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Public institutions and the private sector at time of economic crisis in Africa

Hilary Nwokeabia

African Development Bank Group

Economic Commission for Africa

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By

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Abstract

The global economic crisis of 2008 and market failures have forced countries to pay closer attention to the performance of the private sector and production activities. Generally, policy makers agree that multi-stage *adjustments* led by public institutions should be pre-requisites and co-requisites for private sector activities. But, in Africa, public institutions may not be able to strategically manage inter-temporary adjustments for selecting priorities and switching them, during crisis. Yet the evidence of the *demiurge* functions of these institutions remains incontrovertible. In this paper, we argue that public institutions are more strategically placed in promoting aggregate efficiency - transforming low end human capital to higher end, during crisis. The hypothesis is that public institutions which maintain a positive marginal per capita expenditure on education for creating higher end human capital, over that of marginal per capita expenditure on consumption are able to grow out of crisis faster. We introduce the "Hecksher-Ohlin Preference Locus" model, and Törnqvist slack index to track the effort to promote aggregate efficiency in Africa. We found that few countries have successfully promoted aggregate efficiency, instead of consumption, as a condition for the economies to support private sector-driven growth and quickly break away from economic crisis.

1.   Introduction.

At times of concurrent economic crisis and market failures, public institutions could be catalytic for the private sector to lead recovery. By economic crisis, we mean a situation of setback or slow growth in overall economic activity and income, combined with rising unemployment. Ideally, when crisis occurs it adds significantly to the demands of available resources, and the need to prioritize their use. Crisis makes it difficult for private agents to adapt, as the rapidly changing problems quickly outpace their capacities to manage their own affairs and the entire economy, particularly in Africa. As such, we argue for the _demiurge_[1] functions of public institutions in catalyzing private sector led economic growth in the continent. We focus on the _inter-temporal_ and transformative role of these institutions to promote marginal aggregate efficiency[2] growth - transforming low end to high human capital, as against consumption, in order to stimulate private sector led-growth. According to Stiglitz and Serra (2008), public interventions have become a strategic instrument for market economies to correct for slump in incomes and domestic production.

Particularly, public institutions provide phasing, and undertake multi-stage non/no-profit functions through which economy-wide priorities are selected and switched - the '_transition experiments_', as conditions dictate. In crisis, if public institutions fail, efficiency fails; when efficiency fails, business fails; and if business fails, investments fail and so does the pursuit of economic recovery. Empirical analysis confirms this line of argument (see for instance, Aghion and Howitt (1998)). Growth regressions of Barro and Sala-i-Martin (1995), and the work of Mankiw, Romer and Weil (1992) broadly argued for theoretical and empirical work on public sector and growth in Africa. Based on a large sample of countries during the time period 1965 – 1985, Barro and Sala-i-Martin (1995), regressed the average growth rate of GDP on several macroeconomic variables, including educational attainment, and public spending on education as a fraction of GDP. The finding is that public spending on education has a significantly positive effect on growth: a 1.5% increase of the ratio of public spending on education to GDP during the period of 1965 – 1975 would have raised the average growth rate of the economy by 0.3% per year. In essence, it is easier to make markets work, when public institutions are effective: promoting positive change in aggregate efficiency and education.

In Africa, however, these institutions may be unable to pursue _inter-temporal/transition experiments,_ to reduce risk aversion and stimulate the private sector. The speed of these adjustments is very fast, the process tedious and non-profitable, at least in the short term. In this process, it is the depth and sufficiency of factor endowment that acquiesces and coalesces with other inputs to generate progress. Human capital creates high externalities in economies (see for instance, Savvides and Stengos (2009)). Without public capacity to generate a balanced level of factor endowments, at all times, this inter-temporal functions become daunting for the private economic agents. If, however, both the private and public sectors have a sufficient depth of capacity and efficiency, at least, they can symbiotically adapt and respond effectively to the rapidly changing and uncertain situations. In that, public institutions steer activities out of free-riding behaviors, risk aversion, moral hazards, assist and induce the private sector to attempt new production challenges in areas of high priorities for growth and development.

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[1] _Demiurge_ function can be described as an exposition in which the 'demiurge' is the agent who takes the preexisting materials of chaos, arranges them according to the models of eternal forms, and produces all the physical things of the world, including human capital.

[2] In this paper, efficiency is simply defined as skillfulness in avoiding wasted time and effort.

The phenomenon of undershoot in the level of inter-temporal efficiency could significantly inhibit the ability of the private sector to continuously adapt with the demand placed on them. In this line of argument, when real per capita expenditure on education is higher than real per capita expenditure on consumption, the economy grows, sometimes with some lag, and vice versa. Thus, recovery from economic crisis in Africa could not begin and grow without public institutions balancing this effect and producing capable private agents willing to take chances on something new and perceive clear incentives and rewards for taking such chances. The case of Britain illustrates this point. According to Hobsdawm (1964), Britain's industrial growth in the eighteenth century began for a number of reasons. Britain possessed at virtually all levels of society a hard-working, innovative, risk-taking private sector that received strong support from the government through its public institutions. There existed a close tie between private initiative and creative governmental support (public institutions) throughout the eighteenth and nineteenth centuries in Britain. In this case, both the public and private sectors possessed sufficient human capacity that enabled the symbiotic productivity increases in their activities.

We analyze the functions of public institutions, at times of crisis in Africa, through the algorithm of "Hecksher-Ohlin Preference-Locus" model and Tornqvist slack index. The indices track public institutions' effort to catalyze private sector activities, particularly in prioritizing growth of aggregate efficiency and depth of capacity in response to economic crisis in Africa. As an illustration, an economy that prioritizes expenditure on fertilizer or improved seed procurement recovers from food crisis faster than the ones that import food. Thus, we conjecture that the countries where data are available, for these indices will show major slacks in their public institutional contribution to effective private sector resolution of the prolonged economic crisis.

That said, the paper is divided as follows. After this introduction is the general setting about Africa's economic crisis, how they have been managed, the justification for the role of public institutions in section 2. In section 3, we specify the models, and index the contribution of African institutions. Sections 4 and 5 contain the conclusions and recommendations. The key message is that it is inevitable for African countries to promote aggregate efficiency growth through public institutions as they jostle with the concurrent economic crisis and as way forward with their overall economic development agenda.

2.   The background and rationale.

How has economic crisis and market failures affected aggregate efficiency in African countries? Why will the private sector need public institutions to grow effectively? We aim to answer these questions in this section. We discuss the background of economic crisis in the continent, after which we delve into the rationale for the intervention of public institutions to catalyze economic recovery and save the population.

The background.

In Africa, extreme poverty is estimated to touch over 50% of the population, with a tripling of headcount in urban areas.[3] Most countries in sub-Saharan Africa is in the World Bank's lowest income category of less than $765 Gross National Income (GNI) per person per year. Some of the worst are with just $90 GNI per person. Even middle income countries like Gabon and Botswana have sizeable sections of the population living in poverty. A collapse of basic infrastructure and social services, due to repeated economic crisis, since the early 1980s had led to further deterioration of cost of doing business in the continent, with many countries ending up as aid-dependent economies.

