Building Human Capital for Sustainable Economic Development in Nigeria

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Abstract

This paper examined issues dealing with the effectiveness of the Nigerian educationsector in meeting the human capital needed for economic development in an era of reforms. The paper is essentially a descriptive analysis of a set of indicators to assess the readiness of the sector in providing the needed human capital for the diverse segments of the Nigerian economy. The indicators used to assess the effectiveness of the education sector include: level of funding, the rate of return to investment in the sector, the HDI ranking, expenditure on R&D,and contributions to major patent offices. The study revealed that the sector lags behind in all the indicators used to assess its effectiveness. The paper recommends major reforms in the sector including increased funding, overhaul of school curricula and introduction of a new incentive structure for school workers.

Keywords: Nigeria, Human Capital, Development, Human Development Index, Research and Development

1. Introduction

The relationship between human capital development through education/training and economic development has long been investigated. There are two sides to the research findings. On the one hand, human capital development through education/training contributes to economic development by imparting general attitudes, specific skills, reducing fertility and improving living standards. Lucas (1988), Romar (1990), Barro and Lee (1993) using endogenous growth models revealed that investment in human capital led to growth in physical capital which in turn led to economic growth. In the same vein Adebiyi and Oladele (2005) opined that human resources development ensures that the workforce adapt to new innovations and challenges in its total environment. This view is also supported by the Khartoum Declaration of 1988 as quoted by Adebiyi and Oladele (2005:p.2) thus. ". .. NoStructural Adjustment Program (SAP) or economic recovery programme should be formulated or can be implemented without having as its heart detailed social and human priorities". In a similar vein, Ali (2002) quoted a merchant banker from the Gulf cooperation Council Countries (GCC) as having asked and answered. "What is rich? Rich is education . . . expertise . . . technology. Rich is' knowing'. We have money, yes! But we are not rich. Without knowledge, we are nothing. . ."

In Nigeria, as in many other less developed countries with colonial heritage, the departure of the colonialist created a vacuum which required educated personnel to take over the functions of government. Education became crucial in the development of such countries. Those who had education at that time gained access to clerical, administrative and teaching jobs and became the cream of society. Several other studies have investigated the relationship between the levels of education and economic growth (Bratti et al, 2004), education and inequality (Rehme 2007), technical education and economic growth (Mustafa, Abbas and Saeed, 2005). These studies found a positive relationship between investment in education and economic growth.

On the other hand, there is the body of literature which found that despite the rather impressive expansion in educational facilities especially in the less developed countries, Gross Domesticproduct (GDP) per capita does not show a rising and stable trend. Pritchett (1999a), in a cross country study revealed that the elasticity of output with respect to human capital per worker is negative implying that the growth in per worker human capital had no effect on output. Also, in a study of the relationship between investment in human capital and development in the Middle East and North Africa (MENA)Pritchett (1999b), found the coefficient of human capital to be negative. In all the countries covered by that study, the results seem to suggest that there is surplus education which the realities on ground does not support (Ali, 2002).

What is clear from the above is that there is no consensus in the education –cum-growth literature. It is this apparent contradiction in the theoretical and empirical literature that prompted us to explore issues dealing with the effectiveness of education in providing the human capital needed forsustainable economic development in Nigeria. The specific objectives are (i) to do a trend analysis of public expenditure on the education sector using Nigeria data. (ii) to examine the relationship between education expenditure and returns at the margin (iii) to examine whether, given the incentive structures in the education sector in Nigeria, teachers are well motivated to teach and students willing to learn and school administrators are motivated to monitor. Although the relationship between education, human capital and growth has been variously investigated in Nigeria, the issues raised above have not been well canvassed. The outcome of this paper will benefit government policy makers, educational planners and administrators alike in the formulation of policies and programs for the education sector. The paper is organized in sections. Following this introduction, section 2 discusses the trend in public expenditure and

returns to education in Nigeria. In section 3, we discuss issues in education and investment for technological progress. In section 4 we explore issues in education and the way forward in the education sector in Nigeria while section 5 concludes.

