Gauging countries commitment to skills development for economic transformation

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I) Introduction

It is well documented in the literature that differences in the level of education achieved by citizens in different countries explain why some countries are able to achieve significant and sustained economic growth, and others are not. In addition, recent literature has identified the quality of education as an even stronger predictor of economic growth. Developing countries, particularly in Sub-Saharan Africa, lag behind the rest of the world in education outcomes both in terms of quality (graduation rates, standardized test scores, etc.) and quantity (enrollment numbers) (Hanushek and Woessmann, 2007). This reality calls for an increased focus on both the quantity and quality of education in developing countries.

In recent years, there has been tremendous progress in getting children into primary school in developing countries. For instance, the net enrollment rate in Sub-Saharan Africa increased from 56% to 73% between 1999 and 2007, with the total number of enrollees rising from 42 million to 124 million in the same period (World Bank 2010a)[1]. Similarly in South and West Asia, the net enrollment rate increased from 74% in 1999, to 86% in 2007, with total enrollment increasing from 37 million in 1999, to 192 million in 2007 (ibid)[2]. Secondary and higher education enrollment has also increased during the last decade, though to a lesser extent.

In terms of quality, the picture is less encouraging at all education levels. For example, in 2007 the average mathematics score for the Sub-Saharan African countries that participated in the Trends in International Mathematics and Science Study (TIMSS) was 337, well below the TIMSS scale average of 500. The poor performance in education quality is of major importance because education quality determines the skills level of a country's workforce. The skills level in turn has an impact on the ability to develop new technologies and/or to adopt and adapt existing ones. A country's ability to master the use of technology will determine the sustainability of its competitiveness, and therefore its economic growth. Skills development and mastering technologies also have implications on employment, as the two facilitate labor market clearing[3].

[1] These averages somewhat mask the existing disparity, as some countries report as low as 31% primary school enrollment, and others as high as 98%.
[2] Again, these averages mask disparities between countries where the lowest report 66% enrollment and the highest is 96%.
[3] Labor market clearing refers to matching supply with the workforce skill-level demand.

Based on the experience of countries like South Korea, Chile, and Finland it is imperative to have a comprehensive approach to skills development that is focused on building an education system that provides the kinds of skills needed for competitiveness. South Korea used an aggressive multi-pronged strategy of rapidly increasing primary and secondary school enrollment, providing public funds for research in science and technology, and developing a knowledge driven industrial policy. Chile's growth was attributed to the average years of education increasing from 6 to 10 years between 1974 and 1989, and by knowledge and innovation brought about by even higher educational attainment in the 1990s (World Bank, 2010b). Finland's economic success was attained by developing and maintaining a high performing education system, and consistently ranking among the top in international tests for education quality. Other factors that foster skill development are political consensus on a common school system where all children are educated and expected to perform regardless of socio-economic background, dedication to teacher excellence, shared school responsibility for struggling learners, efficient use of financial resources, and trust between educators and the community.

The purpose of this paper is to measure the commitment of 15 African countries to developing the required skills for economic transformation[4]. These 15 countries were chosen by the African Center for Economic Transformation as focus countries (ACET-15) where both thematic studies and countrywide transformation are being conducted. The choice of the countries is based upon a balance in geographical spread, data availability, and the importance of GDP and population as a share of Sub-Saharan Africa GDP and population. The questions at the core of this study are: how can we measure progress and commitment for countries that are in the early stages of reforming their education system to provide competitive skills? How can we measure the extent to which a country is developing and using skills as a driver of economic transformation? To answer these questions, I propose a three-pronged approach that assesses (1) the education system, (2) its linkages to the economy, and (3) the nature of training available outside the education system. Further questions I will probe are: how many students enroll in the education system?; how many graduate?; what subjects are they studying, in particular, how many are studying scientific and technical fields?; and do graduates leave with the requisite knowledge? The paper ends with concluding remarks and recommendation for further research.

[4] ACET's focus countries are: Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Mauritius, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda and Zambia.

II) The Education System

A. Quantity

a) Enrollment in primary, secondary, and higher education

Table 1 presents the 15 African countries' enrollment trends for primary, secondary, and tertiary education between 1971 and 2009. In 1971, three countries—Mauritius, South Africa, and Zambia—already had primary education gross enrollment rates (GERs) greater than 90%. These countries were followed by Cameroon, Ghana, Kenya, and Rwanda, whose GERs ranged between 55% and 88%. The remaining eight countries had GERs below 50% in the same year. As of 2009, 12 of our 15 countries have GERs of 100% for primary education, and the remaining three countries have rates above 75%. Burkina Faso has the lowest GER with 78.3% of children enrolled in primary school.

Turning to secondary education, all countries had GERs below 50% in 1971 but in 2009, three groups of countries emerge. The countries with the highest enrollment rates are South Africa, Mauritius, Botswana, Kenya, and Ghana, all with 50% or above. The second group of countries has secondary education GERs between 33% and 50% and includes Zambia, Cameroon, Nigeria, and Ethiopia. The countries with the lowest secondary education GERs (less than 30%) are Tanzania, Uganda, Rwanda, Mozambique, Senegal, and Burkina Faso.

The majority of countries had extremely low GERs (less than 1%) for tertiary education in the early 1970s. By 2009, the regional average for Sub-Saharan Africa is still at about 6%, well below the global average of 26% (UNESCO, 2010). Mauritius has the highest tertiary GER (25.9% in 2009), followed by Cameroon, Ghana, Senegal, and Botswana. The remaining countries, excluding South Africa, have GERs between 1.4% (Tanzania) and 4.8% (Rwanda)[5].