As a result of the crisis, by 2000 Africa's per capita income had plunged to about one-quarter of its mid-1970s high, below the level at independence, in the 1960s. Along with the endemic malaise and failure of the most essential infrastructure for managing economies – the education system, the continent experienced massive growth of low end human capital build-up that mostly thrive on "low-skill and informal sector" activities, estimated by some to be as high as 75% of the total economy. Nearly five hundred million African entered the 21st century unable to read a book or sign their names.

Perhaps, the most compelling proofs of the economic woes and failed development efforts in Africa, put in a global context, are the trend in national literacy rate and manufacturing exports. The two indicators put against developed countries show the obvious neglect of capacity building, industrial decline and therefore increased poverty in the continent. Existing literature supports this line of thinking. In recent years, according to government estimates, natural resources alone has accounted for 70-80% of government revenues, around 90% of export earnings and about 35% of GDP, measured at constant 1990 prices, for some countries (Angola, Gabon, Nigeria, among others).   The average manufacturing export as an index of industrial output, 1970 - 1990, was barely 0.4 percent of exports, while import of manufactured goods was about 15 percent of GDP or more than 60 percent of total imports. To make things worse, towards the end of 2008, there was a global economic crisis, further threatening economies, education, productivity and the livelihood of many people in the continent.

Given the central importance of formal education to achieving economic growth and manufactured exports, some Africa Governments had engaged in "the largest social programme," absorbing as much as 40% of the budgets. By 1984-85, just before the entrenchment of the structural adjustment programmes, in Nigeria for instance, more than 13 million pupils attended almost 35,000 public primary schools. At the secondary level, approximately 3.7 million students were attending 6,500 schools (these numbers probably included enrolment in private schools), and about 125,000 postsecondary level students were

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[3] *Source*: World Bank, 1999: wbln0018.worldbank.org/dg/povertys.nsf/0/e4b16f6afdb8133685256b22005c3e38?OpenDocument).

attending 35 colleges and universities. The negative pressure on the system started in the mid 1980s, and by the 1990s it was intense that enrolment figure had declined significantly.

Adult literacy rate, as a percentage of the population that is 15 years and older in the period 2000 - 2004, was only 48 in Africa compared with nearly 90% in Malaysia, 91% in East Asia and Pacific countries (together) and 80% for the world (table 1). Public expenditure on education as a percentage of gross national income and gross domestic product, in Africa, in 1991 was about 1% as against over 7% and 5% in Norway and Malaysia, respectively (UNICEF, 2007).

**Table 1: Basic Education indicators in individual/groups of countries.**

	Total adult literacy rate, 2000-2004*	Net primary school enrolment (%), 2000-2005*
Malaysia	89	93
Nigeria	48	60
Norway	-	99
East Asia and Pacific	91	96
Least developed countries	60	62
Sub-Saharan Africa	62	61
World	80	82

Source: *UNICEF*, 2007.

The *UNICEF* in its state of the world's children report for 1999 pointed out that about four million African children have no access to basic education, and that majority of those that are 'lucky' to enter schools are given sub-standard education. Today, there are about *48,242* primary schools with *16,796,078* students in public schools and *1,965,517* in private schools in Africa. In addition, Africa has *7,104* secondary schools with 4,448,981 students (Dike, 2002).

The standard of education in Africa is on the decline because the government does not infuse funds into the education sector. As a result of this, students are thought outdated materials. The education in Africa had become one which is fit for those who have no hope for a better chance at good education. The performance of the education system is much worse in the natural resource rich economies such as Nigeria (figure 1).

Figure 1: Average spending on education as a proportion of GNP, 1980 - 2000 (%) for select African countries.

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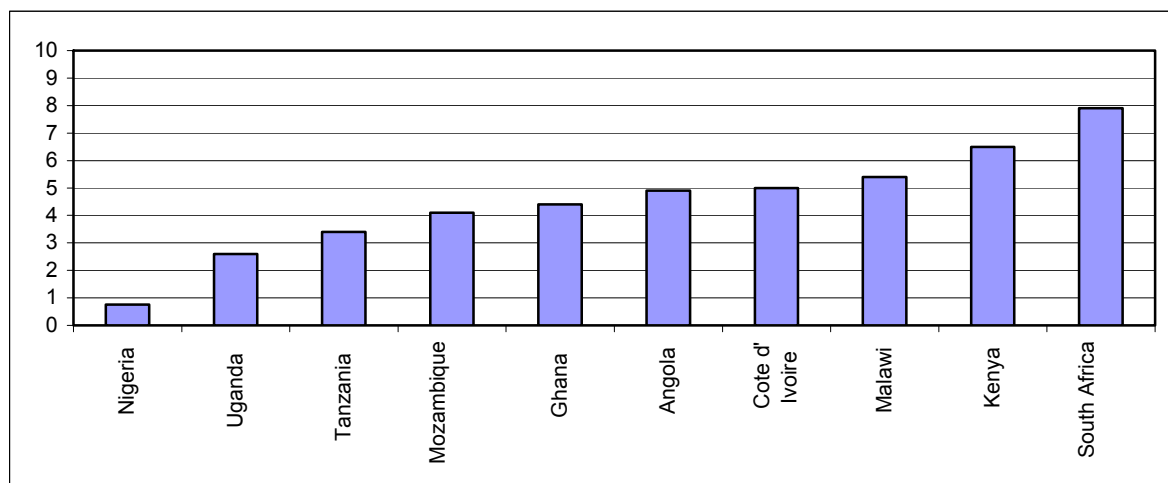
Source: Dike (2002).

The trends and structure of the literate population also betray the failures of Africa to grow into competitive industrial production. Nigeria with the largest population in the continent, for instance, has only 15 scientists and engineers engaged in research and development per million persons. This compares with 168 in Brazil, 459 in China, 158 in India, and 4,103 in the United States. Number of scientific publications for 1995 was 711 – significantly less than its output of 1,062 scientific publications in 1981 by a comparatively much smaller university system. In contrast, scientific publications were 14,883 for India, 310 for Indonesia, and 5,440 for Brazil (Saint et al, 2004).

Much of the failure to build and transform most of the continent's low end human capital to higher end through the education system could be tied to the public sector participation in the area. According to UNESCO (2000), the average budgetary allocation to education in sub-Saharan Africa is 21%. As a result, an estimated 31 million Africans who should be in school are not. The public spending on education has also been erratic. In 1990, estimated public expenditures on education and health services at all levels of Government were about 15 percent of government spending and 4.5 percent of GDP (World Bank, 1999). Africa ranked very low in its adult literacy rate and education index and by 2007, its ranking had declined further.[4] Analyzing the issue of quality of education bring a greater insight to the failure to set directions and proves further the poor prioritizing of investments.

