Determinants of Inter-Country Variations in Industrial Performance in Africa: Evidence from Cross-Country and Panel Regressions

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Abstract

Can inter-country variations in the industrial performance of African countries be explained by differences in openness and economic reform? Are economic reform and liberalization more salient than investment in human capital and technological change for Africa's industrial development? Using three indicators of industrial performance, this paper investigates whether differences in trade openness, economic reform *or* investment in skills and technological change are responsible for the skewed industrial performance of African countries. Preliminary results from cross-country and panel regressions suggest that neither economic reform nor technological capability is an important explanation for the differences in the industrial performance of African countries. To the contrary, investment in education and training seems to be a more important explanatory variable. This implies that human capital may be an important source of growth of total-factor productivity for African firms. The empirical results also suggest that there may be idiosyncratic or African-specific factors that explain the region's weak industrial performance. The robustness of some of the paper's empirical results is evaluated by a case study of the Nigerian textile industry.

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INTRODUCTION

Following their disappointing experiences with Import-Substitution Industrialization (ISI), many African countries began implementing economic reform and liberalizing their economies in the 1980s in order to promote industrial and economic development. Economists and policy makers believe that economic reform and exposure to international competition would spur African enterprises to become more efficient, enhance their productivity and enable them to achieve international competitiveness.

However, almost three decades after implementing economic reform, most African economies are still monocultural, agrarian, service-oriented or mineral-based. From 1965 to 2005, according at an UNCTAD report, Sub-Saharan Africa's (SSA) manufacturing value added (MVA) was below the level (15% of GDP) achieved in the early 1960s. The report also notes that, since the 1970s, MVA has been about half of that of East Asia and Pacific (United Nations, 2008, p.54). While Asian and Latin American countries have been producing and exporting high-end manufactured products, most African countries still maintain colonial-type production structures that make them vulnerable to shocks and volatility in global markets. As Elhiraika (2008, p. 6) points out "African economies continue to suffer from structural rigidities, especially in the form of over dependence on primary commodity production and exports, and shocks emanating from natural calamities and conflicts. This underscores the need for effective long-term diversification strategies, including industrial and trade policies to promote manufacturing."

The unsuccessful attempts by many African countries to diversify their economies after economic reform have generated debate amongst development economists and

policy makers about why Africa has had disastrous outcomes, compared to other developing regions. One group of economists argues that a major reason for the failure of African countries to industrialize is because they have not implemented economic reform *rigorously* and *consistently* (Sachs and Warner, 1997, p.336). In a study of the impact of economic reform on African economies, the World Bank concludes that adjusting countries typically perform better with regard to industrial development and international competitiveness. Using a sample of 29 countries divided into three categories –"large improvements" in macroeconomic policies, "small improvement," and "deterioration," the Bank notes that those with large improvements in policy experienced better outcomes with regard to key indicators of industrial development such as the growth of manufacturing value added [World Bank, quoted in Lall (1996, 131)]. In another study, the World Bank (1994, p.131) found that median annual per capita GDP growth was almost 2% points higher after the implementation of structural adjustment policies and was 2.6% points lower for countries with a deterioration in macroeconomic policies. Furthermore, *industrial growth was up 6.1% points* in adjusting countries, compared with an improvement of just 1.7% points for countries with deteriorating policies.

Other dissenting analysts contend that economic reform and liberalization *per se* are not sufficient for industrial growth, and may well precipitate a process of de-industrialization unless complemented by explicit investments in skills, knowledge, and technology (Pack and Westphal, 1986). These analysts point out that China, Korea, India, and Singapore became exporters of high-end products and services because they combined economic reform with investment in Research and Development (R&D),

acquisition and absorption of foreign technologies, training of engineers and scientists, promotion of mass literacy, and special incentives for firms to innovate.

While both of the above theoretical insights may seem unassailable on their face value, their empirical validity is contentious and unclear. Yet, for these insights to drive economic policy in Africa, they need to be subjected to empirical analysis. A major goal of this paper is to use cross-country and panel regressions to investigate whether economic reform, human capital, technological capability, or institutional variables are important for Africa's industrial performance. The paper uses three indicators of industrial performance to analyze inter-country variations in Africa's industrial performance, and identifies the factors responsible for those variations. A case study of Nigeria's textile industry is used to test the robustness of the regression results.

The paper is divided into six sections. Following the introduction in Section I, Section II reviews Africa's industrial performance since independence. Section III discusses the various explanations for Africa's abysmal industrial performance, while Section IV presents the empirical model and results. Section V discusses the Nigerian experience with industrial development, and Section VI is the summary, conclusions and recommendations of the paper.

II. INDUSTRIAL PERFORMANCE OF AFRICAN COUNTRIES SINCE INDEPENDENCE

African countries have made two major efforts at promoting industrial growth, both with disastrous and disappointing results. The first major push was during the post-independence era, when ISI became a development mantra for many African countries.