Table 1: Evolution of enrollment rates in all levels of education, 1971-2009

Country	GER (%)	**1971**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2009**
BWA	Primary	55.1	70.6	88.1	98.9	105.4	104.3	106.1	108.7	
BWA	Secondary	7.2	14.6	18.5	28.2	40.1	57.8	76.2	78.5	
BWA	Tertiary	0.0	0.6	1.1	1.9		5.1	5.7	7.4	
BFA	Primary	11.8	13.4	16.8	25.0	32.6	39.0	44.6	57.8	78.3

[5] South Africa's tertiary education GER is not available for the past decade. However, it was 10.6% in 1990.

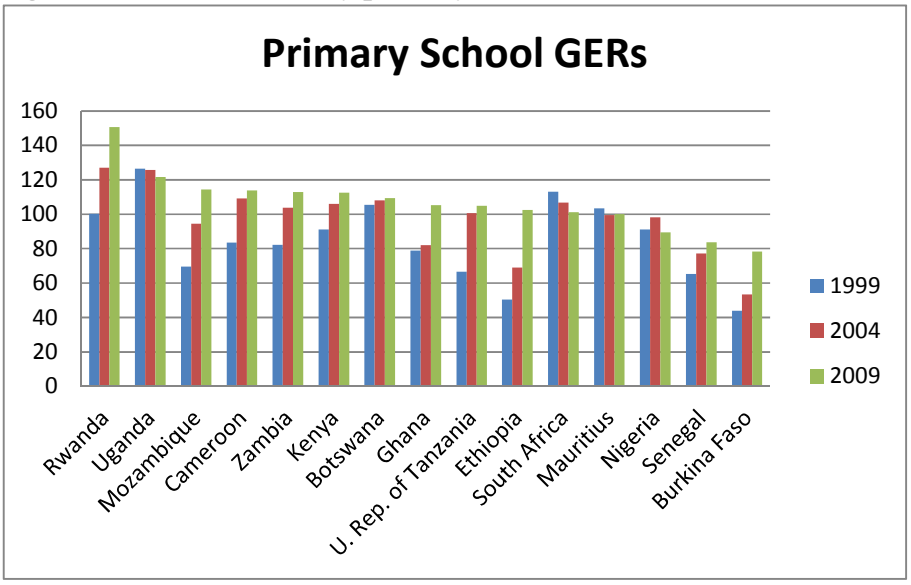
BFA	Secondary	1.3	1.6	2.4	3.7	6.7		10.4	14.0	19.8
BFA	Tertiary	0.0	0.1	0.2	0.6	0.7	1.0	1.1	2.2	3.4
CMR	Primary	87.6	89.4	90.9	96.5	96.1	81.2	86.0	108.1	113.8
CMR	Secondary	7.7	11.5	16.3	21.3	24.8	25.0	27.2	27.2	41.5
CMR	Tertiary	0.5	1.0	1.7	2.0	2.8		4.5	5.7	9.0
ETH	Primary	14.7	18.9	32.8	38.5	36.5	30.9	55.1	81.6	102.5
ETH	Secondary	3.7			11.7		10.8	14.4	24.9	34.4
ETH	Tertiary	0.2		0.5	0.6	0.8	0.7	1.2	2.9	3.6
GHA	Primary	66.5	64.6	74.2	72.3	69.7	77.8	83.5	88.4	105.2
GHA	Secondary	42.5	36.1	38.9	37.0	35.2		39.7	46.1	57.2
GHA	Tertiary	0.7	1.0						5.5	8.6
KEN	Primary	64.8	109.3	119.9	106.6	100.6	90.4	95.0	106.6	112.7
KEN	Secondary	17.3	21.6	30.0	39.6			39.3	47.6	59.5
KEN	Tertiary	0.9		0.9	1.3			2.7	3.0	4.1
MUS	Primary	97.5	104.5	92.7	109.1	111.8	104.8	103.2	98.8	100.0
MUS	Secondary	31.7	37.6	50.0	44.5	52.4		76.9	86.9	87.2
MUS	Tertiary	1.7	1.3	1.1	1.1	3.1	5.6	11.7	20.8	25.9
MOZ	Primary	38.2	57.4	112.0	84.5	62.9	66.2	74.9	101.4	114.4
MOZ	Secondary	2.9		5.4	7.1	6.9	7.3	6.1	13.2	23.4
MOZ	Tertiary	0.2		0.1	0.1		0.5	0.7	1.5	
NGA	Primary	43.4		93.8	104.4	84.2	86.6	95.5	99.4	
NGA	Secondary	4.6		13.4	28.9	24.3		24.9	35.1	
NGA	Tertiary		0.7	1.8	3.3				10.1	
RWA	Primary	66.3	53.5	68.5	75.3	76.7		105.4	137.3	150.7
RWA	Secondary	2.8		8.7	15.7	17.4		10.7	15.8	26.7
RWA	Tertiary	0.2	0.3	0.3	0.3	0.6		1.4	2.8	4.8
SEN	Primary	41.0	40.9	42.6	51.4	54.8	56.5	68.2	79.0	83.7
SEN	Secondary	10.4		10.8	12.2	15.0		15.9	22.6	
SEN	Tertiary	1.4		2.8	2.4				5.6	8.0
ZAF	Primary	96.9	98.9			106.9	117.7	106.1	104.9	101.2
ZAF	Secondary					66.0		85.5	92.6	93.9
ZAF	Tertiary					10.6				
TZA	Primary	35.2	53.1	95.6	76.4	69.7	68.2	68.1	104.7	104.9
TZA	Secondary	2.7	3.1	3.3	3.3	5.0	5.4	6.3	11.0	27.4
TZA	Tertiary	0.2	0.2		0.3		0.5		1.4	

UGA	Primary	41.2	45.2	51.0		69.3	67.7	127.5	119.3	121.6
UGA	Secondary		3.9	5.2		11.2		16.1	18.7	27.4
UGA	Tertiary	0.5	0.6	0.5	0.8	1.1	1.6	2.5		4.1
ZMB	Primary	92.3	94.4	93.7	102.4	96.6	88.6	81.7	115.3	112.9
ZMB	Secondary	13.8	15.2	16.5	18.7	21.3		23.8	33.5	48.7
ZMB	Tertiary		2.0			2.1		2.4		

Source: World Development Indicators, World Bank and UNESCO. BWA=Botswana, BFA=Burkina Faso, CMR=Cameroon, ETH=Ethiopia, GHA=Ghana, KEN=Kenya, MUS=Mauritius, MOZ=Mozambique, NGA=Nigeria, RWA=Rwanda, SEN=Senegal, TZA=Tanzania, UGA=Uganda, ZMB=Zambia.