The failure or case of stagnated system of the capacity building system, however, contrasts with proven empirical analysis. Denison (1985), for instance, had differentiated technological innovation and change into a number of components. His estimate was that a quarter of the increase in output in the per capita income could be attributed to increased labour input of constant educational level in United States. Another 16% were accredited to the increased educational qualification of the average worker. The growth of capital accounted for only 12% of growth of output (this confirmed a similar earlier finding by Solow (1957)). Some 11% came from improved allocation of resources. Another 11% came from economies of scale. Together, this leaves 34% from the growth of knowledge (innovation) or technological development attributed to higher education, in a narrow sense. In line with this,

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4 *Source*: UNDP Human Development Report (2004). Education index: one of the three indices on which the human development index is built. It is based on the adult literacy rate and the combined gross enrolment ratio for primary, secondary and tertiary schools.

economies with a larger stock of human capital are more likely to grow faster than those with less human capital and they are able to reach higher levels of income per person. Much of the vast literature on human capital dedicated to exploring the 'value' of education to individuals and society (see for instance Chiswick (2004) and Xiao (2001) have been unambiguous on this. One of the important reasons why growth rates for economies do not necessarily fall with increased human capital accumulation is that human capital accumulation creates substantial positive externalities.

General improvement in education bring new knowledge which may be created by more educated individuals that adds to the well-being of others through new products, better production processes. They are more efficient workers who reduce the cost of production and prices paid to all consumers; more inclined toward physical capital and infrastructure maintenance; and are able to adapt and innovate on technologies, as well as transfer same to the other workers so that the level of productivity of all workers rises, increasing the income of all involved and driving economic growth.

Apparently, the conceptualization of the dynamics and direction of the capability development and aggregate efficiency industrial growth in the continent was deficient. Absent because of this also in the landscape, was lack of high end capacity for small and medium enterprises. According to the Economist Intelligence Unit,[5] the little that had developed seems to be proactively subjected to destructive policies. Tens of thousands of shoemakers and tailors in Africa's informal sector churn out products worn across Africa. But national and local politicians have persistently failed to promote their products and inhibit their potential. Many enterprises have been hobbled by lack of training to advance their products, in order to compete with a flood of cheap imports that has accompanied Asia's strengthening ties with the continent.

The above picture contrast with that of Europe's economies and other more developed economies that continued to scramble for dominance across Africa for resources to grease the cones of their industrial development. In the recent years, many industrialized and industrializing nations, including China from Asia, have as a matter of public policies intensified the competition, based on FDI inflows into the country, for different valuable qualified human and natural resources in Africa. Without doubt, the natural resources that have left Africa contributed significantly to the growth of the industries at their destinations such as the United States, the United Kingdom, France, China and others.

As African countries operated, the economic crisis was underscored by neglect of the competent human capital build-up, and therefore both short and long-term ability to recover from the crisis on their own. In the absence of strong public institutions that can determine and change the priorities, it was difficult to achieve the capable and competitive setting for growth recovery. Proxies such as share of public expenditure on education in GDP, expected years of schooling for females, gross secondary-school enrolment, although only providing part of the picture, act as an indicator of the state of human skills build-up of an economy in this context. To a large extent, development was mostly seen as increased consumption that is driven, in many African countries by external aid, and not a change in capabilities that transforms and expands the control of the people over their activities. Given the settings in the continent, why is it that market forces could not self correct for these critical failures, as the 'invisible hand theorists' would have predicted? What form and why should public

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[5] *Source: EIU* - "Africa industry: Africa's leaders fail to nurture industrial drive", 29, March 2007.

institutions support for the private sector in the continent? The rationale behind the argument for public is explained next.

Rationale

Again, the central argument in this paper is that public institutions are more effective than the private sector in maintaining economy-wide factor input proportions for growth, especially during economic crisis. Economies in which public institutions maintain higher per capita expenditure on education over that of per capita expenditure on consumption, for instance, are able to grow out of crisis faster. In focusing on the dynamics of inter-temporal public sector intervention to the deepening of the growth effects of private sector, it is important to create and balance the depth of factor endowments[6] for public sector and effective private sector competitiveness.

A real world inter-temporal complication, in terms of designing and implementing a catalytic and transformative policy regime in which the private sector contributes optimally to the process of development has a large public-good component.[7] In the factor proportions[8] and optimal factor choice models, the transmission mechanisms of reforms to private sector contribution to economic growth, and development is via a country's depth of factor endowments, particularly human capacity. The countries that developed effective and sufficient depth of functional human capacity are able to design policies and implement them better and contribute more (aggregate efficiency) to the private sector growth and development. Therefore, at times of economic crisis, public institutions could contribute better to private sector led growth through higher marginal allocation to human capital development, over and above marginal consumption expenditure.

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[6] Altering the allocation of resources with high general externalities and spillover that private individuals may underproduce and, or overcharge for.

[7] Public goods are defined as particular class of goods and services subject to non-rival and non-exclusion principle. That means that excluding other people from access to them is prohibitively expensive. First, w

[8] The standard **Hecksher-Ohlin (H-O) model**, also known as "Factor Proportions Model" begins by expanding the number of factors of production from one to two. The model assumes that labour and capital are used in the production of two final goods. Here, capital refers to the physical machines and equipment that is used in production. Thus, machine tools, conveyers, trucks, forklifts, computers, office buildings, office supplies, and much more, is considered capital. All productive capital must be owned by someone. In a capitalist economy most of the physical capital is owned by individuals and businesses. In a socialist economy productive capital would be owned by the government. In most economies today, the government owns some of the productive capital but private citizens and businesses own most of the capital. Any person who owns common stock issued by a business has an ownership share in that company and is entitled to dividends or income based on the profitability of the company. As such, that person is a capitalist, i.e., an owner of capital. The H-O model assumes private ownership of capital. Use of capital in production will generate income for the owner. We will refer to that income as capital "rents." Thus, whereas the worker earns "wages" for his or her efforts in production, the capital owner earns rents.

The assumption of two productive factors, capital and labour, allows for the introduction of another realistic feature in production; that of differing factor proportions both across and within industries. When one considers a range of industries in a country it is easy to convince oneself that the proportion of capital to labour used varies considerably. For example, steel production generally involves large amounts of expensive machines and equipment spread over perhaps hundreds of acres of land, but also uses relatively few workers. In the tomato industry, in contrast, harvesting requires hundreds of migrant workers to hand-pick and collect each fruit from the vine. The amount of machinery used in this process is relatively small. In the H-O model we define the ratio of the quantity of capital to the quantity of labour used in a production process as the capital-labour ratio. We imagine, and therefore assume, that different industries, producing different goods, have different capital-labour ratios. It is this ratio (or proportion) of one factor to another that gives the model its generic name: the Factor Proportions Model.