2. Public Spending on Education and the Growth process in Nigeria

Public expenditure on education and training is not an end in itself. The goal in investment in public education is to create the skills and attitudes needed for higher levels of productivity and growth. Whether or not such goals would be achieved will depend, not only on the amount of resources invested but also on the efficacy with which the inputs are managed. Resource allocation to the education sector in Nigeria is achieved through annual budgets. Budgetary allocation to the education sector is channeled through appropriate organs of government. Such funds are in turn disbursed to all the levels of education.

Following the entry of petroleum oil as a major source of revenue in the early 1970s, budgetary allocation to the education sector took an upward trend. For example allocation to the education sector as proportion of total budgetary allocation rose from 0.69% in 1970 to 10.83% in 1976 and dropped temporarily to 5.6% the following year following some vagaries in the international price of crude oil. From table 1 below, the proportion of the annual budget allocated to education has remained low and unstable. From 1980 to 2003 allocation to education fluctuated between 1.9% and 9% of total federal government expenditure which is far below the United Nations recommended minimum standard of 26%.A careful study of table 1 reveals that the allocation to capital expenditures in the education sector has lagged behind that of recurrent expenditures particularly since 1986 when the Structural Adjustment Programe (SAP) was introduced as a packaged of economic management.

As budgetary allocations to the education sector got thinner and thinner particularly since the introduction of SAP, school enrolment at all levels recorded a rising trend. At all levels of education, the number of educational institutions has increased tremendously. These developments have created severe infrastructural gaps in schools. Per capita school infrastructures have declined as no new structures are built and old ones are not renovated. These features in the education sector has manifested in several problems. First the classrooms are overcrowded, in some instances school pupils go to school with their own furniture items.Those who could not afford such furniture items sit on bare floor to learn. Teaching aids are generally lacking. The scenario is not different in secondary and tertiary schools where in addition to rusty and cranky classroom facilities, science laboratories are either non-existent or dilapidated (Nwagwu, (1997); Sambo, (2002).

The effect of poor funding of the education sector in Nigeria is not limited to inadequate infrastructure alone but also on the incentive structure for staff in the school system. Teachers are the least paid in the entire public service in Nigeria. All the efforts of the various unions in the education sector e.g. Nigerian Union of Teachers (NUT), Academic Staff Union of Universities (ASUU), Senior Staff Association of Nigerian Universities (SSANU) and Non Academic Staff of Universities (NASU) to persuade government to improve on their welfare had elicited stiff resistance on the part of government. On several occasions, the unions had embarked on outright strikes. Apart from the instability and uncertainty which such strikes caused the school calendar, Ajetomobi and Ayanwale (2005) found that strikes led to the loss of colossal man-hours in the education sector. Ajetomobi and Ayanwale (2005) estimated man-day losses due to strikes in the education sector to be above 100 million since 1996.

2.1 Return to Educational Investment

Psacharopoulos (1994) used three methods to calculate the rate of return on educational investment for a large number of countries. The three methods used were the "extended" earnings function, the "basic mincer" earning function and the "full method". Although no report was made specifically on Nigeria, the observations made on World patterns have implications for the education sector in Nigeria. We herebyattempt a brief summary of the world pattern as reported in that study.

First, the report indicates that primary education exhibits the highest social profitability in all regions of the world. Sub-Saharan Africa with 24.3% records the highest rate while the lowest rate (14.4%) was recorded for organization for Economic Cooperation and Development countries (OECD).The private rates of return are higher than the social rates for all regions of the world and all levels of education. The world average rates of return were 29%. The "full method" of calculating rates of return was used for these estimates.