These countries pursued ISI with a great fervor, introducing industrial development policies such as tax holidays, waiver of customs and import duties, provision of cheap credit by government industrial development agencies, construction of industrial estates with infrastructures, subsidies for government-owned enterprises, and tariff protection.[1] The ineffectiveness of ISI was not obvious in the 1960s for a number of reasons. First, many African countries achieved impressive economic growth rates in the 1960s, from 2% for SSA as a group in 1961 to 8% in 1970, leading some observers to believe that industrialization was responsible for that growth. Second, the proliferation of gigantic industrial projects such as steel mills, aluminum smelters, cement and soap factories, and flour mills created false impressions that African economies were "modernizing."

It was not until the late 1970s that the ineffectiveness of ISI began to be manifested in the form of stagnating manufacturing value added, continuous reliance on imported goods and services, slow economic growth and the debt crisis. Table 1 gives a snapshot of the state of industrial development in Africa during 1960 - 2007. Between 1965 and 1980, for instance, MVA as a percentage of GDP for SSA countries remained flat at 16%. Annual growth of MVA was also on the decline, from a high of 9% in 1966 to -2% in 1982 and 1983 (WDI Database). Additionally, the exports of manufactured goods as a percentage of merchandise exports plummeted from 18% in 1977 to 10% in 1983, while the annual percentage growth of exports of goods and services was mostly negative during 1975-1983.[2] The World Bank (1995) notes that, in the 1990s, manufacturing output as a percentage of GDP was still declining or stagnant in about 90 percent of low

[1] In the Nigerian textile industry, for instance, import duties were raised from 20% in 1957 to 33.3% in the early 1960s and then to 75% in 1973. This was followed by the complete prohibition of the importation of textiles in Nigerian in the late 1970s.

[2] These data were compiled from the World Bank's *World Development Indicators (WDI)* database.

and medium income African countries. In many countries, the report observes, agriculture still accounted for over 50 percent of GDP, and only in a handful of countries did manufacturing exceed 20 percent of GDP.

By the mid 1980s, a decade aptly characterized as a "lost decade" for Africa, it became obvious that the continent was sliding into a dangerous economic cliff. The implementation of economic reform by African countries in the 1980s was expected to not only reverse this inglorious industrial development trajectory, but also to set African enterprises on a new path of efficiency, higher productivity, and international competitiveness. Economic reform is premised on the notion that once African countries get "their prices right" through trade liberalization, devaluation, privatization, removal of government subsidies, and reduction or elimination of budget deficits, firms will respond by reducing X-inefficiency, eliminate slack resources, and raise total-factor productivity.

Structural adjustment policies are fairly well-known, and need not be discussed fully in this paper.[3] It would suffice to say, however, that after nearly three decades of implementation of economic reform, the industrial performance of African countries has been no better than it was during the 1960 – 1980 period. Table 1 shows that the austerity measures and tight fiscal/monetary policies adopted by African countries as part of their economic reform did succeed in reducing SSA's external indebtedness, from 63% of GDP in 1990 to 25% in 2007. They also attracted higher inflows of FDI from nearly zero percent of GDP in 1990 to 3% in 2007. Growth rates and GDP per capita also increased as a result of reform. But little or no improvements were made with regard to key industrial indicators. For instance, MVA fell from 18% of GDP in 1990 to 14% in 2007. The annual growth of MVA did not reach the levels attained in the 1960s and 1970s,

[3] For details about adjustment policies in Africa, World Bank (1994).

while manufacturing exports as a percentage of GDP plummeted from 34% in 1985 to 30% in 2006 (World Development Indicators Database). Economic reform and liberalization also failed to wean African countries off their dependence on imports, which rose from 25% of GDP in 1990 to 37% in 2007. Industrial value added remained flat between 1990 and 2007 (Table 1). An UNCTAD report observes that: "In the period 2000-2006, only 8 countries out of a sample of 35 had manufacturing exports representing 10 per cent or more of GDP. At the continental level, this represented manufacturing export shares averaging 26 per cent of total merchandise exports. This gives Africa the lowest share of all developing regions." (United Nations, 2008, p.54)

In contrast, Asian countries have had a better experience with industrial development than Africa during the post-adjustment era. Exports of goods and services in South Asia, for instance, tripled from just 7% of GDP in 1985 to 21% in 2007 (see Table 2). More significantly, manufacturing exports as a percentage of merchandise exports rose from 57% in 1985 to 66% in 2007. Though MVA rose modestly in absolute terms, it grew rapidly from 4% in 1985 to 8% in 2007 (World Development Indicators Database). Africa's industrial performance becomes even more disappointing when one considers the performance of East Asia and the Pacific, where exports of goods and services more than tripled from 15% of GDP in 1985 to 48% in 2007 (World Development Indicators Database). Industry and MVA also rose within the same period.