The principal issue in the optimal choice model pertains to a wrong value system in expenditure allocation that inhibits growth of aggregate efficency (Corden and Neary, 1984; Sachs and Warner, 1996). Accepted, therefore, that allocation of marginal expenditure to human capacity is critical, how can public institutions contribute to a threshold of its development. Political economy problems associated with the numerous non-productive activities of economic private agents that undermine the capacity development of the economy and thus slow down economic development (Auty, 1994). Ideally, in the procedure, short-term profit motives absorb private savings while creating only a few eminently qualified jobs (deepen capacity) which leads to lower incentive of the society to educate their citizens for industrial activities. This acts worsen in a two-stage relationship where there is also low institutional capacity, eventually leading to an economic decline.

In this model, each country in an economic crisis has a unique general good that also serves as numèraire produced competitively using intermediate inputs. The ex-post intermediate good producer faces a competitive fringe of imitators that forces a limit price. Suppose that these countries have two ways to generate productivity growth: 1.) they can imitate existing world frontier technologies; 2.) they can innovate upon the previous local technology. Imitations use the existing frontier technology at the end of the period, thus they multiply autonomous level of technology, whereas innovations build on the knowledge stock of the county, and therefore they multiply the autonomous level of technology.

In this view, the relative importance of innovation for productivity growth increases as a country moves closer to the world technological frontier, whereas imitation is more important when a country is far below the frontier. As such, the equilibrium level of investment and therefore the steady-state growth rate would be increasing in the aggregate supply of (skilled) labour and in the productivity of the labour force, which refer more to the stock and efficiency of human capital. The detailed version of this model to economy-wide context could be read in Aghion, Meghir, and Vandenbussche (2003). A key prediction from this model is that the closer a country gets to the world technology frontier, the more growth-enhancing it becomes to invest more in education (see for instance, Hall R. and C. Jones (1999)). The key insight is that when aggregate efficiency growth is a multi-stage activity, as in the above case, public institutions have comparative advantage in the earlier stages, whereas private sector has a comparative advantage in the later stages of the process. This complementary approach eventually leads to the optimal and faster growth of an economy trying to pull out of a crisis situation.

Technically, however, there is an ambiguous social benefit which accrues to an economy as a whole as a result of education. Since the social benefits exceed private benefits due to externalities, the choices of private individuals as to the level of education to get, even in a world of perfect market and information, will result in less education, on the average in the aggregate, than would be economically and socially optimal. This is a clear case of market and private sector failure, requiring public institutions, intervention to bring the private sector and social benefits in line with one another for economic wellbeing.

Since the social benefits of education exceed the private benefits of education due to these and other externalities, the choices of private agents as to the level of education to receive, even in a world with perfect markets and information, is expected to lead to less education on average in the aggregation that would be socially desirable. This is a classic of market failure, requiring some sort of public sector/government intervention to bring private and social benefits in line with one another for the well-being of the economy. We explain this divergence through two-factor optimum model (figure x).

Figure (2). Two-factor optimum model.
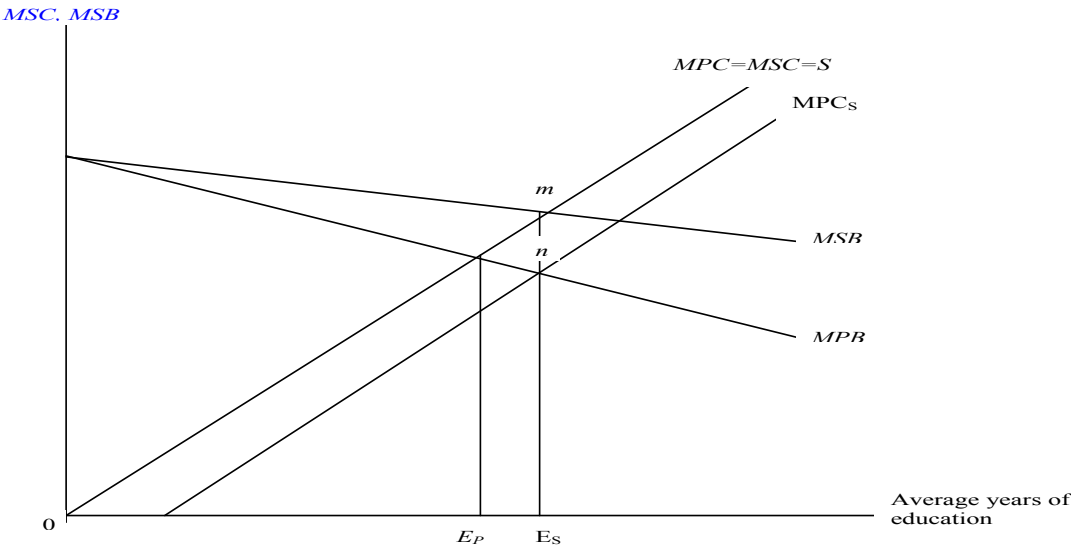
Source: Author.

The model (figure 2) illustrates the divergence between the privately chosen optimum level of education and that which would be socially optimum. The curve labelled *MPC=MSC=S* assumes that the marginal private social costs of education (*MPC*) to individuals are equal to the marginal social costs (*MSC*) of education, and that these can be viewed as the supply curve (*S*) of education, measured in terms of years of schooling on the horizontal axis. The cost of schooling and the benefits are measured on the vertical axis. The market demand curve for education of a society's individuals is shown by the curve *MPB*, which measures the marginal private benefit for additional years of schooling accruing to private individuals as increased income. If individuals choose education based on their own decisions, the quantity of education which is optimal for them to choose is quantity E_p, where the supply curve, S, crosses the individual market curve. Apparently, the marginal social benefit (*MSB*) of education curve which is the social demand curve for education, lies outside and to the right of the *MPB* curve, the private demand curve for education. The gap between the *MPB* and *MSB* curve measures the value of the positive externality to society of any particular average level of schooling. This gap widens as more years of education are accumulated, reflecting the presumption that learning-by-doing, association effects and other gains from increased education levels generate even more beneficial effects to society than do lower levels of education.

The socially optimum level of education, taking into account the positive externalities created by individual decisions to undertake education, is the average year of education, E_s, where the supply curve of education crosses the marginal social benefits curve (that is, where society's supply curve intersects society's demand curve for education). For the socially optimum average level of education, *Es*, to be reached, however, some sort of state/public intervention will be required to subsidize the private decision-makers, since they will not, based on their own private maximizing calculations, accumulate education beyond the *Ep*. A subsidy to the private individuals equal to amount *mn* would, however, induce private individual to choose to undertake *Es* years of educating by lowering the individual costs of education to the new subsidized marginal private cost curve, *MPCs*. Then individuals would rationally choose the socially optimum level of education, as is desired, since the subsidized

marginal private cost curve of education would cross the MPB curve, the private demand curve for education which reflects the private benefits of education, at the socially desired average years of education, *Es*. Thus, in a competitive and successful pursuit of well-being in a finite world, public institutions may be required to safeguard the balance of factor endowments and aggregate threshold of efficiency in the economy when resources are fewer.

