiary school enrolment levels leads to a 0.65% increase in capital per capita.
- Another channel for improvement is through research and development, which can boost economic growth and productivity growth. In a World Bank study, Lederman and Maloney (2003) conducted a cross-country regression analysis that showed that the rate of return on R&D was 78%, an unusually high figure. They also attempt to explain why poor countries pursue high-return investments less frequently than rich countries, concluding, "Financial depth, protection of intellectual property rights, government capacity to mobilise resources, and the quality of research institutions are the main reasons why R&D efforts rise with the level of development" (p. 21).
- Bloom, Hartley, and Rosovsky (2006) found a positive and statistically significant correlation between higher education enrolment rates and governance indicators, including absence of corruption, rule of law, absence of ethnic tensions, bureaucratic quality, low risk of repudiation of contracts by governments, and low risk of expropriation.
- Gyimah-Brempong, Paddison, and Mitiku (2006), in a study of higher education and economic growth in Africa, found that a 1% increase in the average years of higher education would increase the growth rate of per capita income by 0.09 percentage points per year, which is three times as large as the growth impact of physical capital investment. The authors note, however, that the

impact assigned to tertiary education is likely an overestimation, because they could not disentangle primary and secondary education effects.

New Evidence

The traditional method for estimating macroeconomic impacts uses a regression approach to determine the rate of growth of income per capita measured against an initial level of education (such as total years of schooling), with controls for initial levels of income and other factors that may influence steady-state income levels (such as openness to trade, institutional quality, and geographic characteristics).

To analyze the effects of education and health on output, Weil and colleagues applied an aggregate production function and calibrated parameters of the production function (Shastry & Weil, 2003; Weil, 2007). But Weil did not look specifically at the effects of tertiary education. Our analysis examines improvements in labor productivity and output per worker as levels of tertiary education increase. The challenge in this method is ensuring that the parameters of the production function are accurately calibrated.

At the national and regional levels, the variation in education, either by cross-section or time series, is correlated with the error term in the equation determining income. Our method accentuates the proximal differences in education (e.g., how much richer Malawi would be compared with the United States if all its citizens were as well educated as American citizens) rather than the total effects of an exogenous education environment.

We estimate the production function directly using specifications similar to those used by Weil (2007) and by Bloom and Canning (2005), which allows comparisons between our estimates and previous calibrated parameters. Mankiw (1997) argued that estimation methods may capture the effects of health and education on total factor productivity (TFP) that may be missed by calibration techniques concentrating on wage equations. Total factor productivity reflects the efficiency with which factor inputs—e.g., labor and capital—are used in the production of output. The growth of total factor productivity is measured as the portion of output growth that is not accounted for by the growth of factor inputs.

Prescott (1998) commented that an explanation of large international income differences requires a theory of TFP. He concluded that neither capital per worker nor human capital sufficiently captures international income differences by itself and that over half the income gap between rich and poor countries was caused by unexplained differences in total factor productivity.

To analyze the production function, it is important to control for the different levels of TFP and rates of technological progress. Without controlling for these differences, reverse causality may result in estimation bias. Increases in TFP raise output, usually leading to higher levels of saving and investment. Without the careful use of controls, the extra investment induced by economic growth can appear to be the cause of the growth. To control for this effect, we follow methods set out by De La Fuente and Domenech (2001) and Bloom, Canning, and Sevilla (2004) to allow for different steady-state levels of TFP across countries and technological diffusion over time.

In this study, we are interested in investigating two different means by which tertiary education can improve economic growth: (a) raising GDP directly through a productivity effect, and (b) increasing the speed at which a country adopts technology and raises its total factor productivity.

Empirical Specification

Using the model for health and economic growth set forth in Bloom and Canning (2005), we develop a similar model for education and economic growth to make comparison easier.

We use a Cobb-Douglas production function:

$$Y = AK^{\alpha}(Lv)^{\beta} \quad [1];$$

where Y is GDP, A represents TFP, K is physical capital, and L is labor force. Furthermore, v is the level of human capital per worker, and $V = Lv$ is the effective labor input.

The human capital of a worker j can be modeled:

$$v_j = e^{\phi_s s_i + \phi_h h_i} \quad [2];$$

where s_i represents the total years of schooling, and h_i represents health.

The total level of human capital is:

$$V = \sum_j v_j = \sum_j e^{\phi_s s_i + \phi_h h_i} \quad [3];$$

The difficulty with this form of the equation is that national statistics tend to give simple arithmetic averages. But by assuming a lognormal distribution, the log of the average wage equals the log of the median wage plus half the variance of wages. The log of the median wages equals the average of log wages, since log wages have a symmetrical distribution.