To better visualize the evolution of enrollment rates, figures 1-3 display bar graphs of the GERs for all levels of education for the years 1999, 2004, and 2009. Figure 1 shows that most of the ACET 15 countries have made great strides toward achieving 100% primary school GER. For instance, Burkina Faso and Ethiopia nearly doubled their primary school GERs between 1999 and 2009, indicating how fast progress can be. Nigeria' GER was around 99% as of 2008. Burkina Faso and Senegal have the lowest GERs at 78.3% and 83.7%. These numbers suggest that access to universal primary education is achievable in the next decade *if current efforts are increased and sustained.* The bigger challenges are student retention, graduation, and ensuring students learn what they are supposed to learn.

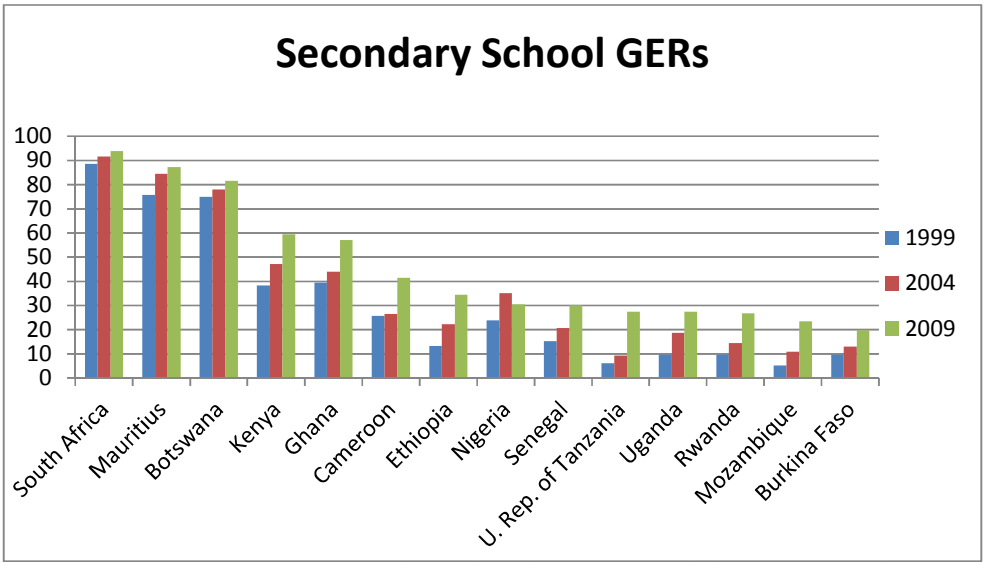
Figure 1: ACET-15 country primary school GERs



Data Source: UNESCO

In terms of secondary education enrollment, Mauritius, Botswana, Kenya, and Ghana are at the top, each with more than 50% GER in 2009. Next are Zambia, Cameroon, Nigeria, and Ethiopia with GERs between 33% and 50% in 2009. The remaining countries had GERs below 30% as of 2009. Although many countries doubled, tripled, or even quadrupled their enrollment rates (Mozambique, Tanzania, Uganda, Rwanda, Ethiopia, and Burkina Faso), it is going to take massive investments in most of these countries to match secondary school rates with the ones at the primary school level. It is at the secondary level where countries should focus their efforts if they are committed to developing the kind of skills needed for economic transformation.

Figure 2: ACET-15 country secondary school GERs

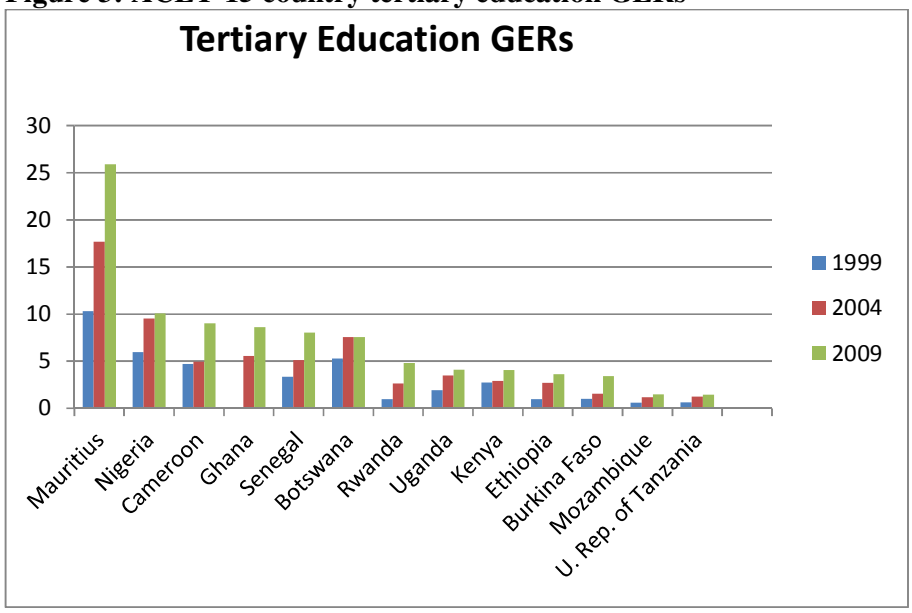


Note: Data source: UNESCO. Zambia is not included because of lack of data. Data for 2007 and 2008 were substituted for the year 2009 for Nigerian and Senegal, respectively.