Stated in terms of allocation to factors of production, it is only possible for an economy to ensure the existence of inter-temporal factor endowment balance at various points of locus within some range of factor endowments, the product mix and equilibrium factor prices are uniquely determined and remain constant. Therefore, the product mix within the cone corresponds to the level of factor endowments. However, given fixed resources, the progress of an economy from one cone to the next one requires a substantial changes in the structure of the utilized endowed factors (upgrade of skills, for instance). This transition could be problematic in the economy as the increase in physical capital accelerates the substitution of labour in production and lowers the return to labour and human capital associated with it.

3.   Indexing allocation slack

In this section, we aim to index the pattern of allocation of per capita expenditure in selected African countries. We link the argument of public allocation of resources to the factor that makes for maximum policy preference-locus to the trade-off of consumption and efficiency improvements, graphically, in the model of optimal choice (figure 2). Figure (3) provides a graphic representation of the efficiency and non-efficiency allocation patterns. Valuation of per capita consumption expenditure - allocation of marginal income to per capita consumption based activities is placed on the X-axis, while the marginal allocation (per capita education expenditure) for efficiency improvements in production is placed on the Y-axis. The point 'zero' can be taken as representative of the state of affairs in the absence of policy. For example, if industrial growth and self-sufficiency (aggregate efficiency improvement) is the objective of policy making, the percentage share of domestic income in marginal per capita consumption expenditure can serve as an index measure of how much this objective is being pursued.

Movement along the X-axis rightward from the intersection represent per capita consumption expenditure; movement leftward indicate declines in the share of production. Identical situation applies to the Y-axis that indexes the allocation for improving aggregate increases in the share of marginal per capita income relative to domestic efficiency in production. A change in policy towards increasing productivity (efficiency) can then be evaluated in terms of their aggregate potential to increase or decrease the self-sufficiency ratio and to increase or decrease domestically produced per capita income. Each of the policy choices is represented as a point on the graph. If the impact is to be located in quadrant I or III, the evaluations are easy. In quadrant I, no trade off exists between the production objectives. Systems in quadrant I are socially profitable in all cases (P>0) and contribute positively to the per capita consumption objective (X>0). Systems that occupy quadrant III (an equivalent of leakage – high consumption, for instance) should be discouraged by policy makers, since those systems decrease national income (P<0) and do encourage the non-efficiency/productivity objective (X<0).

Figure 3.: Optimal policy choice model with multiple objectives and adverse selection.
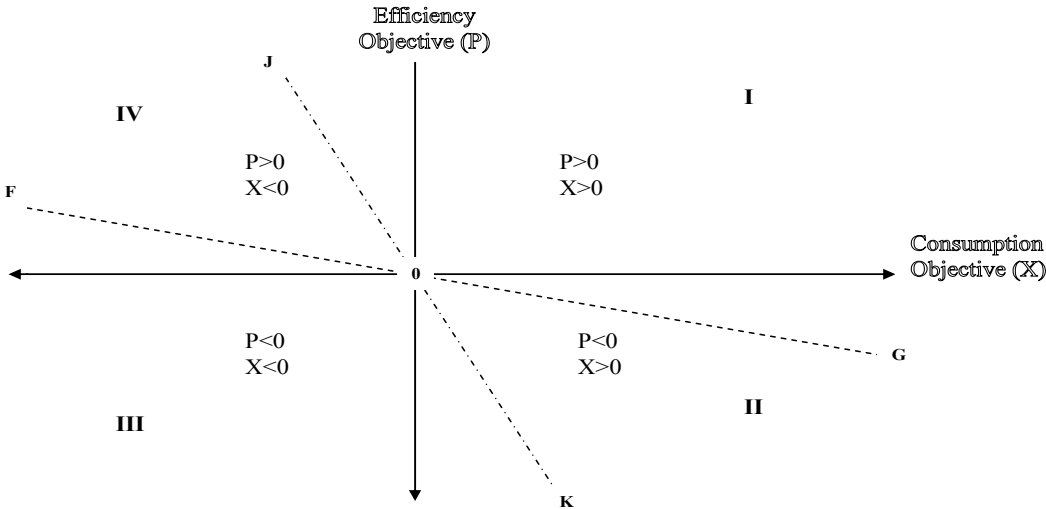
Source: author based on the logics of Factor Proportion Model.

Quadrants II and IV are the areas of difficult policy choice, because they correspond to situations of tradeoffs between objectives. In quadrant II, the new situation encourages the attainment of consumption objectives (X>0), but only at a cost in potential changes (positive) in national income (P<0, since aggregate efficiency gains are negative and decreasing). Because P<0, policy-makers must enact policies that subsidize the system; otherwise aggregate efficiency is low and production will not be undertaken by the private sector. All efficiency related inputs to the economy has to be financed through domestic savings or external debt. In an industrial development process, the best subsidy is towards an efficient labour force, also component of the factor P. In quadrant IV, a socially efficient system (P>0) contributes negatively to the consumption objective but positively to national income.

Therefore, evaluating the systems in quadrants II and IV for policy making objectives will show the policy-makers preference locus - the set of points describing the policy-maker's willingness to trade off one objective against another. Policy makers who place a premium on growth of total national income (efficiency) will have a slightly different locus (such as in the coordinates FOG); those with relatively strong concerns for consumption (non-efficiency) will have a steeply sloped locus (JOK). In an effectively functioning system, without moral hazards, two types of policy interventions are needed. The points to the right of preference locus are encouraged. Points that are socially unprofitable but contribute sufficiently to efficiency objectives need to be encouraged by policy so that private profitability becomes positive. If JOK represents the preference locus, systems located in the triangular continent between OK and the positive X-axis would merit assistance. Points to the left of the locus indicate systems that create unacceptable tradeoffs between alternative objectives. Policy-makers should discourage systems that are socially profitable but that create too negative an impact on non-efficiency objectives. Systems located in the triangular continent between JO and the negative X-axis warrant taxes so that private profitability will become negative. Therefore, only well functioning systems produce organized and capable human capacity through a directed subsidy method. Testable prediction of this result is that the industries which require sophisticated human capital inputs would be disadvantaged in resource rich countries relative to industries that technologically less dependent on the highly skilled labour. This disadvantage should disappear when one differentiates industries based on their demand for lower or average levels of human capital.

In Africa, the broad thrusts of industrial policies have largely tracked changes in the usual historical wrong value system in allocation of per capita expenditure. These can easily portray the underlying causes of industrial backwardness during the years of oil boom.

It can be shown, using the optimal choice model (figure 1), that what applied to Africa is more like the steeply sloping locus JOK than the locus FOG, where JOK represents the preference locus, located in the triangular continent between OK and the positive X-axis. Beneath the failed efforts to catalyze industrial growth and poverty reduction in Africa are at least three connecting rods: low human capacity, institutional decay and most importantly excessive and oversimplification of Africa's need's and policies on standardized imported products, instead of processes for long-term capability for production, all which combine to low efficiency objectives. The concurrent decline of other economic sectors, and a lurch toward a public sector oriented model fuelled massive migration to the cities, neglect of strategic education and led to increasingly widespread poverty in the country.