Although Africa's industrial performance has been below expectation, it varies across countries as shown in the last column of Table 3. Using the Index of Industrial Performance (IPI) in Table 3, African countries can be classified into different levels of industrial performance (see Table 4). The table shows that the top performers are:

Botswana, Mauritius, Morocco, South Africa, Swaziland, and Tunisia. Medium performers include Cote d'Ivoire, Namibia, and Senegal, while a preponderance of African countries are classified as either weak or poor. Notice from Table 4 that all the top performers are located in southern and northern Africa. No southern or northern African country is classified as a poor performer. Perhaps the greatest anomaly in the ranking is Nigeria's classification as a poor performer, an anomaly that is discussed in detail in Section V. Nigeria has had a long history of industrialization, and is arguable one of the largest economies in Africa. An analysis of the country's poor industrial performance will provide additional insights into why the industrial performance of African countries varies.

We have seen from the preceding paragraphs that Africa's industrial performance has been unimpressive relative to both its post-independence performance, as well as the performance of other developing regions. The next section reviews different perspectives on the region's disappointing performance.

III. DEBATE OVER AFRICA'S ABYSMAL INDUSTRIAL PERFORMANCE

Explanations of Africa's lackluster industrial performance have pitched two groups of analysts against each other. One group consists of those who argue that Africa's poor performance is due to the failure of African countries to implement economic reform and open up their economies to international competition. They argue that economic reform spurs enterprises to move faster along their learning curves and enhance their total factor productivity. Krueger (1997) contends that outward-oriented industrial development strategies encourage firms to adopt more efficient production techniques, and hence move

them closer to the international productivity frontier. According to these economists, trade barriers are still prevalent in Africa, and many African countries still retain trade and industrial policies that promote inefficiency in the manufacturing sector (Collier and Gunning, 1999)

Young (1992, p.198) observes that South Korean firms achieved significant increases in sales and market share after trade liberalization in the 1970s. He cited a study undertaken by the Overseas Development Institute (ODI) that analyzed how a sample of 207 Korean firms responded to import liberalization. The ODI study revealed that only 4.8% of the firms surveyed indicated that import liberalization resulted in lower technological development (Young, 1992, p.195). In other words, liberalization resulted in the strengthening of the technological capability and industrial performance of Korean firms.

But critics of economic reform question these perspectives, pointing out that the lack of technological capability and skills usually limits the ability of firms in adjusting countries to increase enhance their efficiency, productivity and international competitiveness (Pack, 1993). In his study of economic reform in Ghana, Lall (1994) notes that "rapid liberalization, unaccompanied by supply-side measures to develop skills, capabilities and technical support, led to significant and costly deindustrialisation." Adei (1990) also found that the failure of the Bonsa Tyre Company in Ghana to improve its performance after the implementation of reform in the country was due to the firm's weak technological capability.

Analysts also point out that the industrial boom experienced by Korea after liberalization was because the Korean government provided a plethora of incentives for

Korean firms to upgrade their skills and technological capabilities. The literature on industrial development in developing countries is replete with evidence of the proactive approach adopted by the Korean state to enhance the technological capability of Korean firms [see, for instance, Amsden (1989) and Kim et al. (1987)].Contrary to the Korean experience, Leff (1979, p.53) contends that "widespread success has not been achieved in technological entrepreneurship" by African countries. In the field of industrial technology, he argues, "African firms often find it more economical to import off-the-shelf know-how via licensing agreements rather than reinvent the wheel."

Africa's poor science and technology infrastructure seem to lend credence to the notion that lack of technological capability may be partly responsible for the region's poor industrial performance. As shown in Table 5, Africa spends less than other regions on R&D, and has the lowest number of researchers. Africa also pales other developing regions with regard to the volume of scientific publications (UNESCO Database).The extent to which weak technological capability and other macroeconomic factors have affected Africa's industrial performance is unclear, and requires empirical investigation.

EMPIRICAL ANALYSIS

The previous section has shown that the industrial performance of African countries can be affected by economic and technological factors. But the empirical validity of some of those factors have not been systematically explored in the literature, especially with regard to African economies. The aim of this section is to use cross-country and panel regressions to investigate whether economic reform, technological capability, human capital, and institutions explain inter-country variations in the industrial performance of

African countries. Industrial performance is an amorphous concept that can be operationalized in different ways. In recognition of the multidimensional nature of the concept, I use three measures of industrial performance as dependent variables in the empirical analysis: Average Manufactured Exports (AME) as a percentage of GDP, Manufactured Valued Added (MVA) as a percentage of GDP, and an Industrial Performance Index (IPI) computed as the sum of the first two measures.