Second, based on the Mincerian earning function, the rate of return of education depends on the regions and levels of development. For example, low income countries with 7.4 years of schooling and per capita income of US $842 had about 11.5% rate of return whereas high income countries with per capita income of $13, 669 and 10.9 average years of schooling had average of 6.6% rate of return. The Psacharopoulos (1994) report also recorded rates of return for various educational disciplines. For example, the following rates were reported for Physics (1.8%), Agriculture (7.6%), Science (8.9%), Law (12.7%), Economics (12%), Engineering (10.9%) and Medicine (10%).

The important lessons to be drawn from the summaries presented above are that the rates reported indicate that investments in education have high rates of return for a low income country like Nigeria. The records also reveal that private rates are higher. This implies that the investments in education will raise the per capita income of Nigerians thereby broadening the tax base as development moves to higher levels. Also the reports give

indication of the different social and private rates according to various disciplines. These findings are vital for planning and funding in the education sector in Nigeria.

2.2 The Human Development Index (HDI) and Educational Achievement in Nigeria

The Human Development Index (HDI) is a composite index that combines the three indicators of human development. Countries are classified as high, medium or low HDI group depending on whether the indices is closer to unity, midway between unity and zero or closer to zero.

Two aggregate indicators of educational achievement are used in constructing the HDI for each country. They are (1) the percentage of people aged 15 and above who can read and write a short statement on their everyday life. This is termed the adult literacy rate. (2).The number of students at all levels as a percentage of the population (gross enrolment ratio).

Given that the two indicators of educational achievement are components of the HDI, it could be argued that the position ofNigeria in the HDI ranking in Africa (i.e the bottom of the medium HDI in Africa) indicates that Nigeria educational achievement is very weak. The level offunding which is grossly inadequate helps to explain the low HDI ranking (158th world ranking).

3. Education and Technological Development

According to Ali (2002, p. 14) a country that is growing and developing "would be one that know how to operate, manage and build instruments of production and could create, adapt and master new techniques on the technological frontier; was able to impact knowledge and know-how to the young, whether by formal education or apprenticeship training; could choose people for jobs by competence and relative merit, and promoted and demoted on the basis of performance". The educational sector in a country should be able to guarantee and propagate intellectual inquiry, create a scientific method of proof, normalize research activities and diffuse research findings (Ali 2002, p.14). It is therefore imperative that a country that must grow and develop should be able to organize and foster a sound educational system that will generate technological and scientific innovations that will lead to increased production. Kaku (1998) noted that three scientific innovations engineered the technological advancement of the 20th century. These are the quantum revolution, the computing revolution and the bio-molecular revolution.

The United Nations Education Scientific and Cultural Organization (UNESCO) identified some indicators with which to measure scientific and technological capacity of nations. The indicators include science and technology personnel, scientific publications, registered patents and expenditures on research and development (R&D). In 1994, UNESCO reported that gross domestic expenditure on R&D worldwide stood at US $470 billion. Of this amount, Sub −Sahara Africa accounted for 0.5%, Western Europe 28.0% and North America 37.9%.

From tables 3 below, the weak position of Sub Saharan Africa in gross expenditure in research and development is revealed. The picture is further reinforced in table 4 where expenditures on R&D in Sub-Saharan Africa is 0.5%. The corresponding figures for North America, Western Europe and Japan are 37.9%, 28% and 18.6% respectively. Given this low level of expenditure on research and development in Sub-Saharan African (inclusive of Nigeria) it could be argued that the educational system in Nigeria lacks what it takes to build the capacity for sustained scientific and technological innovations for increased production that would lead to economic growth and development.

Table 4 below,presents data on other indicators of science and technology development. From the table, Sub-Saharan African countries accounted for 0.8% of scientific publications in leading world science journals. Using this indicator the world scientificoutput is concentrated in the developed countries.

Also table 4 reveals, the number of patents contributed by Sub-Saharan African countries includingNigeria to the European and American patent offices is very low using 1994 data. Sub-Saharan Africa has a share of 0.2% and 0.1% in European and American patents respectively. Western Europe (47.4) and America (9.9) dominated the recorded patents.

