A cross-sectional analysis of industrialization and growth in Africa

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Industrialization, particularly manufacturing, has been identified as an engine of growth. The industrial revolution and the dynamic growth of East Asian economies attest to this. The paper finds that the structure of industry in most African economies, with the exception of the Southern African economies and the Eastern African economies, are geared more towards mining and utilities industries rather than manufacturing which is more growth stimulating. Based on the Lewis –Kaldor theoretical framework, this paper employs cross sectional analysis of 54 African countries to draw the linkages between industrialization and growth. The regression analyses confirm the relationship between industrial development and economic growth. However, industrial development on the African continent has no transfer effects across member countries. Policy attention should therefore focus on manufacturing and the domestic private sector.

Keywords: Industrialization, Economic Growth, Manufacturing, Economies, Development.

INTRODUCTION

Industrial growth by all intents and purposes is an undisputed pre-requisite for economic growth and development. If transformation will take place and the trend of poverty is to be reduced, rapid industrialization in the African sub-region is an agenda to be pursued. Evidences abound of a fairly strong relationship between economic growth and development and industrial process. Economic growth and development needs structural changes from low to high productive economic activities. Industrialization is a key factor in the development process. High, rapid and sustained economic growth and development is strongly related to industrialization (Lall, 2005; Rodrik, 2007; Hasse, 2008; Szirmai, 2009). Industrialization is such a crucial and critical key to economic growth that it calls for improvement in systems, technologies and processes that will utilize natural resources more efficiently. Interestingly, about a fifth of global income is generated directly from the manufacturing industry, and nearly half of household consumption relies on goods from industrial processes. The industrial revolution has indeed altered the way people work, live, and think, (UNIDO, IDR, 2011).

Africa is blessed with a lot of natural resources especially mineral and agricultural resources, and a large workforce. However, Africa is characterized by extreme dependence on export of primary commodities and natural resources. Primary or commodity exports can make for high but not long term economic growth. Africa is unable to derive maximum benefits from its abundant resources without adding value (UNIDO, AIR, 2011). The region is behind other developing regions in industrial performance. For instance, Manufacturing Value Added (MVA) grew just 1.7% a year in developed countries on average from 1990-2010. In developing countries however, MVA within the same period averaged 5.6% due to gradual shift of global industrial production from the developed countries to developing countries as firms move to benefit from cheaper labour, lower social costs and large markets amongst other benefits. The Industrial Development Report, 2011 however notes that sub-Saharan Africa's (SSA) industrial base has worryingly been eroding and this trend is likely to be accelerated by the depletion of much needed resources for investments in productive capacity and infrastructure. Available data, for instance , records MVA in the SSA region at USD54 billion in 2010 as againstUSD210 billion in South and Central Asia, USD 229 billion in Middle East and North

Africa, USD 423 billion in Latin America and the Caribbean and USD 1540 billion in East Asia and the Pacific (UNIDO, IDR, 2011).

Primary products still dominate exports from most African nations. Most natural resources from African countries are sold out in non-processed form – primary form. This does not make for value addition as well as encouraging processing activities. Such dependent nature of the African continent has subjected her to the vagaries of global markets and cycles of various booms and bursts. During the period 1990-2004, manufacturing exports from only a few African countries witnessed a growth. These include Kenya, Cameroun, Egypt, Madagascar, Morocco, Seychelles, Zambia and Mauritius. While volume of manufacturing exports from several African nations declined, high technology exports accounted for only about 4% of manufactured exports from the SSA. This is a low value when compared with 32% from East-Asia. Even in South Africa where the industrial sector is adjudged to be more advanced, the industry's contribution to employment is only 3.5% whereas other countries have only 0.5% industry contribution to employment. The 2008-2009 global economic crises brusquely terminated the growth in manufactured exports which declined by 18.7% in developing countries and 23.2 % in developed countries in 2009. SSA suffered the hardest hit with a 35.7% drop in total exports to the European Union and the United States, jeopardizing years of growth and development (UNIDO, IDR, 2011).

With its rich natural resources which have engineered industrial growth and prosperity in other nations of the world, Africa is still ravaged by poverty, diseases, and a low standard of living. Beside the primary product dependency, these economies are faced with severe and unique challenges such as skills scarcity, weak infrastructures, and structurally shallow institutions. Other challenges include bad governance, corruption, lack of political will and poor business environment. As noted in the Lagos Plan of Action for the Economic Development of Africa 1980-2000, the industrialization of Africa in general and of each member state in particular, constitutes a fundamental option in the total range of activities aimed at freeing Africa from underdevelopment and economic dependence. Years later however, Africa is yet to be industrialized, poverty is still prevalent, level of manufactured consumable imports are still high while most exports are raw material with little or no value added.

To this end therefore, this paper attempts to address the following questions:

- What is the linkage between industrialization and economic growth in Africa?
- What is the structure and trend of industry in Africa?
- What factors influence the level of industrialization in Africa?
- What framework should Africa adopt to attain the needed pace of industrialization in a short time?

The objective of this paper is to establish the linkage between industrial productive capacity and economic growth in Africa. Our hypothesis, (a priori) is that there exists a strong relationship between industrialization and economic growth and by implication level of economic development. The paper uses cross-sectional analysis to identify the variables that influence industrialization in Africa. Furthermore, a framework is recommended with a view to strengthening the pace of industrialization in Africa.

The paper is structured into six parts: After the introduction comes part II which is the efforts at industrialization and growth in Africa. Part III is the theoretical framework and literature review, part IV is the methodology, and Part V is the data analysis and discussion of our findings while part VI concludes the paper.

An Overview of Industrialization and Growth in Africa

When African nations began to gain political independence in the 1960s, the first challenge which confronted the African countries was the promotion of industrialization. African governments believed that industrialization would bring about self-reliance and less dependence on the advanced countries. The conviction and expectations of Africa was premised on the hope that industrialization would transform the African economies from subsistence, agriculture-based economies to more prosperous, modern economies. Industrialization was reasoned to be the engine of growth that will help African countries achieve their macroeconomic objectives of job creation, increased incomes and standard of living, self-reliance and balance of payment stability. This section thus aims to illuminate Africa's journey to industrialization by looking at the policy initiatives, structure of industry in Africa and the industrialization trends.

Initiatives at Industrialization in Africa

The first strategy of industrialization adopted by Africa was the Import Substitution Industrialization (ISI). This started in the mid 1960s – late 1970s (UNIDO, 2006). The ISI started after independence in the 1960s – 1970s. The ISI focused on the domestic production of hitherto imported consumer goods. It was envisaged that the ISI would enhance the domestic production of intermediate and capital goods needed by the home consumer goods industry. The ISI had much government support and protection of infant domestic industries from foreign competition. Though, during the period 1970-1980, the share of African manufacturing in GDP increased, the ISI did not achieve the desired expectations for diverse

reasons ranging from high foreign exchange demand, neglect of agriculture and lack of capacity by domestic industries to compete in the foreign markets. In addition, ISI did not pay enough attention to generation of foreign exchange and the building of entrepreneurial capacity that could enhance industrial development (Wagne and Semboja, 2003).

The second strategy of industrialization in Africa was between 1980s to early 1990s. This decade was proclaimed the Industrial Development Decade in Africa by member states of the Organisation of African Unity. Member states were required to accord a major role to industrialization in their development plans in view of its capacity to meet the basic needs of the population and ensure the modernization of the society and the integration of African countries with the rest of the international community (OAU 1980). This period however coincided with the adoption of the Structural Adjustment Programme by a number of African countries. During this period African economies went through serious problems – balance of payment crisis, oil crisis, fall in commodity prices and so much import dependency by the local industries. African countries saw SAP as a policy solution to enable them rise above crises, make African industries competitive, engender industrial development and prepare the ground for sustainable economic growth. (Soludo et al., 2004). Unfortunately however, SAP was a bitter and ineffective medicine which had a negative effect on most African countries.

The New Partnership for Africa's Development (NEPAD) adopted by African leaders in 2001 identified economic transformation through industrialization as a critical vehicle for growth and poverty reduction in the region (UNCTAD/UNIDO, 2011). NEPAD was born out of the economic crises of the 1990s. It was the blueprint for African development and industrialisation, originally called New African Initiative (NAI). In addition to industrialisation, NEPAD was adopted as an integrated and comprehensive framework for the socio-economic development of Africa. It aimed at the promotion of accelerated and sustainable development through eradication of severe poverty. It also sought to tackle the marginalisation of Africa in the global economy.

Alliance for Africa's Industrialization (AAI) of 2003, was conceived as Africa's response to changing global conditions and attitudes including the realization that macroeconomic reforms alone were insufficient to stimulate real economic development. AAI sought to promote the idea that industrial development in Africa must be African driven and that African economies must focus on rapid strengthening of the regions productive capacity if they must recover their pace of industrialization pre 1980s. In addition, AAI advocated that industrial development is the most sustainable way to create employment and economic development strategies (Magarinos, 1999).