This simplifies to:

$$\log V = \phi_s s_i + \phi_h h_i + \sigma^2/2 \quad [4];$$

where σ is the standard deviation in log wages. This implies that the distribution of wages matters for aggregate output. But because we lack data on wage distributions, we ignore this term for the present. Therefore, the aggregate production function can be summarised as:

$$\log Y = a + \alpha \log K + \beta(\log L + \phi_{psi} s_{psi} + \phi_{ts} s_{ti} + \phi_h h) \quad [5];$$

At the country level, the output is:

$$y_{it} = a_{it} + \alpha k_{it} + \beta(l_{it} + \phi_s s_{it} + \phi_h h_{it}) \quad [6];$$

where y_{it}, k_{it} and l_{it} are the logs of Y_{it} K_{it} and L_{it} respectively. The advantage of this formulation of the aggregate production function, as shown by Bloom, Canning, and Sevilla (2002), is that it is consistent with the Mincer wage equation at the microeconomic level, so the coefficient on schooling can be interpreted as the rate of return to schooling.

In practice $a_{it,}$ the level of TFP in country i at time t, is not observed directly. The approach in Bloom, Canning, and Sevilla (2002) to processing diffusion is to follow a diffusion process across countries, allowing for the possibility of a long-run difference in TFP even after diffusion is complete.

The level of TFP adjusts to its ceiling level at

$$\Delta a_{it} = \lambda^*(a^*_{it} - a_{i,t-1}) + \varepsilon_{it} \quad [7];$$

where ε_{it} is a random shock, a ceiling level of TFP given by a^*_{it} , and TFP adjusts toward this ceiling at rate λ^*. The ceiling level of TFP for a country depends on country characteristics and the worldwide technology frontier:

$$a^*_{it} = \delta x_{it} + a_t \quad [8];$$

where x_{it} are country-specific variables that affect TFP and a_t is a time dummy of current worldwide TFP. Several variables may affect long-run TFP including institutions and "social infrastructure" (Hall & Jones, 1999) and geography (Gallup, Sachs, & Mellinger, 1999).

To determine the technological catch-up coefficient taking tertiary education into account, we use the following equation:

$$\lambda^* = \lambda + \sigma s_{h,t-1} \quad [9];$$

where $s_{h,t-1}$ is the lagged level of higher education. This is similar to the approach to technological catch-up used by Benhabib and Spiegel (2005), except that here higher education is emphasised rather than total education.

Bloom and Canning (2005) rearrange equation [6] to provide a lagged level of total factor productivity:

$$a_{i,t-1} = \alpha k_{i,t-1} + \beta(l_{i,t-1} + \phi_s s_{i,t-1} + \phi_h h_{i,t-1}) - y_{i,t-1} \quad [10];$$

and differentiating the country-wide aggregate output leads to:

$$\Delta y_{it} = \Delta a_{it} + \alpha \Delta k_{it} + \beta(\Delta l_{it} + \phi_s \Delta s_{it} + \phi_h h_{it}) \quad [11];$$

Substituting [7], [8], and [9] into [11] gives the key growth equation:

$$\Delta y_{it} = \alpha \Delta k_{it} + \beta(\Delta l_{it} + \phi_s \Delta s_{it} + \phi_h \Delta h_{it}) + \lambda^*(a_t + \delta x_{it} + \alpha k_{i,t-1} + \beta(l_{i,t-1} + \phi_s s_{i,t-1} + \phi_h h_{i,t-1}) - y_{i,t-1}) - \varepsilon_{i,t-1} \quad [12];$$

De La Fuente and Domenech (2001) and Bloom, Canning, and Sevilla (2002) use this model to allow for TFP diffusion in cross-country production function studies. This implies that output is a function of: (a) growth in capital, labor, schooling and health inputs, (b) the closing of a country's TFP gap $a_{i,t-1}$ (which converges at the rate λ^*) to its ceiling level of TFP; and (c) shocks to a country's TFP, ε_{it}.

Equation [12] is a model of conditional convergence. The speed of convergence λ^* is the rate at which a country is converging to the worldwide technological frontier. This article's innovation is to make the speed of convergence a function of the stock of higher education: We do not think of technology diffusion as being "free" or automatic. Instead, diffusion is dependent on the number of highly educated workers who can access new technologies.

Data Sources

We construct an unbalanced panel dataset with data covering 1975 through 2010. The structure of the dataset is similar to that used by Bloom and Canning (2005).