The evidence provided in tables 3 and 4 indicate that, although the education sector in Nigeria has recorded a high level of expansion since independence, the sector is still at the very early stages of building the technological capacity required for growth and development.

4. Towards a sustainable Education Sector in Nigeria

The World Bank (1998) opined that the education system in developing countries including Nigeria should be reorganized to meet the following goals. First school curricular should be reorganized with emphasis on "learning how to learn". Second, improving the effectiveness of the system in building human capital.Third, completion of good quality primary education.And fourth, maintain a sustainable financial basis for the education system.In line with Ali (2002, p.28) the following are suggested in order to achieve the goals stated above.

➢ Past development planning efforts should be revisited to enable Nigerian education planners do an analysis of the current situation. This will enable the planners restate precise quantitative goals assigned to the education sector as well as performance indicators. Education planners should also discuss the alternative

strategies that could enable the achievement of the set goals and identify the resources costs, within the national budget constraints.

➢ Within the context of a new developmental framework offered by reformsin the country, the goals of the education sector should be formulated around clearly verifiable goals with measures of success. The design of policies and programs for the educational sector needs to change from the provision of inputs to one that monitors result. To facilitate the achievement of this policy goal, the management of the education sector should decentralize decision making by increasing the level of autonomy at the level of educational units i.e. schools, colleges and university. This was actually the practice in the 1950s up to the early 1980s in many parts of the country. Then, secondary and tertiary institutions enjoyed a lot of autonomy in decision making. At that time, quarterly funds were allocated to schools and universities which they used to develop their institutions without interference from government ministries. Today, financial autonomy is almost fully eroded and government officials now directly select projects and award contracts. This has made goal setting difficult and monitoring ineffective because the needed separation between ownership and management is no long there.

➢ A new framework for the development of the education sector in Nigeria should incorporate, and encourage the participation of the private sector not only in the establishment and funding educational institutions but also in the design of the curricula in schools. In Nigeria, establishing private schools and universities has become common place. The quality of the teaching staff at some of such educational institutions has become a matter of intense concern.

➢ The World Bank (1998) noted that in some regions of the world the resources to the education sector could be judged as being sufficient, but are being used in an inefficient way. The Bank further noted that such inefficiencies arise when teachers are paid salaries, some of whom are not teaching effectively; producing students who are not sufficiently trained; putting school buildings where they should not be. A new framework for the development of the educational sector in Nigeria should put a check on these internal inefficiencies.

➢ There is the need to build an interface between researchers on education issues and the public officers who manage the educationsystem. This will enable both parties to exchange views as to the state of theeducation system with regards to its performance and what needs to be done. In Nigeria such networks do not exist. As such a framework of reforms in the education system should identify such networks to avail the opportunity for the exchange of information and garner support for the desired directions of reforms, as well as for subsequent monitoring and evaluation (Ali, 2002).

5. Concluding Remarks

In assessing the effectiveness of the Nigerian education system as a medium for training the needed human capital for the sustainable growth and development of the Nigerian economy, several indicators were used. First, the extent of public funding of the education sector was examined. The analysis revealed inherent instability in the level of resources allocated to the sector. In addition, the absolute amounts allocated to the sector since 1970 were far below the UNESCO minimum standard. In general the analysis revealed inadequate funding in the education sector in Nigeria. Second, the rate of social and private returns in the education sector was examined and the findings show that in general, the rate of return to education depends on the level of education. Although, there were no specific data to utilize in the case of Nigeria, other studies revealed that for Sub-Saharan African countries, social returns are higher at the primary school level. Our analysis also revealed that private returns are higher at all levels of education. One striking feature which our data revealed is that the returns to education are higher for low income countries than high income countries. This tends to suggest that low income countries should invest more in education than high income countries. But the reality suggests the reverse. We must note here in analyzing this indicator, we relied on data reported on the world pattern in general and the less developed countries in particular as the UNESCO relevant data on Nigeria are not available.