Four sets of explanatory variables are included in the regression model:

Economic Reform Variables

Macroeconomic Stability (MACRO): Economists argue that countries with strong, credible, and stable macroeconomic policies tend to perform better than those with weak and unstable policy environments (Meier and Steel, 1989). As mentioned in Section I, a World Bank study found that countries with strong adjustment policies tend to achieve higher levels of industrial growth (1994, p.131). I measure macroeconomic stability amongst African countries by using the World Bank/World Economic Forum's (WEF) ranking of countries all over the world in terms of their macroeconomic performance. The ranking ranges from 1 (the highest level) to 128, the least. Thus, I expect MACRO to be negatively correlated with the dependent variables: AME, MVA and IPI.

Market Efficiency (MKTE): Proponents of economic reform in Africa contend that it promotes efficiency in product and factor markets. Efficient markets are good for industrial development because they generate price signals that lead firms to allocate scarce resources efficiently. With the removal of price distortions caused by excessive state intervention, firms would have the incentive to raise their productivity and output.

Market competition will also lead to the demise of inefficient state-owned or state-supported enterprises. The surviving firms will then have a larger market share, and reap scale economies. The resulting lower unit costs would enhance firms' international competitiveness (World Bank, 1994). I use the WB/WEF ranking of countries on the basis of the efficiency of their markets as a proxy for MKTE, and I expect its coefficient to be negative.

Openness of the Economy (OPEN): Other things constant, openness leads to a better industrial performance by spurring enterprises in an economy to become competitive internationally (Krueger, 1997). Without the shield of tariffs, import prohibition, and other protective measures, firms have no choice but to become efficient, adopt least-cost production techniques, and aggressively explore foreign markets (World Bank, 1994). As pointed out in Section II, several years of inward-looking policies have left African countries industrially weak and unable to compete internationally. Openness is measured by two variables: FDI inflows as a percentage of GDP and Trade as a percentage of GDP. I expect both of these variables to be positively correlated with the three measures of industrial performance.

Technological Variables

Technological Readiness (TECHR): The ability to acquire and assimilate modern technology is very critical for enhancing the efficiency, total factor productivity and international competitiveness of African firms (Pack and Westphal, 1986). The literature on "National Systems of Innovation" is replete with case studies of how Korea and other

Newly Industrialized Countries (NICs) succeeded in strengthening their technological capability, which subsequently resulted in their profound industrial transformation (Amsden, 1989). I use the World Bank/WEF's ranking of the technological readiness of countries all over the world as a proxy for TECHR. Since rank number 1 represents the most technologically advanced country in the world, I expect TECHR to be negatively correlated with industrial performance.

Innovation (INNOV): Industrial performance also depends on the ability of a country to use its technological knowledge to produce innovative goods and services (Moore, 1989). Such goods have the effect of setting the country apart from other exporters, thus giving it a sustained competitive advantage (Perkins, 1989). Indian and Chinese corporations have succeeded in breaking into foreign markets that were once dominated by Western and Japanese firms because of their ability to produce innovative goods and services at lower costs. INNOV is measured using WB/WEF ranking, and is expected to be negatively correlated with industrial performance.

Human Capital Variables

Education and Training (EDUCT): A well-educated workforce is crucial for industrial development (McMahon, 1987). First, universal primary and secondary education enhances productivity by inculcating in workers good work ethics, as well as the acquisition of specialized knowledge (Currie, 1986, p.543). Second, it enables firms to quickly and easily assimilate new technologies. Third, a firm's propensity to introduce innovative products and services is higher if the country has a larger pool of educated and

well-trained workforce (McMahon, 1987). As part of its annual evaluation of the competitiveness of countries across the world, the WB and the WEF have been ranking countries according to the education and training of their workforce, with number 1 being the highest ranked country. Number 128 is the least ranked country. Other things constant, EDUCT should be negatively related to industrial performance. Another proxy used for education and training is public expenditure on education as a percentage of GDP, and I expect this proxy to be positively correlated with industrial performance.

Institutional Variables

Institutional Quality (INST): Institutional economists argue that ineffective institutions are some of the greatest hurdles to growth and development in Africa (Collier and Gunning, 1999). They specifically point to corruption, lack of the rule of law and transparency, bureaucratic red tape, and inefficient factor and product markets as constraints to industrial development (Estache and Wren-Lewis, 2009). Others point to the phenomenon of the "Dutch Disease," in which resource-induced rent-seeking behavior crowds-out economic activities such as manufacturing (De Silva, 2004). Again, using the WB/WEF ranking on institutions, INST should be negatively correlated with industrial development.