Output data are derived from the Penn World Tables (PWT) (Version 8.0) (Feenstra, Inklaar, & Timmer, 2013). We use real GDP at constant 2005 national prices (in mil. 2005 US$) as the main dependent variable. As our measure of labor, we use the number of persons engaged

(in millions) from PWT. Capital stock at constant 2005 national prices (in mil. 2005 US$) for each country is also extracted from PWT.

Education data are from the Barro-Lee dataset (Version 1.3) (Barro & Lee, 2013). The updated Barro-Lee dataset provides information on average total schooling as well as average tertiary schooling for the population over age 25 in more than 140 countries, which we use as our measures of overall education stock and higher education stock, respectively. Data on life expectancy are from the *World Development Indicators* (World Bank, 2013). The analysis includes country-specific variables that may affect the long-run level of TFP, including two variables measuring openness to trade—one as a dummy (Wacziarg & Welch, 2008), and the other as the volume of exports plus imports as a percentage of GDP (Feenstra, Inklaar, & Timmer, 2013)—quality of institutions (Teorell et al., 2013), percentage of land area in the tropics, and a dummy variable for being landlocked to control for geographic factors that may affect productivity and trade (Gallup, Sachs, & Mellinger, 1999).

Results

A total of 108 countries are included in the study, with 771 observations. The parameters are estimated in Equation [12] using quinquennial data from 1975–2010.

The results from estimating Equation [12] are reported in Table 1, Column 1. Although we estimate a growth relationship, it is based on our production function; and the coefficients can be interpreted as parameters of the production function. As expected, capital and labor are major drivers of aggregate output. Health continues to be a small but significant contributor to aggregate growth. For every added year of life expectancy, there appears to be an improvement in aggregate output by 2.3%. We do not find a significant effect of the total education stock in the production function. However, we find evidence of the occurrence of technological convergence; and importantly, increasing tertiary education appears to have a positive and significant effect on the speed of technological convergence.

One concern with the model in Column 1 is that inputs may be potentially correlated with contemporaneous productivity shocks over the five-year intervals. Therefore, in Column 2, we proceed to instrument each input growth rate with its lagged value to avoid reverse causality. In this model, each added year of education plays a large role in raising aggregate output at the 1% significance level. Furthermore, the technological catch-up coefficient from tertiary education promotes faster technological convergence, now significant at the 1% level. Capital and labor remain highly significant, as does the impact of health.

Table 1. Panel Growth Regressions
(n = 788 observations from 108 countries)

Coefficient Term	Explanatory Variable	Coefficient Estimates	
		1	2
α	Capital	0.574***	0.503***
		(0.040)	(0.066)
β	Labor	0.545***	0.533***
		(0.056)	(0.081)
ϕ_s	Total years of education	0.019	0.301***
		(0.031)	(0.060)
ϕ_h	Life expectancy	0.023***	0.052***
		(0.006)	(0.014)
λ	Technological catch-up	0.065***	0.046***
		(0.013)	(0.016)
σ	Tertiary education effect on catch-up	0.057*	0.312***
		(0.033)	(0.103)
δ_1	Open	0.458**	0.300**
		(0.192)	(0.133)
δ_2	Percentage of land in tropics	-0.288*	-0.292**
		(0.172)	(0.138)
$\delta 3$	Landlocked	-0.107	-0.021
		(0.185)	(0.146)
$\delta 4$	Institutional quality	0.044	0.042*
		(0.028)	(0.025)
$\delta 5$	Trade as a percent of GDP	0.003*	0.001
		(0.002)	(0.001)

Note: Standard errors are reported in parentheses.
* p < 0.1, ** p < 0.05, *** p < 0.01
Column 1 reports the results from estimating Equation 12. In Column 2, growth rates are instrumented with all lagged values.

The coefficients on the country-specific variables are consistent with expectations—being landlocked and having more land in the tropics are negatively associated with growth, whereas higher institutional quality

and being more open are correlated with higher output. In particular, the estimates on percent of land in the tropics and being open are statistically significant across both specifications.

Recall that our model has two key components: the first is the effect of increasing the stock of education on potential GDP, and the second is the effect of tertiary education in spurring growth toward the production frontier of the continent. Our results suggest that a one-year increase in the total education stock would raise the long-run steady-state level of African GDP per capita due to factor inputs by 16% (= 0.533*0.301) A one-year increase in tertiary-education stock would have similar effects on steady-state GDP per capita due to higher educational inputs but would also increase the rate of technological catch-up by 0.06 percentage points each year. As an example, if Africa is 20% lower than its production possibility frontier, then each additional year of tertiary education stock would raise the output growth rate by 1.24 percentage points (= 20*0.312/5) in the first year due to faster technological catch-up. This higher rate of technological catch-up growth would be until Africa reaches the world technological, or productivity, frontier. We experimented with calculating the productivity gap for Africa and other regions, but the calculated gaps are sensitive to the sample years and the coefficients used (depending on whether we rely on the coefficients in Table 1 Column 1 or 2). We therefore do not report the results from this exercise.