Since the Industrial Development Decade of Africa of the 1980s and 90s, and the Alliance for Africa's Industrialization (AAI) of 2003, the Action Plan for the Accelerated Industrial Development of Africa is the latest far-reaching initiative endorsed by the African leaders. At the first extraordinary session of the AU Conference of Ministers of Industry from 24-27 September, 2007 in South Africa, this Action Plan was adopted. It was noted that Africa requires an acceleration of industrial development and diversification of the economy to meet the challenges of development and achieve the Millennium Development Goals (MDGs) as well as the socio-economic objectives of the AU. The Action Plan thus provides a continental framework for addressing the root causes of Africa's low industrial development and aims to mobilize both financial and non-financial resources to increase Africa's competitiveness with the rest of the world (Cisse, 2012).

At the sub regional and the national levels of individual African countries, there have also been policy initiatives aimed at industrialisation and the transformation of African countries. The South African Government, for instance, adopted the National Industrial Policy Framework (NIPF) in 2007. The policy was aimed at diversifying the production and export structure, promoting labour-absorbing industrialization, moving towards a knowledge economy, and contributing to the industrial development of the region. Industrialization is also a key component of recent national development programmes unveiled by Egypt, Ethiopia, Kenya, Namibia, Nigeria and Uganda (UNCTAD/UNIDO, 2011).

Structure of Industrialization in Africa

The industrial sector comprises manufacturing, mining and construction. Manufacturing which has been defined as the physical or chemical transformation of raw materials into new products has however been identified as the part of industry that provides opportunities for poverty education, job creation and economic growth. These raw materials include products derived from agriculture, forestry, fishing, mining or quarrying or products of other manufacturing activities (UNCTAD/UNIDO, 2011). Appendix 1 shows the structure of African economies in relative terms to other economies. The world contribution of industry to the GDP has on average been around 30% since the 1970s. Contribution of manufacturing to GDP has declined from about 26.7% in 1970 to about 18.1% in 2008. Interestingly though, contribution of mining and utilities has been fluctuating with the highest percentage contribution being in the 1980's at 7.1% (Figure 1a).

Looking at the developing economies, manufacturing has consistently accounted for about 20% of the contribution of industry to GDP, mining and utilities accounted for 5.7% of the GDP but rose over time to contribute about 11% to the GDP as at 2008. The

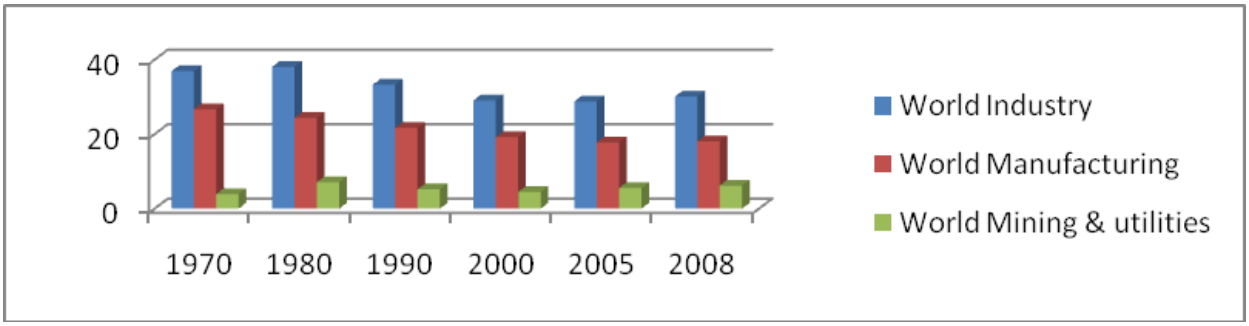

Figure 1a. World Industry Structure**;** Source: Authors Compilation 2012 adapted from UNCTAD and UNIDO, 2010

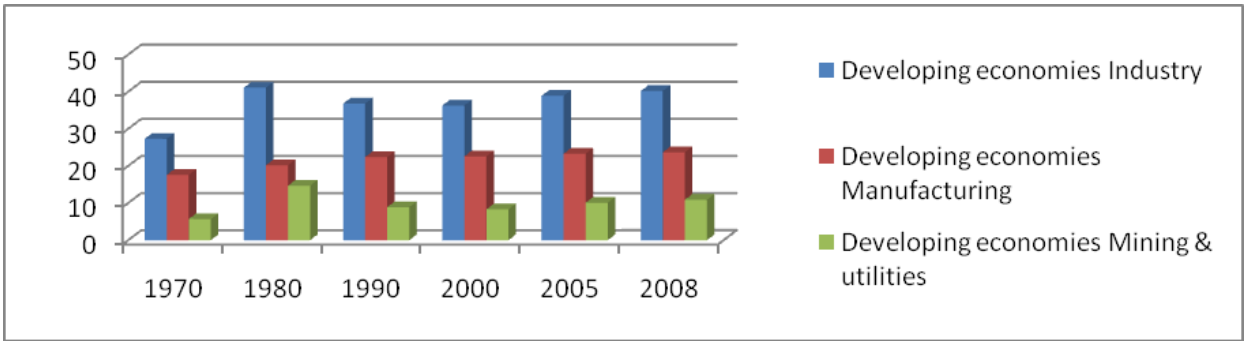

Figure 1b. Developing Economies Industry Structure**;** Source: Authors Compilation 2012 adapted from UNCTAD and UNIDO, 2010

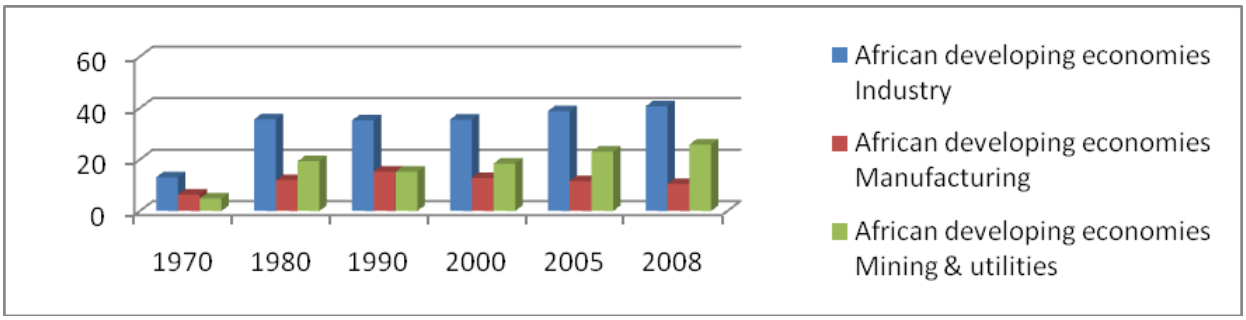

Figure 1c. Developing Economies Industry Structure; Source: Authors Compilation 2012 adapted from UNCTAD and UNIDO, 2010

important point to note is that manufacturing is given higher impetus (Figure 1b).

The situation is however different in African developing economies where mining industry seems to have attracted more attention than manufacturing. Africa is blessed with a lot of mineral resources which have contributed significantly to the development of the developed countries. These resources include oil and gas, bauxite, chromite, cobalt, diamonds, manganese, titanium, and so on. Oil and gas has attracted good measure of foreign investment (UNIDO, 2006). Five African countries contributed 85% of the African oil production. These include Nigeria, Libya, Algeria, Egypt and Angola. In the downstream oil sector, there are 44 refineries in 25 countries with a total distillation capacity of 3.3 million barrels per day. This constitutes 3.6% of world total. Some of the major refining centers are Egypt, Algeria, South Africa, Nigeria, Libya and Morocco. However, these refineries have been experiencing decreasing refining capacity (Figure 1c).

An analysis of the regions shows that the structure of industry in all regions of Africa with the exception of Southern Africa is more gearded towards mining than manufacturing. The situation is more abysmall in