Figure 3 shows the trend in tertiary education enrollment for our 15 countries for the period 1999 to 2009. Compared to primary education enrollment, tertiary education enrollment seems to be stuck in infancy in virtually all countries with the exception of Mauritius. With economic competitiveness becoming increasingly knowledge intensive, there is a lot to be done in terms of enrollment to build a critical mass of tertiary education graduates for transforming African economies. However, there is hope that things can change rapidly if governments are strongly committed to make it happen. For instance, in Ethiopia, tertiary education enrollment has increased from 52,000 in 1999, to more than 265,000 in

2009—a five-fold increase. Likewise, in Mauritius, the tertiary GER increase by 5 percentage points between 2005 and 2009, and 10 percentage points between 1999 and 2009.

Figure 3: ACET-15 country tertiary education GERs



Note: Data Source: UNESCO. Zambia is not included because of lack of data. Data for 2000 replaces 1999 for Kenya; 2005 replaces 2004 for Ghana; 2006 replaces 2009 for Botswana; 2006 replaces 2007 for Uganda; 2005 replaces 2009 for Mozambique, Nigeria, and Tanzania

b) Graduation rates for all levels of education

Graduations rates for all three levels of education are shown in table 2. Primary school graduation rates exceed 80% in Botswana, Ghana, Kenya, Mauritius, Nigeria, South Africa, Tanzania, and Zambia. In the remaining countries, primary school graduation rates range between 40% and 80%. There is no data on secondary education graduation rates for our 15 countries in the UNESCO database; in lieu of this, UNESCO provides data on progression to secondary school for those who complete primary school. In Botswana, Ethiopia, Ghana, Kenya, and South Africa over 90% of students who complete primary school go on to secondary school. There is no data for Kenya or Rwanda, and the remaining countries have progression to secondary school rates less than 70%. These statistics suggest that there is still a lot to do in most of the countries considered to produce a critical mass of secondary education graduates.

Assessing tertiary education graduation rates is difficult because of limited data availability in UNESCO's databases and elsewhere. Indeed, nine out of 15 countries have no data at all on tertiary education graduation rates (or they did not report any to UNESCO). The remaining countries have data for one or two years only; their graduation rates range from 12.8% (Mozambique) to 31.2% (Kenya). On its own, the lack of data is telling about how much emphasis was placed on tertiary education prior to the late 2000s. It is hard to design and implement policies to boost skill formation relevant for economic transformation when a country does not know how many people are being trained, and in what subjects.

Table 2: Evolution of graduation rates at all levels of education, 1971-2009

Country	Graduation rates (%)	**1971**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2009**
BWA	Primary	41.9	53.3	68.2	81.8	89.8	91.8	91.0	95.4	
BWA	Secondary[a]					58.0	88.2	95.8	98.3	
BWA	Tertiary									
BFA	Primary	7.0	7.2	9.0	13.3	19.3	18.6	25.1	31.1	43.0
BFA	Secondary					27.4		36.2	44.4	53.5
BFA	Tertiary									21.4
CMR	Primary		47.5	49.1	51.5	54.2		49.9	52.1	73.4
CMR	Secondary					29.4		26.7	33.1	
CMR	Tertiary									
ETH	Primary						15.0	23.0	43.2	55.2
ETH	Secondary						71.5	93.7		
ETH	Tertiary							17.2	15.5	
GHA	Primary	65.0	55.5	62.5				69.5	73.2	82.7
GHA	Secondary							82.1	90.9	
GHA	Tertiary									13.4
KEN	Primary	50.7	60.6	86.0					90.0	
KEN	Secondary									
KEN	Tertiary							31.2		
MUS	Primary				93.4	113.7	95.8	102.8	94.8	89.4
MUS	Secondary					42.0	59.6	63.2	66.7	
MUS	Tertiary									
MOZ	Primary				32.5	26.4	25.9	16.1	41.6	56.6
MOZ	Secondary					42.8	39.0	40.1	54.0	53.0
MOZ	Tertiary								12.8	

NGA	Primary								80.0	
NGA	Secondary								49.0	
NGA	Tertiary									
RWA	Primary	22.9	28.3	35.9	50.2	49.2		22.3		
RWA	Secondary									
RWA	Tertiary									
SEN	Primary	28.2		29.9	34.1	41.9		39.1	51.5	56.9
SEN	Secondary					24.1		38.9	50.2	
SEN	Tertiary									
ZAF	Primary							86.6	92.5	93.2
ZAF	Secondary								92.0	
ZAF	Tertiary									
TZA	Primary	19.9	35.3		79.9				55.0	102.3
TZA	Secondary							19.8	46.1	
TZA	Tertiary									
UGA	Primary		40.1						55.2	72.5
UGA	Secondary						34.4	40.0	42.9	
UGA	Tertiary							26.0		
ZMB	Primary		79.0	83.5				61.4	84.3	87.1
ZMB	Secondary							49.8	53.9	
ZMB	Tertiary									

a: For secondary education there are data only on the number of primary school graduates progressing to secondary school.
Source: Education Statistics, World Bank

B. Orientation of the education system to economic development

a) Proportion of university students enrolled in scientific and technical fields.