Another indicator used in our analysis is the Human Development Index. To the extent that the HDI are computed using indicators of educational achievement, a low index could be interpreted as an education system that is weak in developing human capital for economic development. Our data revealed that Nigeria occupied the bottom position in 2009 in the medium HDI group of countries. This indicate the low capacity of the education sector to produce needed human capital for any meaningful development.

Finally, the study examined the scientific and technological capacities in World regions to assess the levelof efficiency of the education sector in Nigeria. Three indicators were utilized, namely expenditure on research and development (R&D), scientific publications and patent rights. These three indicators were used as a measure of the technological capability at the frontier of knowledge. Despite recognizing the limitation of unavailability of specific data on Nigeria, the data relating to Sub-Saharan African countries including Nigeria recorded very low share in all three indicators. It could then be argued that Nigeria in Sub-Sahara African is still at the very early stages of building the technological capacity required for sustainable development.

Following many years of declining resource allocation and benign neglect in the education sector, it is now recognized that the quality of education in Nigeria has suffered. Meager resources in the sector have translated into poor pay and incentive structure in the sector. Teachers are the least paid public servants in Nigeria. The

story is not different in the privately owned schools where wages are even lower because of perceived unemployment in the labor market. Consequently, "teaching" has lost its once highly-valued social status. Teachers now engage in rent seeking and are involved either in subsistence farming or engaged in one form of trading or the other. The general perception in Nigeria today is that schools in Nigeria in the 1960s and 1970s are more functional than what we have today. The reason for this is not far-fetched. Teaching no longer attracts high quality teachers and many left for more lucrative employment. Teaching jobs are now regarded as temporary – a waiting point for more lucrative employment. A crucial policy re-orientation is needed to reverse this trend. In any production process, the factor labor (teachers) is the active factor; if it is well motivated, then all other factors can record a rising marginal productivity. Dealing with the incentive structure in the teaching profession should amount to a new enhanced pay structure and other incentives such as housing and the treatment given to retired teachers in terms of the prompt payment of retirement benefits and pensions.

One government action that has weakened the schools in Nigeria is the removal of autonomy in decision making in schools. The implication is that schools are no longer enabled to hire the staff they consider crucial, procure needed inputs and design structures that are needed. Secondary and tertiary schools need, to a large extent autonomy in financing and decision making. This was achieved in early years of independence until the Structural Adjustment Program (SAP) was instituted. Lack of autonomy has engendered internal inefficiencies leading to a rise in per unit cost of school outputs. Today, there are calls that colleges be returned to their former missionary owners. What made mission schools outstanding was the level of autonomy they had at that time. Autonomy in schools is needed if ownership must be separated from management. Such a separation is needed so that school monitors could effectively do the monitoring while the teachers do the teaching.

One phenomenon that has rendered the school system in Nigeria less effective is that the curricular are copied from those of other regions without adequately redesigning them to cater for the needs of our country. To a large extent, the curricular in Nigerian schools place more emphasis on literacy and numeracy. This has led to the situation where school outputs could not fit into the needs of society. This has worsened the unemployment situation in Nigeria. A new reform agenda in the education sector in Nigeria should redesign school curricular with adequate inputs from the private sector. The needs of the different sectors of the society – private and public sectors should constitute the basis for redesigning school curricular so that school leavers could fit into the various sectors of the economy.

And finally, a long term development framework that would incorporate changes would require additional resources which one may be tempted to think might be difficult to acquire in present day Nigeria. It is the position of this paper that all that is needed to transform the education sector in Nigeria is the political will to release needed resources to the sector. For example if the levelof corruption in the sector is reduced by 50%, then a lot of resources would be available to the sector. This would enable the sector to embark on reforms at all levels. Such reforms should aim at re-focusing on results by devising monitoring indicators, increase the participation of the private sector in curricula design, improve internal efficiency and formulate a new incentive structure in the education sector so as to build the needed human capital for development in Nigeria.