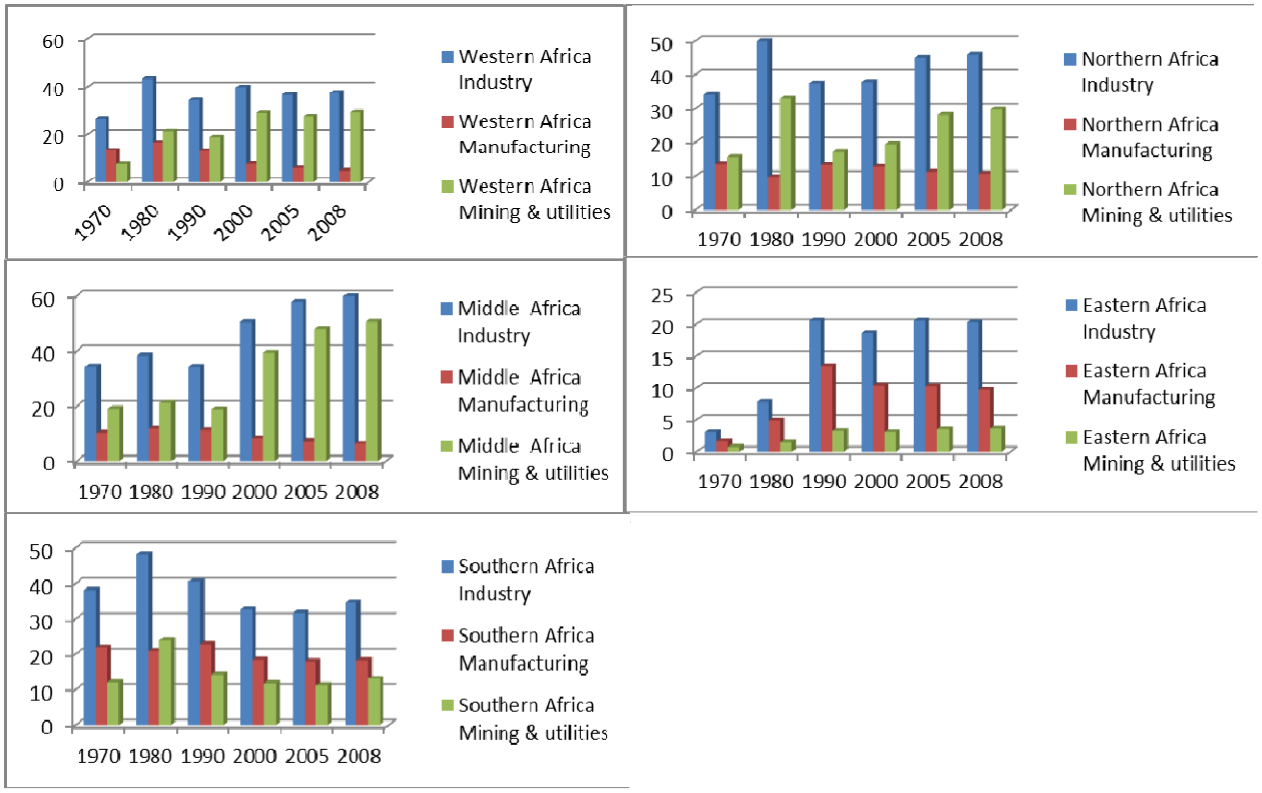

Figure 1d. African Regions Industry Structure; Source: Authors Compilation 2012 adapted from UNCTAD and UNIDO, 2010

Northern Africa and Western Africa. In West Africa for instance, manufacturing contribution was 13.3% in 1970 but fell to about 5% in 2008, the contribution of mining to industry however rose from 7.7% to 29.6% in 2008. The graphs below depict the contribution of manufacturing and mining and utilities to GDP and thus the industrial structure of the African economies (Figure 1d).

Some peculiar features of the African manufacturing include:

(i) Heavy dependence on resource based manufacturing activities (Lall, 2004c).

(ii) The dominance of small scale and micro enterprises (Rankin et al., 2006; Bigsten and Soderborn, 2006).

(iii) Africa economies have weak technological capacities and capabilities (Oyelaran-Oyeyinka, 2006).

(iv) Informality i.e. predominance of informal activities (Bigstern, Kimuyu and Lundvall (2004)

Thus, manufacturing in Africa is small relative to the other developing countries. It is noted that the manufacturing sector in Africa plays a limited role in the economy of the continent. The structure of industry in Africa is therefore skewed in favour of mining and utilities/ construction. The only exceptions are within the Southern African region where manufacturing and mining industries contribute to the GDP at very similar levels. In Eastern Africa, manufacturing contributes more to the GDP than mining and construction, however, East Africa is also noted to have the lowest level of industry contribution to the GDP within the African region.

Trend in African Industrial Performance

The trend in industrial performance in Africa has been the least bit encouraging. Table 1 shows the percentage of industry value added (IVA) in GDP and manufacturing value added (MVA) in GDP for the African continent, North Africa, SSA for all income levels, and SSA without South Africa. Figures 2(a-d) give a graphical representation of the data. The trends reveal that not much has happened in the industrial sector in terms of its contribution to the GDP and thus economic growth and development. The continent has therefore failed to effectively use industrialization as a tool for economic growth and development. It is only in the northern African region that we see industrial value added accounting for over 40% of GDP. Within SSA, IVA remains at about 30% of GDP. However, MVA which is the critical factor for growth in the whole of Africa has never accounted for even up to 20% of the GDP.

In Africa, MVA was highest in the 1970s to 1980's perhaps due to the initiatives of the Import Substitution Industrialisation and the Industrial Development Decade

Table 1. Contribution of African Industry Value Added and Manufacturing Value Added 1970-2010 to GDP

Year	Africa		SSA- all income levels		SSA less South Africa		North Africa	
	IVA% of GDP	MVA % of GDP	IVA% of GDP	MVA % of GDP	IVA% of GDP	MVA % of GDP	IVA% of GDP	MVA % of GDP
1970	32	NAD	31	18	NAD	NAD	33	NAD
1980	39	15	38	17	NAD	NAD	41	13
1990	33	17	32	18	25	12	35	17
2000	33	15	29	15	27	11	38	16
2005	37	13	32	13	32	9	45	13
2006	38	13	32	13	32	9	46	13
2007	37	13	32	14	32	11	45	12
2008	39	13	32	13	31	10	47	12
2009	35	13	30	13	28	10	41	14
2010	35	14	30	12	NAD	NAD	42	NAD

Source: World Bank Database.
Note: NAD signifies No Available Data, IVA is industry value added, MVA is manufacturing value added

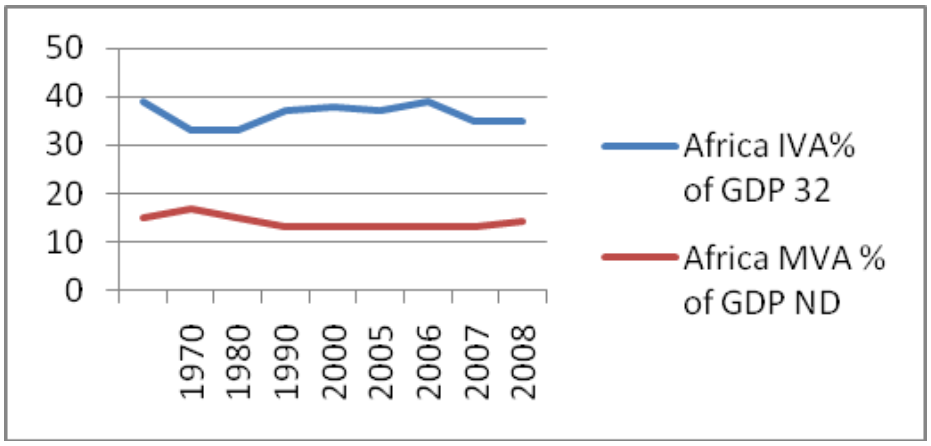

Figure 2a. Africa Industrial Contribution to GDP; Source: Authors Compilation 2012 adapted from World Bank database

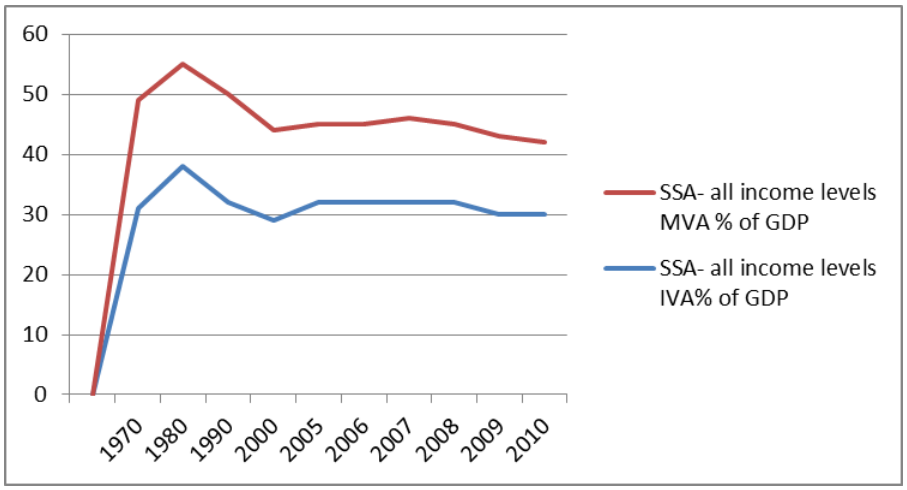

Figure 2b. SSA, all income levels Industrial Contribution to GDP; Source: Authors Compilation 2012 adapted from World Bank database