Table 3 presents the proportion of students in tertiary education enrolled in technical and scientific subjects. Ideally in this section, time series data on enrollment in scientific and technical fields of study from our focus countries would be compared to that of comparator countries (in emerging economies) to provide insights as to why our countries are not transforming enough to be called "emerging". Unfortunately, only eight of ACET's 15 countries have any information on tertiary enrollment by subject. Even among those eight countries, most have only two data points, and the data is not available for the same years for the different countries, making comparisons difficult. Therefore it is hard to draw meaningful

conclusions about the state of scientific and technical training taking place in those countries. Nonetheless, we provide a snapshot of what students are studying in the eight countries based on the most recent year of data comparing enrollment ratios in two broad fields of study: scientific and technical (Agriculture, Engineering, Manufacturing, Construction, and Sciences) and social sciences (Social Sciences, Business, and Law). In all countries with data, the social sciences account for 20% (Tanzania, 2005) to 63% (Cameroon, 2009) of enrollment in tertiary education, and are consistently the largest category in all countries except Kenya and Tanzania. If we isolate agriculture as a category on its own, with the exception of Ethiopia, there is less than 10% of tertiary education students enrolled in agricultural programs and yet, as many as nine of the countries considered here are still dependent on agriculture for between 21% to 58% of GDP, and over 60 % of employment. Many of the countries have adopted and are implementing development plans that put emphasis on transforming and exporting agricultural products, but with the current low enrollment rates in agricultural programs, lack of know-how may hinder the implementation of agriculture development plans. For the most recent year available, and among the eight countries with data, Engineering & Sciences represent 12.1% (Uganda), 16.4 % (Burkina Faso), 22.3% (Cameroon), 23.5% (Ghana), 24.5 % (Ethiopia), 29.0% (Mozambique), 29.0% (Tanzania), and 36.5% (Kenya) of total enrollment in tertiary education. In contrast, there is 18.6% technical and scientific enrollment in Brazil, 27.2% in Vietnam, 29.0% in Indonesia, 36.7% in the Republic of Korea, and 38.7% in Malaysia. Most ACET countries are comparable to Brazil, Vietnam, and Indonesia in science and engineering enrollment but they need to do much more to catch up with the Republic of Korea and Malaysia. In sum, the numbers suggest that there is more orientation towards social sciences and not enough enrollments in the areas of study that can make economic transformation happen faster.

Table 3: Tertiary education enrollment in scientific and technical subjects

Country	Subject	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Focus												
BFA	Technical + scientific									15.4	17.9	16.4
BFA	Social sciences								53.2	53.7	54.7	52.4
CMR	Technical + scientific						23.6		25.2	21.9	21.7	22.3
CMR	Social sciences						43.9		64.5	61.3	57.3	62.3
ETH	Technical + scientific	25.2	19.3	21.7	18.3	20.9	24.8	22.5	21.2		24.5	
ETH	Social sciences	26.9	36.5	31.6	35.2	38.3	41.8	37.7	44.5		37.0	
GHA	Technical + scientific											23.5
GHA	Social sciences											50.4
KEN	Technical + scientific		36.5	36.5								
KEN	Social sciences		21.1	21.5								
MOZ	Technical + scientific						30.8	29.0				
MOZ	Social sciences						45.5	43.9				
TZA	Technical +	28.3						29.0				

	scientific											
TZA	Social sciences	36.9						20.2				
UGA	Technical + scientific	17.3	13.1	10.7			12.1					
UGA	Social sciences	26.0	30.3	32.7			40.3					
Comparator												
Brazil	Technical + scientific				18.2	17.9	17.9	17.9		17.6	17.7	18.6
Brazil	Social sciences				40.4	40.6	40.6	40.5		40.5	40.4	40.4
Indonesia	Technical + scientific											29.0
Indonesia	Social sciences											50.2
Malaysia	Technical + scientific				42.3		42.2	40.7	44.2	41.6	38.7	
Malaysia	Social sciences				27.0		27.0	27.1	27.3	30.1	35.3	
Rep. Korea	Technical + scientific	48.0	46.1	46.1	44.5	41.8	41.3	39.9	38.8	37.9	37.2	36.7
Rep. Korea	Social sciences	20.2	20.8	20.3	19.6	20.4	21.0	21.3	21.6	21.9	22.2	22.4
Vietnam	Technical + scientific	22.1	23.4		25.6	26.2				30.1	26.6	27.2
Vietnam	Social sciences	38.8	42.3		38.6	38.1				34.1	33.3	34.4

Source: Authors' calculations using UNESCO data. No breakdown of enrollment by subject for Botswana, Mauritius, Nigeria, Rwanda, Senegal, South Africa, and Zambia is available.

b) Ratio of students enrolled in TVET to total enrollment in TVET, secondary and tertiary education.

In 1999, Rwanda had the highest Technical and Vocational Education and Training (TVET) to secondary-plus-tertiary enrollment ratio (25.1%) followed by Mozambique (18.1%) and Cameroon (17.3%). By 2009, Cameroon rose to the top place with 17.9%. The countries with lowest TVET to secondary-plus-tertiary enrollment ratio in 1999 were Ethiopia (0.3%), Kenya (0.5%), and Senegal (1.6%) whereas in 2009, the ratios were lowest in Kenya (0.5%), Ghana (2.5%), and Burkina Faso (5.2%).