Infrastructure (INFR): The availability of good infrastructures such as water, electricity, roads, and fuel is important for industrial development. Poor infrastructures often result in higher production costs, as manufacturers would have to provide such facilities by themselves. They will thus become uncompetitive with firms in countries where

infrastructures are excellent (World Bank, 1994). INFR is proxied by the WB/WEF ranking of infrastructures, with the usual methodology of assigning lower numbers to countries with excellent infrastructures. INFR is thus expected to be negatively correlated with industrial performance.

Sources of Data

Data on MVA, Trade, and FDI inflows were collected from the *World Development Indicators* database. Data on manufacturING exports as a percentage of GDP came from UNCTAD's 2008 report on *African Economic Development,* while data on all other variables came from the World Bank/World Economic Forum's *African Competitiveness Report, 2007and 2008.* Data used for the cross-country and panel regressions were for 2006 and 2007. The choice of these years was based on data availability. There were missing data points for several African countries, which necessitated a reduction in the number of observations to 22 countries. The descriptive statistics for the dependent and explanatory variables are summarized in Table 6.

Results and Discussions

Five OLS regressions were estimated, with Manufacturing Value Added, Average Manufacturing Exports, and the Industrial Performance Index as dependent variables. The results are reported in Table 7. They show that the determinants of industrial performance in Africa differ according to the indicators used to measure performance. In other words, it would not be very useful to generalize about what determines industrial performance in Africa, without specifying what one means by industrial performance.

Model 1 shows that, when defined on the basis of average manufactured exports as a percentage of GDP, industrial performance in Africa depends on macroeconomic stability and institutional quality. Specifically, a one-point increase in a country's ranking on macroeconomic stability raises the country's manufactured exports by about 0.11%. A one-point increase in institutional quality also increases manufactured exports by about 0.28%. None of the technological indicators are significant, suggesting that differences in the technological capability of African countries do not explain differences in their manufactured exports.

Model 2, which measures industrial performance in terms of manufacturing value added as a percentage of GDP, shows that only INFRA is significant at the 10% level. A one-point increase in a country's ranking on infrastructure increases MVA by about 0.03%.This implies that differences in MVA amongst African countries are not attributable to economic reform, technological or human capital variables. It should be pointed out, however, that Model 2 has very low R-squared and adjusted R-squared values (0.49 and 0.23 respectively).

Model 3 uses the Industrial Performance Index (IPI) as the dependent variable. The IPI can be considered a more superior indicator of industrial performance, as it combines manufactured exports and manufacturing value added, both as a percentage of GDP. The regression results show that OPEN is significant for the IPI, but with an unexpected sign. The negative sign on the coefficient on OPEN implies that the more open an economy is, the lower its industrial performance. In other words, liberalization of the economy does not enhance a country's industrial performance. As Model 3 in Table 7 shows, a 1%

increase in FDI inflow decreases the IPI by about 0.74%.[4] EDUCT is also significant for industrial performance at the 10% level. A one-point increase in ranking on education and training raises a country's IPI by 0.29%. With an R-squared value of 77%, Model 3 has a better fit than the other four regression models.

It is instructive to note that none of the technological indicators (Technological Readiness and Innovation[5]) is significant in the three models. Thus, there is no strong empirical support for the notion that technology and innovation are *important* determinants of inter-country variations in the industrial performance of African countries. That said, it is imperative to point out some of the shortcomings of the empirical analysis. The few observations in the regressions (and hence small degrees of freedom) may have the effect of exacerbating multicollinearity, which would result in small t-values and insignificance of some of the explanatory variables. Table 8 summarizes the correlation matrix for the dependent and explanatory variables, and it shows that some of the variables are indeed correlated. Note, in particular, the high correlation between the following pairs of variables: TECHR/EDUCT, INFR/EDUCT, INFRA/TECHR and INFR/INST.

To increase the sample size, as well as minimize the correlation problems reported in Table 8, I re-estimated the model as a panel regression that includes data for the period 2006-2007 for 19 African countries. This increased my observation from 22 to 38, and the results of the panel regression (with MVA as dependent variable)[6] are reported under Model 4. EDUCT is the only significant variable for MVA at the 5% level.

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[4] When Trade as a percentage of GDP was used as a proxy for openness, OPEN was insignificant.
[5] Technological Readiness was replaced with Innovation in the three models, but it turned out to be insignificant each time.
[6] Data on IPI are unavailable for many African countries.

I next investigate the empirical validity of the notion that African countries typically achieve a lower industrial performance than other developing countries. I use a sample of 19 African countries, and a random sample of 20 other developing countries in Asia, Latin America/Caribbean, and the Middle East.[7] Due to lack of data for many developing countries, the measure of industrial performance used for this analysis is MVA (which is the dependent variable in the model). A dummy variable that assigns the number 1 to non-African countries and zero to African countries is included in the model, in addition to most of the explanatory variables used in Models 1-4.