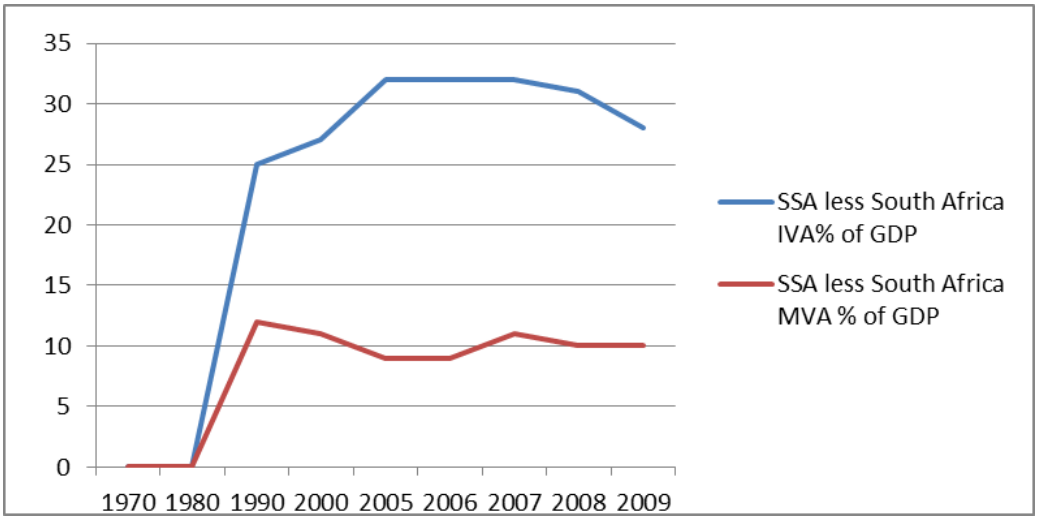

Figure 2c. SSA less South Africa Industrial Contribution to GDP; Source: Authors Compilation 2012 adapted from World Bank database

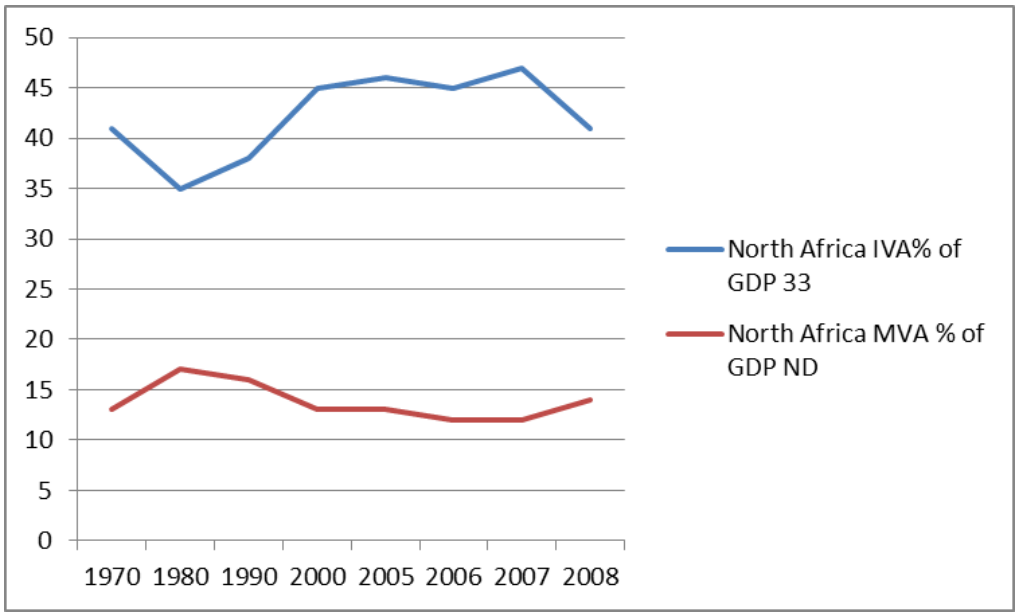

Figure 2d. North Africa Industrial Contribution to GDP; Source: Authors Compilation 2012 adapted from World Bank database

whereby member states gave major roles to industrialization in their development plans. The late 1980's to 1990s however, saw the introduction of SAP in a number of African countries. This had a deleterious effect on African industrialization as a number of hitherto government operated industries were sold off. MVA has remained at basically the same level since then with a slight improvement seen in the last few years.

The trend in SSA for all income levels is similar to the African trend whereby MVA is seen increasing in the 70's and 80's , declines in the 90's and 2000s and has remained at basically the same level. Both MVA and IVA can be seen to follow the same trend.

The effect of South Africa in SSA in terms of industrialisation is quite obvious from figure 2c. MVA is considerably lower. But with regards to IVA, it has taken on an increasing trend except in 2008 when it started showing a decline.

In North Africa, the trend shows an increase in contribution of industry to GDP from 1980 where it remained more or less on the upward trend until about 2007 when it started to decline.

Literature Review

Theoretical and Analytical Framework

Industrialization and Growth: Theoretical Explications

Economic theorists have to a large extent agreed on the linkages between economic growth and industrialization at least up to certain levels. Only three countries worldwide have become rich on agriculture alone. These are Australia, New Zealand and Canada. The shift from agriculture to industry has however been a recurring decimal in all other developed countries, (Thirlwall, 1999).

The concept of structural transformations from a largely agrarian traditional society to a more modern industrialized society as a principal aspect or essential condition for economic growth and development has been prevalent for a long time. Writers such as Prebisch (1950, 1959), Nurkse (1953), Lewis (1954) and Kaldor (1967), represent a few of the influential contributions to these theories of growth and development (Botta, 2007). This work uses the Kaldorian framework in analyzing the role of industrialization especially manufacturing in economic growth in a cross section of African countries. However, we believe that a recap of the Lewis Theory on Structural transformation and a dualistic economy provides a foundational background to Kaldors growth laws.

Lewis tried to explain the process of economic growth and development within the classical framework with its assumption of unlimited labour supply as an initiator of economic development. Lewis considers the classical framework to be more applicable to the analysis of the least developed countries (Hiroto, 2002). Lewis model assumes a two sector economy made up of the traditional agrarian sector and the more modern industrial sector. It assumes that there is surplus labour in the traditional agricultural sector which could easily be withdrawn to the industrial modern sector without a loss of output in the agricultural sector. The transfer of labour to the modern sector is premised on the expanding output in the sector which is in turn determined by the rate of investment and capital accumulation in the industrial sector. Capital accumulation arises as a result of the profit over wages under the assumption that capitalist would reinvest all their profits after wages. In addition, wages in the industrial sector is assumed to be constant and is determined as a given premium over fixed average wages in the traditional agricultural sector. Lewis assumed an urban wage rate of about 30% above the average rural rate and the existence of perfect elasticity in the supply of rural labour. This process is assumed to be continuous until all surplus rural labour is absorbed in the industrial sector. Thereafter, additional workers can only be withdrawn from the agricultural sector at a higher cost of reduced food production since the marginal product of rural labour is no longer zero. While Lewis contributions to the literature cannot be flouted, Lewis model has however been critiqued based on its one-dimensional suppositions. It does not take into consideration for instance, the role of technology in introducing cost saving devices. In addition, Lewis assumes that all the profits go to the owners of the capital and thus a widening gap is created between owners of capital and workers. The notion of a competitive modern sector labour market that guarantees the continued existence of constant real urban wages up to the point where the supply of labour is exhausted is also an unreal assumption in today's world (Todaro and Smith, 2003).

The relationships between industrialization, particularly manufacturing and growth are captured in Kaldors growth laws. Kaldor, writing in the postwar period, noted that the link between industrial growth and the performance of the economy as a whole was imperative for the growth trajectory of developed economies then. Kaldor's three basic growth laws have been tested in developed and developing countries using both time series and cross sectional analysis (Thirlwall, 1999). These laws are explained below:

Law 1: The first law is that there exists a strong positive relationship between the growth of manufacturing output and the growth of the GDP. This law is summed up by the statement that manufacturing is the engine of growth. Kaldor tested this proposition using the regression

$q_i = a_i + b_i m_i$ .....(1)

Where q and m refer to growth of total output and manufacturing output. Kaldor's proposition suggests that high growth rates are usually found where the share of manufacturing output in GDP is increasing. Kaldor also argues that the growth in non-manufacturing output also responds to the growth of manufacturing output. Two reasons have been adduced for this. The first reason, which is in line with Lewis model of a dualistic economy, is that the expansion of manufacturing leads to the transfer of labour from the low productivity areas to industrial activities. This invariably has little or no negative impact on the traditional sectors given surplus labour. The second reason has to do with the existence of static and dynamic returns to scale in the industrial sector. These include economies of scale internal to the firm as well as increasing productivity that arises as a result of technology and on the job training (Libiano, 200?).

Law 2: The second law, also known as Verdoorn's law, is that there exists a strong positive correlation between the growth of manufacturing output and the growth of labour productivity in manufacturing. An increase in manufacturing output is expected to lead to an increase in labour productivity in manufacturing. An initial growth in output is expected to induce productivity gains which allow for a reduction of unit labour costs and consequently a fall in prices. This increases the competitiveness of the country and allow for further

output expansion through increased exports which reinitiate the cycle. (Libiano, N.D.)

Law 3: The third law is that there exists a strong positive relationship between the growth of manufacturing output and the growth of productivity outside the manufacturing sector. The basic argument of this law is that the non-industrial sector has diminishing returns to scale and as such, when resources move to the industrial sector, the average productivity of those that remain will rise (Wikipedia, 2012).