An index of allocation of resources to aggregate efficiency against the trade-off on consumption in an inter-temporal adjustment is easily calculated through the following equation:

$$X_t = g(l_{1,t}, l_{2,t}, ..., l_{J,t}) = \exp[a_t + \sum_{j=1}^{J} s_{j,t} \ln l_{j,t} + \frac{1}{2} \sum_{j=1}^{J} \sum_{k=1}^{J} s_{j,k,t} \ln l_{j,t} \ln l_{k,t}],$$

Where, X_t, can be equated to marginal per capita expenditures - aggregate efficiency factors and consumption. In the case of efficiency (H_t) and consumption (C_t).

The aggregate efficiency growth rate in the economy can then be calculated through a variant algorithm of Tornqvist index:

$$\triangle \ln X_t = \ln(\frac{X_t}{X_{t-1}}) = \sum_{j=1}^{J} \frac{(s_{j,t} + s_{j,t-1})}{2} \ln(\frac{h_{j,t}}{h_{j,t-1}}),$$

where $h_{j,t}$ denotes the per capita public expenditure by country j, and $s_{j,t}$ is the share of expenditure of group of sectors j. The per capita expenditure by country j, $h_{j,t}$, are defined as $h_{j,t} = \sum_{i=1}^{I_j} \omega_{i,t} h_{i,t}$, where $h_{i,t}$ denotes the total expenditure by sectors (ministries) i and $\omega_{i,t}$ is a correction factor that accounts for differences between sample and population. The share of expenditure of group j, $s_{j,t}$, is defined as $s_{j,t} = \frac{\sum_{i=1}^{I_j} (\omega_{i,t} h_{i,t} q_{i,t})}{\sum_{j=1}^{J} \sum_{i=1}^{I_j} (\omega_{i,j,t} h_{i,j,t} q_{i,j,t})}$, where i is the number of ministries in group j. Next, the aggregate index of aggregate efficiency growth rate is derived based on the growth rates of total expenditures and of quality-adjusted spending. The total expenditure in the economy, X_t, is given by $X_t = \sum_{j=1}^{J} \sum_{i=1}^{I_j} \omega_{i,j,t} h_{i,j,t}$

Growth of aggregate efficiency can therefore be calculated as
$$\triangle \ln Q_{x_t} = \ln H_t - \ln C_t.$$

The results of the calculations for selected African countries, especially those where data are available and fairly reliable, are reported in figure 4.

Figure (4): Index of aggregate efficiency changes in selected African countries, 1980 = 100

Angola

Egypt

Cape Verde

Liberia

Nigeria

South Africa

Côte d'Ivoire
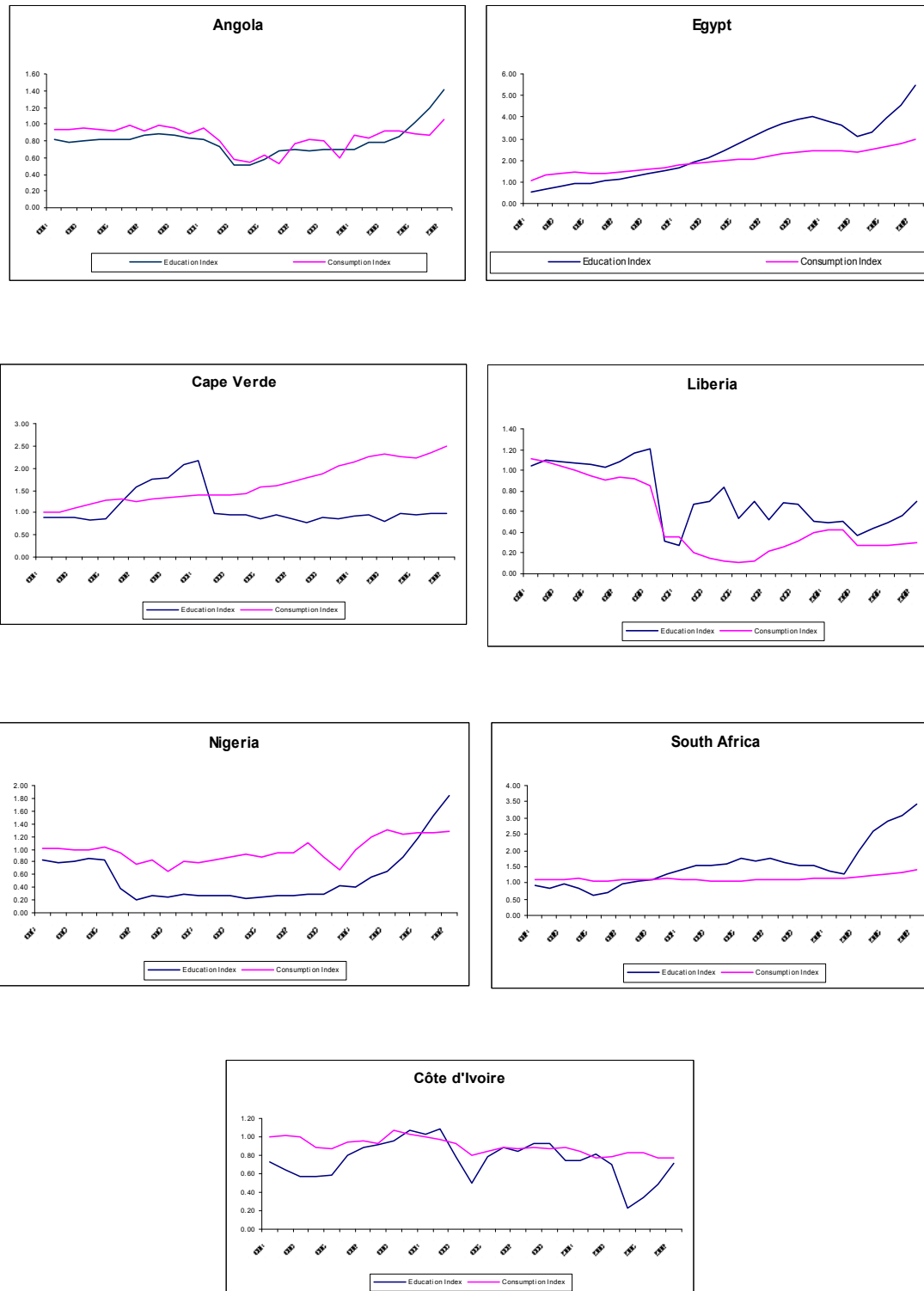
The indices in figure 4., show that the best effort keep the level of aggregate efficiency high - consistently invest more in creating high end human capital in Africa, was made in Egypt and South Africa. The worst case scenario was in Nigeria and Cape Verde.