Table 4: Ratio of TVET enrollment to total enrollment in TVET, secondary, and tertiary education in focus countries

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Botswana	5.7	6.1	6.6	6.1	6.1	6.0	6.0	5.6	5.3		
Burkina Faso	7.2	7.6	8.2	8.1	7.2	7.1	6.9	6.6	6.4	5.5	5.0
Cameroon	17.2	18.9	17.8		17.0	16.7	16.3	14.4		16.9	17.9
Ethiopia	0.3	0.6	0.5	2.1	3.6	3.8	4.0	3.9	5.2	5.8	7.8
Ghana	2.2	1.3	1.4	1.3	1.7	1.5	1.4	2.0	4.0	3.9	2.5
Kenya	0.5	0.5	13.5	0.7	0.6			0.9	0.9	1.0	0.5
Mauritius	7.7	8.5	8.1	9.4	10.6	11.8	11.9				
Mozambique	18.1	14.8	14.6	12.4		8.8	7.6	7.1	6.3	5.8	6.2
Nigeria									4.3		
Rwanda	25.1	23.0		21.7	19.4	17.7	16.2	15.2	14.1	14.1	13.5
Senegal	1.6	1.8	1.7	1.3		1.0	1.0			3.6	
South Africa	3.8	4.8	5.2	5.6	5.8	6.0	4.9				5.7
Uganda	11.1	4.7	4.9	4.2	4.2	4.3	4.2			4.5	
United Republic of Tanzania	8.1										

Source: Authors' calculations using UNESCO data. Note: No data for Zambia

Comparing our countries to the comparator countries, the ratios range from 4.6% in Brazil to 19.4% in Indonesia in 2009, versus 0.5% to 17.9% in our focus countries. Cameroon has ratios similar to those of Finland and Indonesia, while Mauritius' ratios are close to those of Ireland and Thailand. Excluding countries like Ghana, Kenya, and Senegal that have TVET to secondary-plus-tertiary enrollment ratios less than 4% for the most recent year, the rest of our

countries have ratios that are comparable to those of the comparator countries, countries which have emerged, or are starting to emerge economically. Perhaps, what makes the difference between these comparator countries and our focus countries is the quality of the Technical and Vocational Education and Training.

Table 5: Ratio of TVET enrollment to combined enrollment in TVET, secondary, and tertiary education in comparator countries

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Brazil	6.2	3.9	4.9	1.7	1.7	2.7	2.9		3.8		4.6
Chile	21.1	20.5		19.6	18.2	17.7	17.3	17.2	16.4	15.8	14.9
Finland	20.6	22.8	24.0	24.3	25.0	17.2	17.4	17.5	17.7	17.8	18.3
Indonesia		25.1		17.1	16.8	17.1	17.2	17.0	17.9	18.4	19.4
Ireland						9.8	10.1	10.1	10.2	10.6	11.1
Malaysia	5.0	5.0	5.1	5.0	4.5	4.7	4.7	4.7	4.9	5.0	
Republic of Korea	16.2	14.0	12.0	10.5	9.8	9.1	8.8	8.5	8.4	8.3	8.1
Singapore									12.7	6.7	6.5
Thailand			10.7	10.2	10.0	10.2	10.9	11.4	11.9		11.9
Vietnam	2.4	2.4	2.5	2.3	3.4		4.5		5.0		

Source: Authors' calculations using UNESCO data

c) Ratio of TVET to secondary plus higher education expenditures.

Only Ethiopia has the relevant data to compute this indicator that measures whether the education system is oriented towards providing skilled manpower for developing a manufacturing base. The ratio of TVET expenditures to the sum of secondary and higher education expenditures show a downward trend between 2003-04 and 2007-08. Two explanations can be put forward. If one just looks at the ratio, it seems that the government is spending less on TVET. When one looks at the individual expenditure patterns the trend is downward for TVET expenditures but in addition higher education expenditures have increased more than twofold between 2003-04 and 2007-08. The ratio of TVET expenditures to the sum of secondary and higher education expenditures dropped from 28.9 in 2003-04 to 7.5 in 2007-08. Unfortunately, I have not yet been able to obtain similar data for the other countries; therefore I cannot compare Ethiopia's expenditure pattern to its peers.

Table 6: Education expenditures in Ethiopia by education level

Education expenditures (Millions of Birr at current prices) in Ethiopia	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**
TVET	544	516	487	274	358
Secondary	298	515	552	714	903
Higher	1585	1364	2247	3245	3892
S+H	1883	1879	2799	3959	4795
Ratio TVET/S+H	28.9	27.5	17.4	6.9	7.5

Source: Education Statistics Annual Abstract 2000 E.C./2007-2008 G.C., Ministry of Education, Ethiopia

C. Quality

a) Tertiary education graduation rates by subject

Similarly to the case of education expenditures, data on tertiary graduations rates by subject are available for Ethiopia only. Table 7 shows that "Social sciences, business, and law" is the subject with the highest graduation rate (43.3% in 2008), followed by "Education" (23.6% in 2008). Engineering and agriculture graduation rates are low, 8.5% and 6.4% in 2008, respectively. This suggests difficulties in meeting the skills requirements for the agricultural-led industrialization strategy that Ethiopia has chosen to transform its economy. Here again the lack of data makes it impossible to compare Ethiopia's performance to its African peers.

Table 7: Enrolment by Subject (% of total enrolment) in Tertiary Education, Ethiopia

	1999	2000	2001	2002	2003	2004	2005	2006	2008
Tertiary Enrolment	52,305	67,732	87,431	101,829	147,954	172,111	191,212	180,286	264,822
Education	0.28	0.27	0.32	0.32	0.26	0.24	0.30	0.20	0.27
Humanities, Arts	0.41	0.52		0.29	0.48	0.85	0.86	0.83	0.95
Social Sciences, Business, Law	26.85	36.49	31.58	35.24	38.33	41.80	37.69	44.51	37.01
Sciences	4.53	3.58	3.65	3.15	6.59	8.82	8.48	7.33	6.97
Engineering	11.31	8.70	13.06	9.21	9.21	10.08	8.88	8.43	7.39
Agriculture	9.38	7.00	5.04	5.90	5.09	5.88	5.15	5.48	10.14
Health, Welfare	6.68	5.90	5.65	4.92	4.62	5.27	6.17	7.88	8.45
Services			0.04	0.02		0.28	0.24		

General programs	9.33	8.19	6.70	7.92	7.79				
Unspecified	0.05		0.05	0.04	0.03	0.93	0.30	2.90	0.21

Source: authors' calculations using UNESCO data. There is no data for 2007.