Review of Related literature

Industrialization refers to part of a wider modernization process, where social change and economic development are closely related with technological innovation. The application of science to the problems of economic production leads to industrialization, urbanization and improved quality of the population (Perkins et al., 2001). Thus the economy undergoes extensive organization for the purpose of manufacturing. Among the key positive factors that can enhance industrial modernization are favourable political-legal environments, abundant natural resources of various kinds, plentiful supplies of relatively low-cost skilled and adaptable labour. An economy consists of a primary sector of commodity production such as farming, livestock breeding, and exploitation of minerals; a secondary sector made up of manufacturing and processing as paid job, and a tertiary sector of service industries: The industrialization process is based on expansion of secondary sector where the economy is dominated by primary activities. Thus, while the presence of industry does not mean presence of wealth and prosperity to the people, the lack of an industrial sector can limit a country from improving on its economy and power. Industrialization, if properly pursued, will turn the economy around from a traditional low level of production to a higher and a more efficient system of production of goods and services (Lall, 2005, UNIDO-UNECA, 2006; Ayodele and Falukun, 2003; Adeoye, 2004). Thus, industrialization is central to economic growth and development pursuit.

There are quite a few empirical works done in the area of industrialization in Africa. Some of these works include that of Adeoye, 2005; Ayodele and Falokun, 2003; Falokun, 1996; Adeboye, 2002; etc. Even then these works paid more attention to sources of industrial growth, the link between industrialization and its effects on the various sectors of the economy and policy issues. Falokun (1996) recommended that governments at all levels should focus on identified key sectors that could stimulate the economy. The economy could be stimulated through export diversification and expansion of programme which would in turn cause a rapid industrial transformation. The finding by Falokun (1996) showed that the economy is still dependent on the external sector for its intermediate inputs. The Nigerian economy depends on crude oil export.

Focusing on the Indonesian economy, Hayashi (1996), studied the changes in the structure of industry and trade. He employed input-output analysis, and recommended that further deregulation measures need to be taken on a continuous and consistent basis. Adeoye (2005) examined the extent to which the Nigerian economy restructured her industrial and trade systems for effective industrialization using historical analysis. The study found out that the Nigerian economy has not changed its export and import structure over the period of 1970-2002. He suggested that incentives should be given so as to make for efficient allocation of resources in order to promote manufactured exports. Furthermore, he recommended a mixture of the invisible hand of the market with the visible hand of government so as to guide the process of industrialization, economic diversification and development akin to what is obtained in the East Asian economies.

Nzau 2010 examines the various debates and models that have been used to influence industrialization in Africa and the challenges for the 21st century. Industrialization had often been associated with Western Europe and North America because of their development experience in the 19th and 20th centuries. The term is used to mean a clear departure from a subsistence economy, based largely on agriculture to a more mechanized production. Industrialization had been looked at in economic terms, represented by the physical presence of industrial plant. These plants are expected to engage in the manufacturing of capital goods in addition to processing of raw materials into finished goods for industrial, commercial and domestic uses. Nzau (2010) identified five (5) challenges confronting African economies. The first challenge after political independence by most African countries was on strategy. Leaders of Africa were divided as to which strategy will promote development. They agreed on methods, but differed on strategy. Hence development planning was resorted to. The second challenge was the poverty, ignorance (illiteracy) and diseases that were found amongst African people. The third challenge was the ideological path to take that would have guided the development in Africa. There were capitalist and socialist ideologies. African economies inherited an economic system that was not indigenous. These economies were dominated by foreign firms. As such, there was no or very small domestic private sector. The fifth challenge then was the political challenge. This has to do with the problem of state formation.

One approach the African countries found is the modernization approach to development. According to this approach, the industrial development that Africans are looking for had been realized already by North America and Western European countries. Africa was made to believe that all she needed then is to follow the

industrialization path set by these American countries. Africa does not need to re-discover anything again. This approach emphasizes economic growth vide GNP and annual economic growth rate indices (Ndegwa et al., 1985; Nzau, 2010).

The development of an economy is basically a process that involves structural transformation. This entails the re-allocation of productive resources from traditional agriculture to modern agriculture, industry and services. It also involves the reallocation of resources among industrial and service sub-sectors of the economy. This process entails moving resources from low productivity activities to high productivity sectors (Ocampo, 2007). Sustained economic growth has a linkage with the capacity to diversify the domestic production structure. This means generation of new activities in order to strengthen economic linkages within the economy as well as to create domestic technological capacities. This is what industrialization should be. It is through industrial sector that African economy can diversify its process of economic growth.

Rodrik (2007) identified some stylized facts in relation to industrialization and economic growth. First, economic development requires diversification, not specialization. Second, countries with impressive growing records are those with large manufacturing sectors. These include East Asia, the Pacific, South Asia, Latin America, the Caribbean, Middle East, North Africa. Thirdly: acceleration in growth is associated with structural changes in the aspect of manufacturing (Rodrik, 2005; Jones and Olken, 2005). The fourth, specification patterns not tied to factor endowment. Fifth, economies that promote exports of more industrial goods grow faster.

Rodrik (2006, 2007) proposed a model of growth through industrial development. The model addressed variables that can contribute to productivity. These include production and technology. He developed a production model comprising of importable, non-traditional exportable, traditional exportable, non-tradable goods. Full employment constraint was included into the model. He introduced pricing and market equilibrium. The external balance sector in the model explained the difference between domestic expenditure and domestic income. The findings showed that when output in the economy is low, the economy's productivity and growth rate will also be low. In the absence of policy intervention, output in the modern industrial sector will be low. Thus, for industrial development to take place, both effective industrial policy that aims at new exportable products and a supportive exchange rate policy that will promote industrial production of tradable goods and services across board have to be in place.

Industrialization in Africa should consider three key dimensions. These include innovations as in Schumpeterian model, linkages as in the Hirshman model, and surplus labour as advocated by Lewis. Innovation in a broad sense implies the development of new economic activities and/or new ways of pursuing existing activities. Both technological and non-technological innovations have a role to play in this regard. Thus, to create new marketing and to develop new organizational structures are more important than creating new production technologies. This is because innovations in distribution and organization are determinants of the benefits obtainable from new technologies. Schumpeter's concept of "new combination" captured this broad concept of innovation.

The key to competitiveness is linkages. Linkages to be put in place should have both demand and supply sides. The demand side helps to determine the magnitude of macroeconomic multipliers. The supply side is related to positive externalities created by different actors among themselves. This can be achieved through economies of scale and increased scope of production, lower transactions and transport costs. Thus, more attention should be given to the development of domestic linkages than integration into world market. This is because not all integration into the global market has the same impact on economic growth (Rodrik, 2007).

METHODOLOGY AND DATA ANALYSIS

Model Specification

The theoretical strength of this paper is the Lewis-Kaldor models of industrialization and economic growth and development. The structural view of economic development holds that when an economy experiences structural transformation in a sufficient measure, the economy would be opened to world markets. Not only that, it would become an exporter of manufactured products and it might derive the benefits of industrialization, which will include high growth rates. Thus, a nation's pattern of specialization is influenced by that country's inherited advantages. Hence, for African economies, the advantages are in the areas of abundant natural, agricultural and human resources. Manufacturing activities are believed to drive the economy along the pathway of economic growth. Thus, manufacturing helps in technological development and advancement, transformation of intermediate goods and raw materials; increased productivity through production of intermediate and capital goods (Romer, 1986, 1990).

In presenting a model for this study, we draw from Ortiz et al. (2009, 2004) and Chenery et al. (1986). In line with the Cobb Douglas type production function a simple model is offered as follows:

GDP = F(DCPS, GDPGR, GDPPK, IVAGDP, IVAG, MVAGDP, MVAG)..... (2)

The regression equation becomes

$GDP = B_0 + B_1 DCPS + B_2\ GDPGR + B_3\ GDPPK + B_4\ IVAGDP + B_5\ IVGA + B_6\ MVAGDP + B_7\ MVAG + E$ … (3)

Where β_1 *to* β_7 are the coefficients of the various variables. These are expected to show the rates of changes of the respective variables in relation to the GDP - the dependent variable. The coefficients are expected to be positively related to the growth of GDP. The independent variables are as follows:
GDP = GDP (constant 2000 US$);
DCPS = domestic credit to private sector (% of GDP);
GDPGR = GDP growth (annual %);
GDPPK = GDP per capita (constant 2000 US$);
IVAGDP = industry, value added (% GDP);
IVAG = industry, value added (annual % growth);
MVAGDP = manufacturing, value added (% GDP);
MVAG = manufacturing, value added (annual % growth).

Data

Appendix 3 shows the data on GDP (proxy for growth) and other variables as explained in section 4.1. The data is a cross-country data of 54 African countries.

Data Analysis

The OLS regression tool was applied on the cross-sectional data including the dependent variable from 54 African countries. The OLS estimates were corrected using weighted statistics consistent with covariance matrix. Descriptive statistics were also used to capture the behavior of the key variables of influence on growth.