Finally, we note that the coefficient on education (0.301, implying a rate of return of 30.1%) is higher than, but not significantly different from, the average of the Psacharopoulos studies. This finding is consistent with the existence of a positive spillover from private to public returns, though the lack of statistical significance does not allow us to reject the null hypothesis that there are no spillovers.

Conclusion and Suggestions for Additional Research

Past studies linking education to economic growth have focused predominantly on the effects of primary and secondary education. This study examines the impact of tertiary education on economic growth. Our analysis suggests that increasing tertiary education may be important in promoting faster technological catch-up and improving a country's ability to maximise its economic output.

This article challenges the belief that tertiary education plays little part in promoting economic growth. In fact, tertiary education may improve technological catch-up and, in doing so, help to maximise Africa's potential to achieve its greatest possible economic growth given current constraints. Investing in tertiary education in Africa may accelerate technological diffusion, which would decrease knowledge gaps and help reduce poverty in the region.

As we suggest in our introduction, higher education will not make a difference in Africa if other barriers to development play a determinative and negative role. Without sensible macroeconomic management, for example, new graduates will be much less likely to find productive work. Good governance is another *sine qua non*. Openness to trade—with provisions to ensure that Africa actually benefits from such openness and with increased cooperation from developed countries—is likely to be key. Debt relief, which some African countries have received, may also allow governments to begin programs that take better advantage of well-educated workers. Higher education creates the potential, but governments and private actors must seize the opportunities.

Many avenues for further research are evident. If new research points to specific actions that African governments can take to strengthen the ability of higher education to enhance economic growth, Africa may benefit substantially. Among the directions such research could take are the following:

- The cost of expanding higher education. South Africa has the highest tertiary education enrolment rate in Sub-Saharan Africa. If all other barriers could be overcome, what would it cost to bring the rest of Africa up to this level?
- Curricular reform. Few development strategies mention curricular reform as a necessary area of improvement for increased competitiveness within the globalizing economy. Research on existing curricula and their suitability for serving Africa's needs may shed light on new and useful directions that curricula could take. It appears, but is not clearly established, that African universities have not yet engaged in significant efforts to reform their curricula in response to rapidly expanding scientific knowledge and changing economic opportunities. However, a number of recent initiatives are addressing this challenge, including (as noted above) the African Higher Education Harmonisation and Tuning Project which, as part of its objectives, guides the development of curriculum to enhance the integration of higher education and the portability of degrees across Africa.
- Evaluation of data quality. To the extent that data on current practices guide the reinvigoration of higher education in Africa and affect the analysis of higher education and economic growth, it is important to know how accurate such data are. Recent work on the reliability of data on primary and secondary education shows that the data sources manifest severe internal and inter-dataset

inconsistencies (Bloom, 2006; Bloom, Canning, & Sevilla, 2002). Such inconsistencies may afflict tertiary education as well. If so, analyses need to take this fact into account. Researchers could try to verify the accuracy of existing cross-country datasets by comparing them with individual country data emerging from household surveys.

- Balance among levels of education. As the World Bank moves toward greater inclusion of higher education in its funding priorities, the question of how to balance funding for different levels of education arises. Research could analyze the effects not only of higher education on economic growth but also, for example, of higher and secondary education taken together. More broadly, studies could seek to determine the best mix of primary, secondary, and higher education according to the circumstances of different developing countries.
- Disciplinary focus within tertiary education. The study on Taiwan cited in this article suggests that science and engineering courses are the most useful for promoting development (Lin, 2004). Additional research could assess whether this finding holds in a wider range of countries. Driven by such views, Ethiopia aggressively reversed the intake of students to a ratio of 70 to 30 in favor of science and technology admissions in 2008 and has established 10 institutes of technology in recent years (Raynor & Ashcroft, 2011).
- Focusing on data from developing countries. Much of the cross-country work on higher education looks at all countries for which there are data. Obviously, developing countries face extremely different challenges than developed ones. Separately and systematically examining the benefits of higher education in poor countries may lead to sharper conclusions than have been reached to date.
- Case study comparisons. In higher education, as in other fields of inquiry, case studies can be extremely effective in shedding light on facts and trends that may not stand out in the available data. Studies that compare a country in which significant advances have been made (e.g., Mauritius) with a country or countries that exhibit more common problems (e.g., Ethiopia, Madagascar, Senegal, and Tanzania) may be particularly useful.

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