Apparently, per capita income in Egypt and South Africa is among the highest in Africa. The details of the individual public institutional activities will be useful for more insights into the factors behind the successes and failures. Off course, there remains the question of whether the outcome of the reforms would have been better had any of the poorly performing African economies and their public institutions, for that matter, leaned towards knowledge for development angle. To answer the question we do a small calculus on the effects of continued increase in public education allocations in a typical African country - Nigeria. Calculating backwards from 2004 to 1960, using the parameter provided by UNESCO, Nigeria would have achieved a GDP (1995 prices) of US$243 billion if it had continuously invested 1.5% on an incremental basis, as a ratio of its education spending to GDP; this is ignored. Using this argument, minimum wage in Nigeria would have been US$25,000 in 2004. Take the case of American and British secular rise in production and wealth in the 20th century.[9]

Test

The validity of the indices were tested using a simple correlation of the variation in real per capita change of GDP and the difference between index of real per capita expenditure on education expenditures (used as proxy for change in aggregate efficiency) and the index of real per capita expenditure on consumption in a pool cross-country/time series analysis. The change in real per capita expenditure on education was the explanatory variable with its value lagged for two years. The coefficient of determination was 0.48. The regression test had a coefficient of the dependent variable proved valid at 1 percent critical test level and turned a positive relationship, as per the theoretical expectations. The test of theoretical assumption of serial correlation with the changes in growth of GDP was confirmed in a number of countries tested. In the theoretical assumption we drop the normalization by σ^2 for autocorrelation or autocovariance on the basis that a drop in efficiency usually leads to a decline in GDP and in many cases a subsequent drop in aggregate efficiency. To even be more meaningful, this index should be seen against similar index of marginal change in consumption per capita. The principal conclusion is that a change in aggregate efficiency should at all times be higher than the change in marginal per capita consumption for an economy to be ready to respond to crisis.

Many African countries appear to be struggling with maintaining their level of per capita expenditure that was attained twenty nine years ago, in 1980 (table 3). Only a few of the countries with fairly reliable data were able to increase their per capita expenditure on education, considering that the figures were in 2000 prices.

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9 *Source:* Chataway, J. and D. Weild (2000), "Industrialization, Innovation and Development: What does Knowledge Management Change"? Journal of International Development. J. Int. Dev. 12, 803-824

4. CONCLUSIONS.

As a way to conclude this paper, it can be said that the expectations that Africa would emerge from the economic crisis, escape low development trap and reduce poverty are true. In the absence of adequate policy strongly pursued through public institutions, however, the attempts to achieve these objectives through sole reliance on market forces, in many African countries would simply be false. African countries, in response to economic crisis and market economy failures, need to particularly ensure consistency and compatibility of policies between macroeconomic, industrial, trade and other development needs. Clearly, this is a tall order for isolated private operators. In that sense, a strategic vision of national development and organizational setting in which the African private sector optimally fulfils its role as an engine of growth requires relevant and public institutions with the priority of creating and balancing the depth of factor endowment, particularly human capacity and threshold of infrastructure as the conditions for the transmission of policies in the intended manner.

This paper has introduced two targeting and intervention models to explain the path through which public institutions in the continent could fulfill and evaluate the initial aggregate efficiency objectives. The models are: Hecksher-Ohlin preference locus model and Törnqvist index. These two models when applied could help African economies track the aggregate efficiency changes and improvement in policy targeting. They also help identify areas that require changes.

The reforms that the Governments of African countries have so far put in place also, did not yield the right results. In the observations of Jeffrey Sachs, **(1989)** on Structural Adjustment Programmes: "The sobering point is that programmes of this sort have been adopted repeatedly and failed repeatedly". Sachs did not overstating the case. Essentially, the reforms emphasized financial account balances and were negligent of public institutions' role in a balanced human factor input endowments. Apparently, finance did not automatically produce economic growth.

What's more! The claims of policy reform were dapper and meaningless. Effort to achieve price stability and balanced budgets under the IMF-World Bank SAPs left people uneducated, created greater imbalances in the economies and condemned the population to poverty. This means that industrial setups could not operate with uneducated people. As a result, at the end of adjustment, Africa did not manage to adjust the structure of its exports, due to lack of depth of human capital. Instead Africa grew even more dependent on natural resources. The country had even fewer list of commodities-exports and no manufactured products that is the basis of the dramatic urban-based economic growth that it needs and is capable of achieving.

Faced with serious economic and social difficulties as a result of destruction of its capacities, Africa had to survive by aid assistance. This was followed by another nondescript but damaging perspective on the capacity of the private sector, usually created by those who wish to help Africa by all means, at any cost. As the global economy changes, Africa had lurched from one economic crisis to another. The nations with skills keep the loot of the resources, including oil, to grease their continued industrialization while the Africa lags. What this proves is that large natural resource reserve does not have to be an obstacle to Africa's industrial progress. But to achieve the industrial objectives, the continent has to change its value system and path of policy application. Effective policy actions in the area of human capacity development under competent public institutions are key to the successful reprise of the industrial development efforts in Africa, using the following specific recommendations as a guide.

5.   RECOMMENDATIONS.

An organized, aggregate efficiency and capable labour force: A principal instrument in re-generating industrial growth and national industrial poles is to inject more of the available resources into competent public institutions creating an organized and capable factor endowment. This should be achieved in three - short term, medium term and long term phases, as follows:

Vocational training: A principal short-term instrument for responding to economic crisis and industrial labour needs of the African private sector is through **applied** vocational trainings, upgradeable to high end capacity with time. Governments and their institutions should engage in importing highly skilled labour force as a technology transfer tool to upgrade aggregate productive efficiency to groom the young private entrepreneurship, through active vocational activities.

Public expenditure on education: The current level of about 1% of GDP on education as against an average of 7-8% in most successful developing countries must be revised. This falls into the short to medium term promotion of aggregate depth of factor endowments.

Relevant skills for industrial production: In today's globally competitive knowledge economy, updating of curricula for competitiveness needs to be a permanent undertaking of public institutions responsible for education in African countries. There is a big mismatch between the education system, particularly the curricula, and the development requirements of modern African economy, today. The subjects thought in African school date back to the early days of independence (47 years ago) whereas the global, and therefore Africa's development requirements have changed significantly. Productions have moved from labour-intensive/low technology production to highly technical modes of production. These aspects of global trends in industrialization are not part of Africa's education system. Many, this function is far beyond individual private operators. As part of the medium to long term plan, Africa should completely revise the curricula in the schools to respond the changing global situations and its development plans. A good part of the trained labour force should also be prepared to organize - plan and regulate the activities of the economy. These should be followed with periodic operational capability-training activities as the participants engage in production.