EMPIRICAL RESULTS

The results from the various models are presented in table 2. The estimated generalized least squares (EGLS) weighted regression method was used to analyze the data. Since we cannot reject the presence of heteroscedasticity, the OLS estimates were corrected using covariance matrix. Since industrialization is believed to drive growth, industry value-added (IVA) and manufacturing value-added (MVA) and Domestic credit to the private sector (DCPS), are expected to predict the pace of African industrialization. GDP growth rate and GDP per capita are expected to be push variables growing as the economies are growing.

All the regression models used the basic variables hypothesis in the paper. Their overall objective is to measure the linkages of these variables on growth – GDP. The first regression is the linear regression; only DCPS and MVAGDP are significant at 5% and 1% respectively. On the basis of the coefficients, DCPS, MVAG and IVAGDP are positively and robustly related with growth in descending order GDPPK, GDPGR, MVAGDP and IVAG are very robust but are negatively linked with growth. We carried out an improvement on the results by dropping GDPGR and IVAGDP. The results show that only one variable, GDPPK was significant. The others are significant at various levels: DCPS (1%), IVAG (10%), MVADGP (1%) and MVAG (1%). In terms of magnitude of coefficients, all the five variables are very robust, but only DCPS and MVAG are positively related to growth while GDPPK, IVAG and MVAGDP are negative.

The second regression is the log-linear model. Three variables are significant, DCPS at 5%, GDPPK at 5%, and MVAGDP at 5%. However, their linkages and that of other variables with growth are minimal. Besides, GDPGR, GDPPK, IVAG, and MVAGDP are negatively related with growth. To improve on this regression, we dropped IVAG. Thus, all variables except IVAGDP are significant. GDPGR is significant at 10% while the remaining five (5) are significant at 1% respectively. Even then, GDPGR, GDPPK and MVAGDP are negatively correlated with growth. We further dropped IVAGDP and IVAG hence all the remaining five variables become very significant at 1% in measuring growth. However, GDPPK, GDPGR and MVAGDP though robust are negatively related to growth.

The log regression is the third regression model. In this result, LMVAG is the most robust followed by LDCPC. Incidentally, the two variables are the only variables that are positively related to LGDP (growth). The remaining five are negatively related. Similarly, three variables are significant: LMVAG at 1%, LDCPCS at 10% and LMVAGDP at 1%. To improve on the regression, we dropped GDPPK. Yet only LMVAG and LDCPS maintain their prominent effect on growth. The other four (4) are negative. However, more variable became significant: LDCPS at 5%, LMVAG at 1%, LIVAGDP at 5%, LIVAG at 10% and LMVAGDP at 5%. In further improvement, we dropped GDPGR and GDPPK. Hence, all variables are significant. LMVAG, LMVAGDP and LIVAG are significant at 1% respectively while LDCPS and LIVAGDP are significant at 5% each. Still only LMVAG and LDCPS are positive.

The fourth regression is the lin-log regression model. From the result, no variable is significant. However, all are positively related to growth except for LGDPGR, LMVAGDP and the constant which are negative. We dropped LGDPPK and LIVADP yet only LDCPS is significant at 10%. Even so LGDPGR and LMVAGDP are still negative.

Our preferred regression is regression four (4) – log-linear because the estimates give us the highest levels of significance at 1%. The results confirm that there is a linear relationship between industrialization and economic growth, but the relationship is not as strong as expected. Manufacturing activities and the activities of the private sector led other chosen indicators. Indicators like the GDPGR, GDPPK, IVAGDP and IVAG apart from being significant, have negative coefficients. This explains our focus on DCPS, MVAGDP and MVAG which

Table 2. Empirical Regression Results

Variable	1	2	3	4	5	6	7	8	9	10	No. Obs
	1.090**	8.66	10.302	10.382	10.540	10.958	10.760	10.276	-3.110E+10	-1.55	
Constant	(0.54)	(1.66)	(29.36)	(4.313)	(76.618)	(10.840)	(13.848)	(17.378)	(-0.505)	(-0.480)	
	6.60	6.47*	0.013**	0.012*	0.011*	0.619***	0.636**	0.668**	2.98E+10	3.30***	
DCPS	(2.65)	(3.09)	(3.069)	(4.490)	(4.189)	(2.126)	(2.441)	(2.640)	(1.160)	(1.905)	46
	-9.02	-	-0.044	-0.058***	-0.072*	-0.284	-0.236	-	-1.31E+10	-1.46	
GDPGR	(-0.53)		(-1.219)	(-2.017)	(-3.575)	(-1.044)	(-0.994)		(-0.634)	(-1.272)	52
	-2715873	-126951	-0.0001**	-0.0001*	-8.220*	-0.049	-	-	3.49E+09	-	
GDPPK	(-1.01)	(-0.69)	(-2.528)	(-3.479)	(-6.490)	(-0.167)			(0.214)		52
	1.12	-	0.003	0.003	-	-0.049	-0.784**	-0.597**	2.83E+09	-	
IVAGDP	(0.46)		(0.740)	(0.809)		(-1.543)	(-2.676)	(-2.734)	(-0.076)		25
	-3.23	-5.53***	-0.004	-	-	-0.472	-0.450***	-0.597*	1.10E+10	1.03E+10	
IVAG	(-1.01)	(-2.13)	(-0.667)			(-1.252)	(-1.910)	(-3.147)	(0.904)	(0.802)	25
	-5.67*	-4.66	-0.028*	-0.029*	-0.029*	-0.615*	-0.539*	-0.409*	-1.48	-1.74E+10	
MVAGDP	(-3.91)	(-3.97)	(-8.443)	(-11.169)	(-9.980)	(-2.953)	(-2.953)	(-3.424)	(0.650)	(-1.332)	24
	6.12	8.74	0.0106	0.0064*	0.0071*	1.070*	1.057*	1.041*	1.22	9.50	
MVAG	(1.610	(2.86)	(1.488)	(3.080)	(3.705)	(10.181)	(11.441)	(11.723)	(1.126)	(1.008)	23
R^2	0.9648	0.9158	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9712	0.9244	
$\bar{R}^2_{adj}$	0.9402	0.8807	0.9994	0.9999	0.9998	0.9999	0.9999	0.9999	0.9487	0.8899	
S.E	2.700	2.680	0.40	0.3679	0.358	0.3748	0.3676	0.3694	2.30	2.19E+10	
No. Obs	54	54	54	54	54	54	54	54	54	54	

Notes: t-statistics are in parentheses; significance levels: *1%, **5%, ***10%
Source: Authors' computation, 2012

are good representations of manufacturing. Thus, given the coefficients of the independent variables, the coefficients of partial adjustment or spread between industrial development and economic growth are DCPC (0.989 or 98.9%), GDPGR (1.072 or 107.2%), MVAGDP (1.029 or 102.9%) and MVAG (0.993 or 99.3%). This implies the existence of a large gap of adjustment to be made and covered in our industrialization efforts and policies in order to attain the desired level of economic growth. Thus, it would take Africa a longer time to eliminate the disequilibrium between actual change and the desired change in the economic growth.

Descriptive Statistics

Appendix 1 contains this information for all variables. These explain the growth rate of output across countries. The growth rates for all the variables are positively skewed, judging by their kurtosis statistics. GDP (proxy growth) turns in a mean of 5% (median of 5%); DCPS has a mean of 28.2% (median of 19.1%); GDPGR has 4.9% (median of 4.7%; GDPPK has 1303.7% (median of 452.6%); IVAGDP has 33% (median of 29.0%); IVAG has 5.9% (median of 6.2%); MVAGDP has 10.8% (median of 8.0%) and MVAG turns in 2.2% (median of 5%). Based on the Jarque Bera statistics, we reject the null hypothesis of normality of data for GDPGR, but accept for other variables as normally distributed. Besides, the probability values for GDP, DCPS, GDPPK, IVAG, MVAGDP, and MVAG are significant at the 1% threshold respectively while that for IVAGDP is significant at 5%.

CONCLUSION

The structure of African industry shows that mining and utilities dominate African industry rather than manufacturing which is prescribed as the panacea for growth and development. The exception of course was South Africa in which manufacturing and mining have a more balanced weight and eastern Africa where industry is generally low with regard to its contribution to the GDP. The trends also reveal that industrialization in Africa is not approached in a sustained manner in which industry continues to grow thereby driving economic growth.

From the regression analyses, it is confirmed that a relationship between industrial development and economic growth exists which is linear. However, industrial development in the African continent has no transfer effects across member countries. That is, it is not statistically significantly different from zero in relation to the national outputs in the continent. We see this in the minimal values of the coefficients. The values point to the

fact that for any minimum relative level of industrialization and economic integration in Africa, policy should focus attention on the manufacturing and the domestic private sector. This would bring the benefits of industrialization closer because the development of manufacturing is linked to the advancement in technology and other attendant benefits already mentioned in our methodology. We limited the analyses to the dominant positive effects of the variables on the dependent variable. This also implies dominant positive effects of industrialization on economic growth. The spread between industrialization and growth is wide requiring long term policy initiatives and commitment on the part of African leaders at ensuring the industrialization of the continent.