The result of this regression is shown in Table 7, Model 5. The result indicates that the coefficient on the dummy variable is positive and significant at the 10 percent level. This suggests that, if the values of all the explanatory variables were the same for African and non-African developing countries, MVA as a percentage of GDP would be about 4.4% higher for a non-African country than an African country. In other words, there appears to be idiosyncratic or African-specific factors that explain the poor industrial performance of African countries. Although the identification of these factors are beyond the scope of this paper, the Africa-specific variables may include the fact that many African countries are landlocked, which increases transportation costs that render their manufacturing inefficient. The initial conditions under which African countries began their process of industrial development may also have been unfavorable, compared to other developing regions.

Model 5 also shows that EDUCT and MACRO explain differences in the industrial performance of African countries and other developing regions. It is instructive to note that, while macroeconomic stability does not explain inter-country variations in the

[7] About 6-7 countries were selected from each region based on the alphabetical listings of the countries.

industrial performance of African countries, it does explain the skewness between the industrial performance of African countries vis-à-vis other developing countries. However, Model 5 has a very low R-squared value of just 46%.

V. ROBUSTNESS TEST: THE CASE OF THE NIGERIAN TEXTILE INDUSTRY

One of the key results from the empirical analysis in the previous section is that openness and liberalization, *per se*, do not positively affect the industrial performance of African countries. In none of the five regression models is openness significant with the right sign. The insignificance of openness for industrial performance is consistent with an UNCTAD report which shows that "Africa has played almost no role in the world manufacturing trade, both before and after trade liberalization," (UNCTAD, 2008, p.59). In this section, I use evidence from the Nigerian textile industry to show that economic reform and trade liberalization did not improve the country's industrial performance.

Nigeria is considered as one of the African countries that have implemented economic reform vigorously (Easterly (2006, pp.346-347). Determined to reverse the inglorious economic trajectory of the previous decade, and to garner concessions from the country's bilateral and multilateral creditors, the Obasanjo regime implemented economic reform with a tenacity never seen in Nigeria's economic history. So aggressive was the administration's implementation of reform that the Bretton Woods institutions and the international financial community showered praises on the administration. As a reward for its adjustment intensity, Nigeria also received significant debt relief from its international creditors, which saw the country's external debt plummet from a whopping $30 billion to less than $5 billion.The liberalization of the Nigerian economy is also

manifested in the increase in trade from 38% of GDP in 1986, when economic reform was first introduced in the country, to nearly 90% in 2005 (World Development Indicators Database).

However, Nigeria's industrial performance has declined inexorably since its implementation of reform. Nowhere is this decline more manifested than the country's textile industry, the largest and oldest in the country.[8] Between 1991 and 2007, the number of firms in the textile industry plummeted from about 200 to 28, while the number of workers fell from 250,000 to 18,000 (NTMA, 2007, quoted in All Africa Global Media, December 7, 2007. Most of the surviving firms are fledgling, and more are expected to go out of business. According to the Secretary-General of the National Union of Textile, Garment, and Tailoring Workers of Nigeria, Issa Aremu, 15,000 jobs have been lost in the industry within the past year alone (Daily Champion, 2008). A recent survey showed that the cumulative market share of local textile firms in the Nigerian market is now 20 per cent, down from over 90 percent prior to SAP."[9]

Economic reform and liberalization of the Nigerian economy did not also seem to have spurred Nigerian firms to enhance their productivity and export performance. Table 9 shows that the productivity levels of the mills continued to be low after the implementation of economic reform, compared to those of a South Korean firm and "Best Practice."[10] For instance, the most productive of the Nigerian mills shown in the table had

[8] It accounted for 22.1% of employment and 15.2% of manufacturing value added in 1984 (UNIDO, 1988: 17). In good times, when it operated at nearly full capacity in 1981, it employed about 250,000 workers (Short, 1989: 1). In the late 1980s, it consisted of about 134 mills of which 45 were medium and large-scale, with a combined installed capacity of 860 million linear meters (Short, 1989: 1-2).

[9] Nigeria: How Nigerian Textile Failed to Tap Into the $31bn US Booming Garment Market, Vanguard (Nigeria), April 14, 2008.

[10] Best Practice productivity levels are those specified by equipment manufacturers as being optimal. In other words, they specify the potential levels of output that could be attained if the equipment is used

labor productivity that was just 14% of best practice, and 25% of that of a Korean firm. The least productive of the firms had labor productivity that is about 3% of best practice and 5% of that of a Korean firm. The Nigerian mills, however, performed better with regard to machine productivity; indeed better, in some cases, than both best practice and the Korean firm. Although the other mills had levels of machine productivity that were lower than both best practice and a Korean firm, their machine productivity was not as dismal as their labor productivity.