References

Adebiyi M.A and O. Oladele. (2005). Public Education Expenditure and Defense Spending in Nigeria: An Empirical Investigation. http//www.saga. cornell.educ /saga/educconf/adebiyi.pdf (accessed February 10, 2010).

Ajetomobi J.O. and Ayanwale A.B. (2005). Education Allocation, Unemployment and Economic Growth in Nigeria: 1970 – 2004. http//www.saga.cornell.e.ducconf/ajetomobi pdf.(accessed 15th May,2011).

Bratti, M., A. Bucci and E. Moretti. (2004). "Demographic Trends, Human Capital and economic Growth in Developing countries: Theory and evidence, University of Ancona, Department of Economics, Ancona, Italy.

Ali- Abdel G.A. (2005).Building Human Capital for Economic Development in the Arab Countries. www.uis.unesco.org/template/pdf/ged/2005/gec. (Downloaded April 10 2011)

Barro, Robert J., and Jong-Wha Lee. (1993). "International Comparison of Educational Attainment" Journal of Monetary Economics 32(3): 363-394.

Kaku, M. (1998).*Visions: How Science Will Revolutionize the Twenty First Century*.Oxford University Press. Oxford.

Lucas, Robert E. Jr. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics,* 22 (July 1988): 3-42.

Mustafa, U., Abbas, K., &Saeed, A. (2005). Enhancing Vocational Training for Economic Growth in Pakistan.*The Pakistan Development Review.* 44(4), 567-584.

Nwagwu C. C. (1997). The Environment of Crisis in the Nigerian Education System. *Comparative Education* .33(1): 87-95.

Onoyere, I. A. (2010). *Pattern and Determinants of Federal Government Expenditure in Nigeria.* A Ph.d thesis submitted to the Department of Economics, Delta State University, Abraka

Paul M. Romar. (1986). Increase Returns and Long run Growth.*The Journal of Political Economics.* 94(5), (Oct1986):1003-1037.

Pritchett, L. (1999-a). Where Has All the Education Gone? Policy Research Working Paper, World Bank, Washington D.C.

Pritchett, L. (1999-b). Has Education Had a Growth Payoff in the MENA Region? Discussion Paper, World Bank, Washington D.C.

Psacharopoulos, G. (1994). Returns to Investment in Education: A Global Update, *World Development,* Vol. 22, no.9.

Rehme, G. (2007). Education, Economic Growth and Measured Income Inequality.*Economica*, 74, 493- 514.

Romer, Paul M. (1990). Endogenous Technological Change .*Journal of Political Economy* 98(5) part II: S71-S102.

Sambo, A. A. (2002). The Nigerian Education System: Brief History. *National Freedom,* 1(6):8-9. UNDP 2009 Report.

UNESCO. (1998-a). World Science Report, UNESCO, Paris.

World Bank. (1998-b). Education in the Middle East and North Africa: A Strategy Towards Learning for Development: Washington D.C.

World Bank. (1998-a). World Development Indicators 1998.CD-ROM, Washington DC.

Table 1. Distribution of Federal Government Expenditure in Nigeria (N Million Education)