We therefore make the following recommendations:

i. Our economic growth pursuit and policies should aim at industry, particularly manufacturing. Such manufacturing activities that make for technological development and technological integration. This means deliberate efforts must be directed at diversification and structural transformation of the economic processes of the African economies. This is because Africa is advantaged in agricultural and natural resources.

ii. Economic growth depends on the growth of factors of production such as labour, physical capital, human natural resources. Policies must consider human resource development. Africa lacks technological skills or at best the skills are scarce.

iii. In a closed economy, investment is equal to savings. However, in a globalized (open) economy which is integrated, we could draw from foreign savings. It suffice that even in African economies, there is no integration, even in output let alone returns on investment because domestic savings is low. From the findings, there is a good linkage between domestic credit and growth and by implication shows that the linkage between domestic savings and investment exist. Thus policy for domestic savings is very necessary for growth in Africa. While returns on investment in Africa are high, capital flow to investment in Africa for meaningful growth and development is little and slow. This could be a reason why DCPS as a variable performed well in the analysis. The domestic economy needs reasonable domestic savings and credit for investment and growth to take place.

iv. Industrialization Framework- The framework proposed here is based on the premise that industrialization and particularly manufacturing is very critical for integrated and sustainable growth. The framework recognizes the fact that Africa's industrialization policy should give attention to technological skill development and advancement in manufacturing. This is important bearing in mind the empirical finding that there are no linkages and integration in the African economies. This is in spite of the existence of several regional economic communities. Linkages thus need to be created within the continent.

Human capital vis-à-vis entrepreneurial skills development is part of the framework. Investment by African economies at all levels of education; training and capacity building is a necessity. In addition, our seminars and workshops should be modular type training as opposed to the present form of speech making. The essence of all training is to build capacity, build knowledge and eventually knowledge economy.

At the political front, Africa requires a stable and uninterrupted political environment. A strong political environment is a function of strong leadership and commitment. We must therefore as a continent seeks to sustain true democratic values that will ensure the election of committed leadership with the political will to ensure Africa is industrialized.

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APPENDIX 1.DESCRIPTIVE STATISTICS RESULTS

	GDP?	DCPS?	GDPGR?	GDPPK?	IVAGDP?	IVAG?	MVAGDP?	MVAG?	LGDP?	LDCPS?	LGDPGR?	LGDPPK?	LIVAGDP?	LIVAG?	LMVAGDP?	LMVAG?
Mean	5.27E+10	28.17543	4.911154	1303.661	32.90640	5.858000	10.83083	2.229130	9.837842	1.318721	0.639160	2.800458	1.472940	0.800363	0.935802	0.620879
Median	5.82E+09	19.10000	4.675000	452.6000	29.00000	6.250000	8.010000	5.000000	9.764775	1.281033	0.669650	2.655653	1.462398	0.799669	0.903328	0.698970
Maximum	9.32E+11	145.3600	10.14000	8661.410	80.21000	41.96000	45.17000	16.65000	11.96928	2.162445	1.006038	3.937589	1.904229	1.622835	1.654850	1.221414
Minimum	2.44E+08	5.510000	0.950000	103.8500	13.82000	-57.84000	3.070000	-66.24000	8.388093	0.741152	-0.022276	2.016407	1.140508	0.000000	0.487138	-0.050610
Std. Dev.	1.57E+11	26.18437	2.243416	1909.409	16.09923	15.63486	8.881428	15.35507	0.812619	0.329710	0.229114	0.498743	0.197389	0.333527	0.286755	0.331376
Skewness	4.290997	2.452163	0.398652	2.535031	1.250664	-2.291058	2.503242	-4.061252	0.660217	0.360824	-0.775908	0.644373	0.263245	0.067941	0.469412	-0.413644
Kurtosis	22.13165	10.27178	2.431585	9.453792	4.276051	13.25460	10.34007	18.83235	3.229887	2.762394	3.510620	2.453952	2.513224	3.996456	2.763173	2.424746
Jarque-Bera	952.6200	147.4515	2.077376	145.9401	8.213493	131.4091	78.94145	303.4452	3.892184	1.106363	5.782539	4.244580	0.535564	1.011389	0.937478	0.930712
Probability	0.000000	0.000000	0.353919	0.000000	0.016461	0.000000	0.000000	0.000000	0.142831	0.575117	0.055506	0.119757	0.765075	0.603087	0.625791	0.627912
Sum	2.74E+12	1296.070	255.3800	67790.39	822.6600	146.4500	259.9400	51.27000	511.5678	60.66118	33.23633	145.6238	36.82351	19.20872	22.45926	13.65934
Sum Sq. Dev.	1.25E+24	30852.95	256.6787	1.86E+08	6220.446	5866.773	1814.235	5187.119	33.67780	4.891897	2.677153	12.68600	0.935095	2.558525	1.891256	2.306007
Observations	52	46	52	52	25	25	24	23	52	46	52	52	25	24	24	22
Cross sections	52	46	52	52	25	25	24	23	52	46	52	52	25	24	24	22

APPENDIX 2. COVARIANCE MATRIX RESULT

	C	DCPS?	GDPGR?	GDPPK?	IVAGDP?	IVAG?	MVAGDP?	MVAG?
C	0.123150	-0.000995	-0.011823	5.25E-06	-0.001227	0.000738	-0.000771	-0.000604
DCPS?	-0.000995	1.67E-05	7.40E-05	-1.15E-08	6.78E-06	-9.42E-06	3.83E-06	1.20E-05
GDPGR?	-0.011823	7.40E-05	0.001285	-5.85E-07	0.000121	-8.35E-05	7.49E-05	6.27E-05
GDPPK?	5.25E-06	-1.15E-08	-5.85E-07	1.56E-09	-1.04E-07	-1.28E-07	-3.14E-08	1.75E-07
IVAGDP?	-0.001227	6.78E-06	0.000121	-1.04E-07	1.52E-05	1.09E-07	7.74E-06	-4.47E-06
IVAG?	0.000738	-9.42E-06	-8.35E-05	-1.28E-07	1.09E-07	3.33E-05	-4.10E-06	-3.85E-05
MVAGDP?	-0.000771	3.83E-06	7.49E-05	-3.14E-08	7.74E-06	-4.10E-06	1.10E-05	3.25E-06
MVAG?	-0.000604	1.20E-05	6.27E-05	1.75E-07	-4.47E-06	-3.85E-05	3.25E-06	5.03E-05

APPENDIX 3. CROSS-COUNTRY DATA USED (FIFTY-SIX AFRICAN COUNTRIES)

COUNTRY	DCPS	GDP	GDPGR	GDPPK	IVAGDP	IVAGR	MVAGDP	MVAG	LGDP	LDCPS	LGDPGR	LGDPPK	LIVAGDP	LIVAG	LMVAGDP	LMVAG
Africa	55.73	9.317E+11	4.56	913.08	..	..	..	..	11.96927593	1.746089043	0.65896484	2.96050883	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Algeria	15.81	78708051653	3.01	2219.12	..	..	..	..	10.89601916	1.19893187	0.4785665	3.34618079	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Angola	20.39	25901052471	2.3	1357.36	62.86	5.56	5.79	9	10.41331741	1.309417226	0.36172784	3.13269505	1.79837438	0.74507479	0.76267856	0.95424251
Benin	23.07	3336801340	3	377.04	..	..	..	..	9.523330351	1.363047595	0.47712125	2.57638743	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Botswana	23.4	8405868745	7.19	4188.39	45.25	41.96	3.07	16.65	9.924582604	1.369215857	0.85672889	3.62204711	1.65561858	1.62283548	0.48713838	1.22141424
Burkina Faso	17.61	4548468401	9.24	276.19	..	..	..	..	9.657865182	1.245759356	0.96567197	2.44120795	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Burundi	25.5	966494857.7	3.9	115.29	..	..	..	..	8.985199548	1.40654018	0.59106461	2.06179164	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Cameroon	11.59	13905299155	2.6	709.49	..	..	..	..	10.14318034	1.064083436	0.41497335	2.85094628	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Cape Verde	62.54	944370323.7	5.41	1903.98	..	..	..	..	8.975142331	1.796157877	0.73319727	3.27966238	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Central African Republic	8.73	1054122016	3.3	239.52	..	..	..	..	9.022890884	0.941014244	0.51851394	2.37934178	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Chad	5.68	3097352885	4.3	275.88	..	..	..	..	9.490990688	0.754348336	0.63346846	2.44072022	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Comoros	19.12	247231030.9	2.1	336.48	..	..	..	..	8.39310298	1.281487888	0.32221929	2.52695926	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Congo, Dem. Rep.	6.57	6850715769	7.24	103.85	..	..	..	..	9.835735949	0.81756537	0.85973857	2.0164065	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Congo, Rep.	5.51	5067059617	8.75	1253.32	80.21	..	3.84	..	9.704756014	0.741151599	0.94200805	3.09806197	1.90422852	#VALUE!	0.58433122	#VALUE!
Cote d'Ivoire	18.13	11666499085	3.01	591.07	27.39	4.5	19.24	4.9	10.06694055	1.258397804	0.4785665	2.77163892	1.43759203	0.65321251	1.28420507	0.69019608
Djibouti	..	..	..	..	..	..	..	..	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Egypt, Arab Rep.	33.07	1.64092E+11	5.18	2022.81	29	7.6	13.9	8	11.21508809	1.519434195	0.71432976	3.30595509	1.462398	0.88081359	1.1430148	0.90308999