b) International tests for education quality

International tests[6] for monitoring education quality include: the Southern and Eastern Africa Consortium for Monitoring Education Quality (SACMEQ), the *Programme d'Analyse des Systèmes Educatifs de la CONFEMEN*[7] (PASEC), the Trends in International Mathematics and Science Study (TIMSS), the Programme for International Student Assessment (PISA), and the Progress in International Reading Literacy Study (PIRLS). These tests involve primary and secondary education only. For tertiary education, quality assurance systems are generally used (CAMES for Francophone Africa, and many Anglophone countries have their own quality assurance mechanisms). Unfortunately, Ethiopia, Nigeria, and Rwanda have not participated in any international student learning assessments, which makes it impossible to compare their pupils' performance to that of other countries. Burkina Faso, Cameroon, Mauritius, and Senegal students were tested in PASEC rounds. Botswana, Kenya, Mauritius, Mozambique, South Africa, Tanzania, Uganda, and Zambia participated in SACMEQ tests. Botswana, Ghana, and South Africa students were tested in several rounds of TIMSS between 1999 and 2011. Botswana (2011) and South Africa (2006 and 2011) students participated in PIRLS. Only Mauritius (2010) participated in a PISA survey.

The performance of the SACMEQ countries is summarized in Table 8. Botswana, Mauritius, South Africa, Tanzania, and Zambia improved or maintained both their reading and mathematics scores between 2000 and 2007 while Kenya, Mozambique, and Uganda did not. Kenyans students had the best reading score in 2000 (547) but Mauritian students took over the first place in 2007 with a score of 574. The lowest scores in both reading and math were earned by Zambian students. The highest mathematics scores were achieved by Mauritian students in both 2000 (585) and 2007 (623). Only South Africa, Uganda, and Zambia scored below the

[6] There are other international tests for Spanish and Portuguese speaking countries but they are not mentioned here since none of our countries fall into either category.

[7] CONFEMEN stands for Conférence des Ministres de l'Education ayant le français en partage.

SACMEQ average for reading in both 2000 and 2007. For mathematics, South Africa and Zambia scored below the SACMEQ average in both years while Uganda score below average in 2007 only.

Table 8: Trends in Reading and Mathematics for grade 6 pupils in selected SACMEQ countries

	Reading score		**Mathematics score**	
Country	**2000**	**2007**	**2000**	**2007**
Botswana	521	535	513	521
Kenya	547	543	563	557
Mauritius	536	574	585	623
Mozambique	517	476	530	484
South Africa	492	495	486	495
Uganda	482	479	506	482
U. R. Tanzania	512[a]	556[a]	500[a]	520[a]
Zambia	440	434	435	435
SACMEQ average	500	512	500	510

a: This is an average score from Tanzania and Zanzibar which had individual scores of their own.
Source: SACMEQ Policy Issues Series and author's calculations.

Four of 15 countries participated in PASEC tests. Table 9 shows their results at the beginning and at the end of the school year for grades 2 and grade 5 students (100 possible points). For grade 2 students, with the exception of Burkinabe students who had a lower score in mathematics at the end of the school year, students from all other countries improve their scores in both mathematics and French or English. Comparing countries for which the tests are comparable, Cameroonians pupils performed better than their Senegalese and Burkinabe counterparts in both French and mathematics. Turning to grade 5 students, the end of year

performance in mathematics was lower than that of the beginning of the year in all four countries. For the same students, French scores in Burkina Faso dropped slightly between the beginning and the end of the year while they increased in Cameroon, Mauritius, and Senegal. Anglophone Cameroonians pupils also improved their English scores. Similar to the grade 2 case, grade 5 students from Cameroon performed better than those from Burkina Faso and Senegal.

Table 9: Trends in French/English and Mathematics for grade 6 pupils in selected PASEC countries (2006)

	French/English score		**Mathematics score**	
	Beginning	**End**	**Beginning**	**End**
Grade 2				
Burkina Faso	25.3	43.1	37.7	34.4
Cameroon[1] French	42.6	64.4	54.6	55.5
Cameroon[1] English	37.5	59.7	58.6	61.0
Mauritius[2]	54.3	59.0	40.7	63.1
Senegal	32.6	48.1	42.1	47.9
Grade 5				
Burkina Faso	33.7	33.0	39.8	39.1
Cameroon French	40.3	47.8	51.6	46.2
Cameroon English	35.8	46.4	42.0	38.2

Mauritius	44.8	51.4	60.1	47.1
Senegal	33.8	35.2	47.5	41.6

1: Cameroon data is from the year 2005 whereas the other countries data was collected in 2006.
2: The tests given to Mauritian pupils are said to be "very different" from those of the other countries but I included Mauritius' results so one can see how its students fared between the beginning and the end of the school year.
Source: PASEC database

Only one of our countries, South Africa, participated in PIRLS 2006. South African students had the lowest score among all participating countries, 302. Similarly, Mauritius was the only ACET-15 country to participate in PISA 2010[8]. Mauritius scored 407 in the reading test, significantly below the OECD[9] average of 493 but similar to Malaysia (414) and well above the lowest performer Kyrgyzstan (314). In the mathematics test, Mauritius' performance (420) was similar to Chile's (421), slightly better than Malaysia's (404), far above Kyrgyzstan's (331, lowest score) but again well below the OECD average of 496. The OECD average score for the science test was 501 which Mauritius failed to achieve (417) but its performance was similar to that of Malaysia (422) and well above that of Himachal Pradesh state (India) with the lowest score of 325.