Given their low labor productivity levels,[11] the Nigerian textile mills were not internationally competitive ---five years after liberalization and implementation of economic reform. Table 10 shows that Nigeria's exports of manufactured goods have been abysmal compared to many other SSA countries. In 1999, manufactured exports as a percentage of merchandise exports was a paltry 1%, the same level as in 1965! Although the number rose to 5% in 2002, it plummeted to 2% in 2003. The situation is even worse in textiles, where export as a percentage of merchandise exports was zero between 1965 and 1991 (see Table 11). It is noteworthy that over five years after liberalization, Nigeria's exports of textiles continued to lag behind those of Kenya, Cote d'Ivoire, and Mauritius.[12]

The regression results in Section IV show that Education and Training are important for industrial performance in Africa. This author interviewed a random sample of 16

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efficiently and according to the norms stipulated by the equipment manufacturers. However, most firms (even the very efficient ones) do not often attain the Best Practice productivity levels. Their productivity levels are measured by how far those levels are from Best Practice.

[11] For developing countries where the use of labor-intensive technologies is prevalent, labor productivity (rather than machine productivity) is a key determinant of international competitiveness.

[12] It is noteworthy that the first Nigerian export of garments to the United States under the African Growth and Opportunity Act (AGOA) Act of 2000 took place just this past July 2008. F&D Garment Manufacturing Co. in Lagos became the first textile firm to take advantage of the Act, designed to facilitate the access of African manufacturers to the US market in order to promote the growth of African economies through trade and investment.

textile mills in Nigeria in 1991, and found at that time that they had invested very little in the training of their workers (see Table 12). A 2008 visit to these firms showed that 15 of the firms surveyed in 1991 had gone out of business, with their buildings converted into churches, warehouses and other non-manufacturing activities. The 1991 interviews and visits to the firms showed that training in most of the mills was unsystematic, with no specific long-term training goals. The lukewarm attitude to training is partly manifested in the lack of formal training schools/centers, training equipment, and training managers in most of the mills, and in the fact that all the mills surveyed spent, on the average, less than 1 percent of their annual sales on training (see Table 12). This can be contrasted with the NICs, where the government made it mandatory for firms to spend at least 5-6 percent of their annual sales on training (McMahon, 1987). Some of the Nigerian mills used their cafeterias as training centers, while in most of the mills, the human resource manager doubled as training manager. According to the human resource manager of one of the mills, the top management of most Nigerian mills regard training as a "waste of resources".

Training in most of the mills focused on production-related activities, particularly in the training of production supervisors, line managers, and production operatives. None of the mills undertook any training in textile engineering, which implied that the mills were mainly interested in acquiring the capacity to operate and maintain production equipment, as opposed to the capacity to adapt, modify, and improve on imported technologies. Table 12 also shows that the firms had not been able to attract professional engineers with university degrees in engineering. There were very few engineering staff employed by the mills, and nearly all of them possessed the Higher National Diploma

(HND) degree, which are considered to be sub-standard in the engineering profession in Nigeria. None of the mills employed an engineer with a university degree.

It seems, therefore, that the Nigerian case supports the notion that economic reform and liberalization do not automatically lead to a better industrial performance. It also lends credence to the contention that education and training can be critical for industrial performance in Africa.

VI. SUMMARY, CONCLUSION, AND POLICY RECOMMENDATIONS

This paper has shown that Africa's industrial performance has been abysmal relative to other developing regions. Despite two major efforts to promote industrial development in the region, Africa's industrial performance is no better today than it was during the immediate post-independence era. There also are inter-country variations in the industrial performance of African countries, with the top performers located in southern and northern Africa.

There is debate about the factors responsible for the region's disappointing performance. While some analysts attribute Africa's poor performance to inadequate and inconsistent economic reform, others blame the lack of investment in innovation, technology and human capital for the problem. On the basis of results from OLS and panel regressions, this paper finds weak evidence to support the contention that lack of economic reform is responsible for the regions lackluster industrial performance. Specifically, the results suggest that liberalization might even lead to de-industrialization. There also is no strong evidence that technological factors or innovation play important roles in the inter-country variations in the industrial performance of African countries. Rather, education and training seem to be important explanatory variables. A case

analysis of the Nigerian textile industry lends some credence to the notion that economic reform and liberalization *per se* may not be a panacea for Africa's poor industrial performance.

Results from the empirical section of the paper imply that African countries should not rely entirely on economic reform as a strategy for promoting industrial development. Economic reform and liberalization have their merits, but they should be complemented by explicit investment in education and training. Abrupt exposure of African firms to international competition may be counter-productive, as the case of the Nigerian textile industry has shown in section V of the paper. Rather, the process of exposure should be sequenced in such a way that African firms will gradually develop the skills and capabilities for competing globally.