CONTINUATION OF APPENDIX 3. CROSS-COUNTRY DATA USED (FIFTY-SIX AFRICAN COUNTRIES)

Equatorial Guinea	7.75	6058175791	0.95	8649.58	..	..	..	..	9.782341871	0.889301703	-0.02227639	3.93699502	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Eritrea	15.98	692457271.6	2.2	131.8	..	..	..	..	8.84039298	1.203576775	0.34242268	2.11991541	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Ethiopia	..	18322929015	10.14	220.89	14.28	8.8	5.24	9.76	10.2629949	#VALUE!	1.00603795	2.34417606	1.15472821	0.94448267	0.71933129	0.98944982
Gabon	8.24	6287360043	5.66	4176.36	53.52	2.92	3.73	2.96	9.798468331	0.915927212	0.75281643	3.62079793	1.7285161	0.46538285	0.57170883	0.47129171
Gambia, The	19.08	613102926.8	5.01	354.72	15.73	6.36	4.96	..	8.787533389	1.28057837	0.69983773	2.54988568	1.19672872	0.80345712	0.69548168	#VALUE!
Ghana	15.71	8722164062	6.62	357.59	18.64	6.01	6.47	2.1	9.940624251	1.196176185	0.82085799	2.55338537	1.27044591	0.77887447	0.81090428	0.32221929
Guinea	..	4107607446	1.93	411.52	47.38	6.81	4.76	..	9.613588932	#VALUE!	0.28555731	2.61439095	1.67559506	0.83314711	0.67760695	#VALUE!
Guinea-Bissau	6.23	244395462.7	3.47	161.29	..	..	..	..	8.388093139	0.794488047	0.54032947	2.20760744	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Kenya	34.69	18938389509	5.3	467.47	13.82	7.5	7.65	5	10.27734304	1.5402043	0.72427587	2.66975375	1.14050804	0.87506126	0.88366144	0.69897
Lesotho	14.05	1046135464	3.3	481.8	34.16	7.41	15.65	0.89	9.019587925	1.147676324	0.51851394	2.6828668	1.53351786	0.86981821	1.19451434	-0.05060999
Liberia	..	619202725.5	5.51	155.03	..	..	..	..	8.791832859	#VALUE!	0.7411516	2.19041575	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Libya	..	..	..	..	..	..	..	..	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Madagascar	11.71	5026822443	1.57	242.68	..	..	..	..	9.701293545	1.068556895	0.19589965	2.38503399	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Malawi	..	2743896911	7.1	184.14	..	15.23	..	7.51	9.438367791	#VALUE!	0.85125835	2.26514814	#VALUE!	1.1826999	#VALUE!	0.87563994
Mali	18.37	4148253583	4.5	269.9	..	..	..	..	9.617865297	1.264109156	0.65321251	2.43120288	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Mauritania	..	1592148932	5.01	460.19	37.01	6.25	3.95	5	9.20198369	#VALUE!	0.69983773	2.66293718	1.56831909	0.79588002	0.5965971	0.69897
Mauritius	87.77	6630525389	4.04	5175.19	28.6	1	19.07	1.1	9.821547942	1.943346098	0.60638137	3.7139263	1.45636603	0	1.28035069	0.04139269
Morocco	68.5	59797619847	3.3	1871.52	29.21	2.85	16.05	1.31	10.7766839	1.835690571	0.51851394	3.27219447	1.46553156	0.45484486	1.20547504	0.1172713
Mozambique	25.77	9116571405	7.2	389.75	23.39	6.2	13.08	3	9.959831538	1.411114419	0.8573325	2.59078612	1.36903022	0.79239169	1.11660774	0.47712125
Namibia	45.64	6089324238	4.8	2666.91	19.61	-57.84	7.71	-66.24	9.7845691	1.659345636	0.68124124	3.42600836	1.29247759	#NUM!	0.88705438	#NUM!
Niger	12.63	2793453329	8.81	180.08	..	..	..	..	9.44614142	1.101403351	0.94497591	2.25546548	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Nigeria	29.43	85602703669	7.85	540.34	..	..	..	..	10.93248748	1.468790262	0.89486966	2.73266712	#VALUE!	#VALUE!	#VALUE!	#VALUE!
North Africa	37.08	3.84396E+11	4.18	2323.41	..	..	..	6.55	11.58477871	1.569139725	0.62117628	3.36612585	#VALUE!	#VALUE!	#VALUE!	0.8162413
Rwanda	..	3593742140	7.5	338.27	..	..	..	..	9.555546912	#VALUE!	0.87506126	2.52926348	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Sao Tome and Principe	39.67	..	..	..	..	..	..	..	#VALUE!	1.5984622	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Senegal	25.89	6970078285	4.17	560.58	22.15	4.58	12.77	2.98	9.843237656	1.41313205	0.62013605	2.7486376	1.34537373	0.66086548	1.1061909	0.47421626
Seychelles	28.73	749428459.1	6.2	8661.41	..	..	..	..	8.874730181	1.458335626	0.79239169	3.9375886	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Sierra Leone	10.4	1574302614	4.95	268.31	20.66	3	..	..	9.197088216	1.017033339	0.6946052	2.42863686	1.31513032	0.47712125	#VALUE!	#VALUE!
Somalia	..	..	..	..	..	..	..	..	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

CONTINUATION OF APPENDIX 3. CROSS-COUNTRY DATA USED (FIFTY-SIX AFRICAN COUNTRIES)

South Africa	145.36	1.87234E+11	2.84	3745.34	..	..	..	..	11.27238514	2.162444914	0.45331834	3.57349125	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Sudan	11.62	22819076998	4.45	523.95	33.04	22.5	5.62	6.02	10.35829807	1.065206128	0.64836001	2.71928984	1.51904004	1.35218252	0.74973632	0.77959649
Swaziland	23.29	1845684558	1.1	1556.15	50.29	2	45.17	2	9.266157479	1.367169489	0.04139269	3.19205146	1.70148164	0.30103	1.65485009	0.30103
Tanzania	16.11	19954809364	6.98	445.01	24.55	7.48	9.83	8.64	10.30004758	1.20709554	0.84385542	2.64836977	1.3900515	0.8739016	0.99255352	0.93651374
Togo	22.97	1719332980	3.37	285.23	..	..	..	..	9.235359994	1.361160995	0.5276299	2.4551952	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Tunisia	68.76	30347628073	3.7	2876.8	..	..	..	..	10.48212475	1.837335868	0.56820172	3.45890967	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Uganda	15.81	12614923290	5.18	377.41	25.47	5.82	8.31	6.09	10.10088461	1.19893187	0.71432976	2.5768134	1.40602894	0.76492298	0.91960102	0.78461729
Zambia	11.5	5587389858	7.61	432.25	37.23	10.82	9.16	5.39	9.747208975	1.06069784	0.88138466	2.635735	1.57089304	1.03422726	0.96189547	0.73158877
Zimbabwe	..	4081749006	9	324.68	29.21	11.13	14.92	2.66	9.610846296	#VALUE!	0.95424251	2.51145554	1.46553156	1.04649516	1.17376882	0.42488164
Sub-Saharan Africa (all income levels)	64.88	5.47147E+11	4.79	639.97	..	..	..	..	11.73810366	1.812110841	0.68033551	2.80615962	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Source: World Bank Data Base, 2012. (www.worldbank.org)
GDP = GDP (CONSTANT 2000 US$); DCPS = DOMESTIC CREDIT TO PRIVATE SECTOR (% OF GDP); GDPGR = GDP GROWTH (ANNUAL %); GDPPK = GDP PER CAPITA (CONSTANT 2000 US$); IVAGDP = INDUSTRY, VALUE ADDED (% GDP); IVAG = INDUSTRY, VALUE ADDED (ANNUAL % GROWTH); MVAGDP = MANUFACTURING, VALUE ADDED (% GDP); MVAG = MANUFACTURING, VALUE ADDED (ANNUAL % GROWTH).
LGDP =LOG OF GDP (CONSTANT 2000 US$); LDCPS = LOG OF DOMESTIC CREDIT TO PRIVATE SECTOR (% OF GDP); LGDPGR = LOG OF GDP GROWTH (ANNUAL %); LGDPPK = LOG OF GDP PER CAPITA (CONSTANT 2000 US$); LIVAGDP = LOG OF INDUSTRY, VALUE ADDED (% GDP); LIVAG = LOG OF INDUSTRY, VALUE ADDED (ANNUAL % GROWTH); LMVAGDP = LOG OF MANUFACTURING, VALUE ADDED (% GDP); LMVAG = LOG OF MANUFACTURING, VALUE ADDED (ANNUAL % GROWTH).