Annex 1.: Index of real per capita expenditure on education in selected African countries, 1980 = 100

	1981-1985 (Avg)	1986-1990 (Avg)	1991-1995 (Avg)	1996-2000 (Avg)	2000-2005 (Avg)	2005	2006	2007	2008
Major Oil producing countries.									
Angola	0.91	0.96	0.73	0.78	0.81	1.12	1.29	1.52	1.66
Cameroon	1.24	1.21	0.87	0.84	0.86	0.97	0.98	0.99	1.00
Egypt	1.25	1.49	1.69	1.85	1.89	2.35	2.47	2.59	2.73
Equatorial Guinea	0.91	0.75	0.79	1.17	2.22	9.40	8.64	9.46	9.89
Gabon	0.95	0.83	0.85	0.87	0.89	0.75	0.75	0.77	0.78
Libyan Arab Jamahiriya	0.70	0.57	0.49	0.48	0.49	0.53	0.55	0.58	0.61
Nigeria	0.85	0.70	0.72	0.71	0.71	1.07	1.11	1.14	1.18
Sudan	0.89	0.80	0.86	1.05	1.09	1.71	1.84	1.99	2.05
Resource rich countries									
Botswana	1.22	1.74	2.20	2.28	2.35	3.45	3.42	3.58	3.62
Central African Republic	0.94	0.90	0.78	0.75	0.77	0.70	0.71	0.73	0.74
Dem. Rep. of the Congo	0.95	0.89	0.54	0.43	0.39	0.34	0.34	0.36	0.37
Lesotho	0.94	1.09	1.35	1.53	1.62	1.64	1.74	1.81	1.86
Namibia	0.92	0.89	0.93	0.97	0.99	1.17	1.19	1.22	1.23
Sierra Leone	1.01	1.02	0.89	0.62	0.51	0.70	0.72	0.75	0.77
South Africa	0.98	0.93	0.85	0.87	0.88	1.02	1.06	1.10	1.13
Others									
Chad	1.13	1.27	1.33	1.30	1.33	2.16	2.15	2.10	2.04
Congo	1.39	1.26	1.16	1.13	1.10	1.25	1.30	1.25	1.32
Sao Tome and Principe	0.84	0.73	0.68	0.68	0.67	0.84	0.89	0.92	0.96
Algeria	1.04	1.00	0.91	0.91	0.90	1.13	1.14	1.17	1.19
Morocco	0.99	1.11	1.15	1.23	1.18	1.43	1.53	1.55	1.61
Tunisia	1.03	1.07	1.21	1.31	1.37	1.84	1.92	2.02	2.10
Swaziland	1.03	1.29	1.43	1.48	1.50	1.67	1.68	1.70	1.72
Benin	1.07	1.07	1.07	1.11	1.14	1.24	1.24	1.28	1.29
Burkina Faso	0.99	1.04	1.05	1.15	1.19	1.47	1.51	1.55	1.56
Côte d'Ivoire	0.99	0.94	0.85	0.88	0.90	0.78	0.76	0.76	0.76
Gambia	1.14	1.09	1.06	1.00	1.01	1.05	1.07	1.09	1.12
Guinea	0.97	1.00	1.00	1.03	1.06	1.18	1.18	1.17	1.19
Guinea-Bissau	1.18	1.28	1.33	1.46	1.53	1.04	1.06	1.08	1.09
Liberia	0.86	0.70	0.15	0.09	0.18	0.18	0.19	0.20	0.21
Mali	1.02	1.17	1.25	1.36	1.40	1.77	1.82	1.82	1.84
Mauritania	0.91	0.89	0.89	0.94	0.88	0.97	1.05	1.03	1.04
Niger	0.86	0.79	0.70	0.68	0.66	0.72	0.73	0.73	0.72
Senegal	1.02	1.02	0.95	0.97	0.97	1.15	1.15	1.17	1.18

Source: author based on information from DESA database. Calculation based on 2000 prices.

Annex 1.: Index of real per capita expenditure on consumption in selected African countries, 1980 = 100

	1981-1985	1986-1990	1990-1995	1995-2000	2000-2005	2005	2006	2007
Oil rich countries								
Angola	0.94	0.95	0.70	0.70	0.84	0.88	0.87	1.05
Cameroon	1.20	1.25	0.91	0.89	0.97	1.00	1.00	1.05
Egypt	1.32	1.51	1.91	2.26	2.46	2.62	2.74	2.96
Equatorial Guinea	0.89	0.68	0.61	1.18	1.17	1.12	1.19	1.26
Gabon	1.10	1.45	1.29	1.13	0.93	0.82	0.77	0.82
Libyan Arab Jama	1.03	0.95	0.84	0.77	0.60	0.48	0.46	0.43
Nigeria	1.01	0.80	0.86	0.91	1.11	1.26	1.26	1.28
Sudan	0.92	0.78	0.82	1.10	1.32	1.59	1.70	1.74
Resource rich countries								
Botswana	1.25	1.34	1.90	2.05	2.57	2.93	2.92	2.91
Central African Re	0.91	0.84	0.71	0.72	0.71	0.68	0.68	0.69
Dem. Rep. of the	0.85	0.97	0.58	0.43	0.39	0.43	0.43	0.42
Lesotho	1.07	1.13	1.20	1.24	1.15	1.20	1.26	1.40
Namibia	1.35	1.17	1.25	1.32	1.33	1.34	1.27	1.40
Sierra Leone	0.96	0.95	0.82	0.49	0.76	0.74	0.70	0.74
South Africa	1.10	1.10	1.08	1.11	1.19	1.29	1.34	1.38
Others								
Chad	1.11	1.29	1.30	1.31	1.14	0.92	0.97	1.01
Congo	1.30	1.67	1.50	1.07	0.94	0.88	0.69	0.73
Sao Tome and Pr	0.84	0.78	0.75	0.69	0.83	0.95	0.99	1.01
Algeria	1.12	1.31	1.12	1.08	0.98	0.90	0.86	0.92
Morocco	0.98	1.05	1.14	1.21	1.29	1.36	1.41	1.46
Tunisia	1.06	1.11	1.25	1.43	1.72	1.90	1.98	2.06
Swaziland	1.03	1.10	1.24	1.30	1.21	1.17	1.19	1.20
Benin	1.24	1.28	1.25	1.26	1.37	1.38	1.39	1.38
Burkina Faso	1.01	1.02	0.95	1.14	1.33	1.38	1.45	1.47
Cape Verde	1.12	1.31	1.44	1.80	2.21	2.22	2.36	2.49
Côte d'Ivoire	0.96	0.99	0.91	0.88	0.82	0.83	0.77	0.78
Gambia	0.91	0.77	0.74	0.68	0.69	0.76	0.72	0.77
Ghana	0.84	0.86	0.93	1.01	1.11	1.24	1.23	1.21
Guinea	1.00	1.00	1.05	1.11	1.23	1.26	1.28	1.32
Guinea-Bissau	1.21	1.35	1.38	1.25	1.03	1.02	0.99	1.05
Liberia	1.04	0.79	0.19	0.26	0.34	0.27	0.29	0.30
Mali	1.09	1.17	1.25	1.38	1.48	1.60	1.59	1.60
Mauritania	0.84	0.86	0.88	0.88	0.93	0.96	0.87	0.93
Niger	0.94	0.87	0.83	0.78	0.80	0.80	0.81	0.83
Senegal	1.00	0.93	0.83	0.86	0.92	0.97	0.98	0.96

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