Year	Total Federal Government Expenditure (TFGE)	Recurrent	Capital	Total	Total as % of TFGE
1970	903.9	3	3.2	6.2	0.69
1971	997.2	4.2	4.4	8.6	0.86
1972	1463.6	21.3	7.3	28.6	1.95
1973	1529.6	16.3	10.4	26.7	1.75
1974	2740.6	134.4	62.4	196.8	7.18
1975	5942.5	631.1	218.9	850	14.3
1976	7856.7	529.2	322	851.2	10.83
1977	8823.8	256.8	246.3	503.1	5.70
1978	8000	431.9	394.7	826.6	10.3
1979	7406.7	306.7	360.4	667.1	9.00
1980	14968.5	729.4	509.1	1238.5	8.27
1981	11413.7	217.2	712.8	930	8.15
1982	11923.2	412.4	511.6	924	7.75
1983	9636.5	367.2	586.6	953.8	9.90
1984	9927.6	87.6	657.9	745.5	7.51
1985	13041.1	126.2	126.2	252.4	1.94
1986	16223.7	391.4	391.4	782.8	4.83
1987	22018.7	354.1	94.6	448.7	2.04
1988	27749.5	1458.8	327.9	1786.7	6.44
1989	41028.3	3011.8	387.2	3399	8.29
1990	60258.2	1458.8	327.9	1786.7	2.97
1991	66584.4	1256.3	297	1553.3	2.33
1992	9279.4	1529.2	310.1	1839.3	1.98
1993	191228.9	5336.4	995.1	6331.5	3.11
1994	160893.2	7382.8	2051.9	9434.7	5.86
1995	248768.1	9746.4	2426.4	12172.8	4.89
1996	337217.6	11667	3215.7	14882.7	4.47
1997	428215.2	12983.1	3808.2	16791.3	3.92
1998	487113.4	14034.8	14034.8	28069.6	2.37
1999	947690	23047.2	17253.5	40300.7	4.25
2000	741059.4	39034	27963.2	66997.2	9.56
2001	1018155.8	39844.6	19860	59704.6	5.87
2002	1018155.8	10240.2	9215	19455.2	1.91
2003	1225965.9	64755.9	14680	79435.9	6.48
2004	31,464.6	75627.7	9053.1	85580.8	21.18
2005	51,951.0	31940.8	82797.1	114738	20.68

Source: Onoyere 2010

Table 2. List of Some African Countries and their HDI grouping

High Human Development			
Rank	Country	HDI	World Ranking
1	Libya	0.847	44
2	Seychelles	0.845	57
3	Mauritius	0.804	82

Medium Human Development			
Rank	Country	HDI	World Ranking
4	Tunisia	0.769	98
5	Gabon	0.755	103
6	Algeria	0.754	104
7	Equatorial Guinea	0.710	118
8	Uganda	0.514	157
9	Nigeria	0.511	158

High Human Development			
Rank	Country	HDI	World Ranking
10	Togo	0.499	159
11	Malawi	0.493	160
12	Benin	0.492	161
13	Cote d'Ivoire	0.484	163
14	Niger	0.340	182

Source: UNDP report 2009

Table 3. Data on gross expenditure on R&D   in parts of Africa, Japan and China (billions of PPP$).

Country/ Sub region	GERD* (bppp$)		% World GERD		GERD as % GDP		GERD per Capita in PPP$	
	2002	2007	2002	2007	2002	2007	2002	2007
South Africa	2.3	4.1	0.3%	0.4%	0.7	10%	48.9	85.3
Other SSA	1.8	2.8	0.2	0.2	0.3	0.3%	2.9	3.9
Arab State in Africa	2.6	3.3	0.3	0.3	0.4	0.3%	14.0	16.3
Japan	108.2	147.6	13.7%	13.0%	3.2%	3.4%	848	1,153.3
China	39.4	104.9	5.0%	9.2%	11%	15%	3.6	79.0

Source: UNESCO 2009 (Downloaded)   *Gross Expenditure on Research and Development

Table 4. Scientific and Technological Capacities in World Regions (1995:Percentage of Total)

REGION	Expenditure on R&D	Scientific Publication	European Patents	US Patents
Arab states	0.4	0.7	0.0	0.0
North America	37.9	38.4	33.4	51.1
Western Europe	28.0	35.8	47.4	19.9
Latin America	1.9	0.7	0.2	0.1
Sub-Saharan Africa	0.5	0.8	0.2	0.1
Japan and NICs	18.6	10.1	16.6	27.3
China	4.9	0.6	0.1	0.2
India and Central Asia	2.2	2.9	1.3	0.6
Others	2.2	2.9	1.3	0.6
World	100.0	100.0	100.0	100.0

Source: UNESCO (1998a:23-26) *data are for 1994