In 1999, South Africa, the only country in our group of countries to participate in TIMSS had the lowest scores among all participating countries in both mathematics (275) and science (243) tests. In the eighth-grade[10] mathematics test of TIMSS 2003, all our countries that participated fared below the international average score of 466. With a score of 366, Botswana did better than Ghana (276) and South Africa, which had the lowest score, 264. In 2007[11], Botswana eighth grade students scored 355 on the science test and Ghana's students scored 305, both well below the international average of 500. Similarly, their respective scores on the mathematics test of TIMSS 2007, 364 and 309 are below the international average of 500. In 2011, Botswana (397 fared better than South Africa and Ghana in both mathematics (397 versus 352 and 331) and science (404 versus 332 and 306). But all three countries fared much lower than South Korea (613 and 587) and Singapore (611 and 583), countries that have successfully used skill development as a basis for economic transformation.

[8] The test were administered in 2010 as an extension of the 2009 survey thus the 2010 survey is called PISA 2009+
[9] Organization for Economic Cooperation and Development
[10] For Botswana and South Africa, 9th grade students took the 8th grade tests in 2011.
[11] South Africa did not participate in TIMSS 2007.

III) Skill Development Policy

A 2011 International Labor Organization policy brief discusses the importance of national skill policies, what they can achieve, and the key principles of effective policy development, implementation, and monitoring and evaluation. The brief presents a map of countries that recently adopted a stand-alone skills development, TVET, human resource development (HRD), or lifelong learning policy worldwide. Skills mismatch, limited involvement of social partners, poor quality and relevance of training, limited access to training opportunities, and weak coordination in the system were identified as the challenges that led to a renewed attention on policy especially from low and middle-income countries.

Table 10 presents the name of the countries, the year the stand-alone policy was adopted and whether the countries have a skills development fund for ACET-15 countries and the comparators countries. Six out of the ACET-15 countries have adopted a stand-alone skills development policy versus four out 10 for the comparator countries. In terms of percentage, the two groups of countries fare equally with 40% of countries having a stand-alone policy. Twelve of the ACET-15 countries have skills development fund and nine of the countries also have levy-financed skills development funds.

Table 10: Countries with stand-alone policy for skills development, TVET, HRD, or lifelong learning

	Skills Development Policy*	Skills Development Fund	Levy-financed Fund
ACET-15			
Botswana	2010	Yes	Yes
Burkina Faso	2008	Yes	Yes
Cameroon		Yes	Yes
Ethiopia	2008		No
Ghana		Yes	No
Kenya		Yes	Yes
Mauritius		Yes	Yes
Mozambique		Yes	
Nigeria		Yes	Yes
Rwanda	2008	Yes	No
Senegal	2001-11	Yes	Yes
South Africa	2011	Yes	Yes

Tanzania		Yes	Yes
Uganda			No
Zambia			No
Comparators			
Comparators-Asia			
Brazil	2003	Yes	Yes
Chile	2008	Yes	No
Finland			
Indonesia			
Ireland	2007	Yes	Yes
Korea, Rep.	2005, 2008	Yes	Yes
Malaysia		Yes	Yes
Singapore		Yes	Yes
Thailand		Yes	No
Vietnam			

Source: ILO, World Bank (2009) and country sources
* Countries with standalone skill development policy, year adopted

Having a stand-alone policy and a skills development fund are indicative of some level of commitment to skills development but it not an end in itself. An assessment of how these policies were designed in African countries can help determine the level of commitment to skills development for economic transformation. This can be done by answering the question: how many of the African countries stand-alone skills development policies are based on an analysis of manpower requirements and existing skills gap in the countries? In addition, one needs to monitor the implementation of the policies and the management of the skills development funds to check whether the funds are used efficiently and the goals are reached in the timeframe they were scheduled to be achieved before giving a pass mark to the countries. To do so, country case studies are needed which is beyond the scope of this paper.

IV) Conclusion

African countries have been successful at significantly increasing enrollment in primary school in the past decade. Secondary and higher education sectors have seen less success in enrollment rates. Overall, quality of education is low by international standards, with African countries consistently faring at the bottom in international student assessment.

Data availability is a big challenge and makes it difficult to thoroughly assess countries and compare them with one another. The lack of good record keeping suggests commitment issues, as policy makers seem to be governing without the data needed for forecasting needs. This data collection problem needs to be addressed urgently for African countries to be successful in reforming their education and training systems so as to maximize the contribution of those systems to economic transformation.

The recent adoption of stand-alone skills development policies by several ACET-15 countries and the existence of skills development funds shows promise in the level of commitment. However, these policies need to be reviewed and their implementation monitored before concluding on policymakers commitment to skills development. Future research should thus examine case studies of the African countries that recently adopted stand-alone skills development policies, focusing on whether the policy was developed based on an analysis of manpower requirements in the different sectors of the economy ad on existing skills gap and on implementation of the policies. Future research should also look at how linked the education system and the economy are. In other words, is education in technical institutes and universities across Africa in line with what businesses need? And are there institutional mechanisms that enable government-business collaboration in training? Finally, future research should investigate the nature, quality and quantity of training outside the education system, and how it is financed.

References

International Labor Organization (ILO) 2011. "Formulating a National Policy on Skills Development, Skills for Employment Policy Brief.

Hanushek, E. and L. Woessmann 2007. "Education Quality and Economic Growth" Report for the World Bank

Lall, S. 1999. "Competing with Labour: Skills and Competitiveness in Developing Countries" International Labor Organization Discussion Paper.

OECD 2010. Strong Performers and Successful Reformers in Education: Lessons from PISA for the United States.

UNESCO Institute of Statistics Database.

UNESCO 2010. "Trends in Tertiary Education: Sub-Saharan Africa" UIS Fact Sheet, December 2010, No.10.

World Bank 2009. "A Review of National Training Funds", Social Protection Discussion Paper No. 0922.

World Bank. 2010a. "Education for all Global Monitoring Report", Washington, DC.

World Bank.2010b. "Stepping up skills: For More Jobs and Higher Productivity", Washington, DC.