The regression results also confirm the widely held view that African countries tend to achieve a lower industrial performance than other developing regions of the world. The variation between the industrial performance of African and other developing countries can be explained by differences in human capital and macroeconomic stability. The significance of the regional dummy suggests that there are African-specific factors that explain the abysmal industrial performance of African countries. Further empirical research that uses more observations and alternative sources of data is needed to investigate these African specific factors, as well as reaching a more definitive conclusion on the determinants of the industrial performance of African countries.

Table 1

Industrial Performance of African Countries, 1960 – 2007

Variable	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2006	2007
FDI % of GDP	-	-	1	1	0	0	0	1	2	3	3	3
GDP Growth %	-	6	8	1	4	1	1	4	4	6	6	6
GDP Per Capita*	435	495	547		593	542	533	492	508	559	579	601
Imports of Goods & Services % GDP	24	26	25	30	31	26	25	30	31	34	35	37
Industry Value Added % GDP	-	31	31	33	37	34	32	29	29	31	32	32
Manufacturing Value Added % GDP	-	17	18	18	17	16	18	16	15	13	13	14
External Debt Stock % GDP	-	-	11	15	23	53	63	76	66	36	25	25

*Constant 2000 US$

Source: World Development Indicators

Table 2: Industrial Performance of South Asian Countries, 1960 – 2007

Variable	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2006	2007
FDI % of GDP	-	-	0	0	0	0	0	1	1		2	2
GDP Growth %	-	-1	6	7	6	5	5	7	4	9	9	8
GDP Per Capita*	186	202	225	224	239	277	327	377	448	565	606	647
Industry Value Added % GDP	19	21	21	23	24	25	26	27	26	28	29	29
Export of Goods & Services % of GDP	6	5	5	7	8	7	9	12	14	19	21	20
Manufactured exports % of Merchandise Exports	-	42	48	42	54	57	71	76	79	74	70	66
Manufacturing Value Added % GDP	14	15	14	16	16	16	16	17	15	16	17	17
External Debt Stock % GDP	-	-	15	17	16	7	9	12	14	19	21	21

*Constant 2000 US$

Source: World Development Indicators

Table 3: Inter-country Variations in Industrial Performance

Country	Average Manufacturing Exports (% of GDP), 2000 – 2006	Manufacturing Value Added (% of GDP)	Industrial Performance Index (IPI)*
Benin	1.3	5	6.3
Botswana	35.7	4	39.7
Burkina Faso	1.4	15	16.4
Burundi	0.4	9	9.4
Cameroon	0.9	18.0	18.9
Cape Verde	1.4	7.0	8.4
Cote d'Ivoire	7.8	19.0	26.8
Egypt	2.1	16.0	18.2
Ethiopia	0.8	5.0	5.8
Gabon	4.0	4.0	8.0
Gambia	0.6	5	5.6
Ghana	4.5	8.0	12.5
Guinea	6.3	4.0	10.3
Kenya	3.5	12.0	15.5
Madagascar	6.3	13.0	19.3
Malawi	2.6	14.0	16.6
Mali	8.8	3.0	11.8
Mauritius	26.1	18.0	44.1
Morocco	14.0	19.0	33.0
Mozambique	1.1	16.0	17.1
Namibia	17.2	11	28.2
Niger	1.8	-	-
Nigeria	0.7	3	3.7
Rwanda	0.2	6.0	6.2
Senegal	7.5	13	20.5
Seychelles	2.3	17	19.3
South Africa	13.2	18	31.2
Sudan	0.3	6.0	6.3
Swaziland	46.9	41	87.9
Togo	13.7	10	23.7
Tunisia	25.9	17	42.9
Uganda	1.0	9	10.0
Tanzania	1.9	7	8.9
Zambia	4.4	11	15.4

*IPI = Average Exports + Manufacturing Value Added

Table 4: Ranking African Countries Based on their Industrial Performance*

Top Performers (IPI >= 30	Medium Performers (IPI 20 – 29	Weak Performers (IPI 10 – 19)	Poor Performers (IPI < 10)
Botswana	Cote d'Ivoire	Burkina Faso	Benin
Mauritius	Namibia	Cameroon	Burundi
Morocco	Senegal	Egypt	Cape Verde
South Africa	Togo	Ghana	Ethiopia
Swaziland		Guinea	Gabon
Tunisia		Kenya	Gambia
		Madagascar	Nigeria
		Malawi	Rwanda
		Mali	Sudan
		Mozambique	Tanzania
		Seychelles	
		Uganda	
		Zambia	

*Other countries could not be ranked because of the non-availability of day

Table 5: Regional Science and Technology Indicators

Regions/Countries	GERD as % World GERD*	GERD as % of GDP	GERD per Inhabitant (PPP $)	Researchers as a % of World Total	Researchers Per Million Inhabitants	GERD Per Researcher (thousands of PPP$)
Developing Countries	15.6	0.6	20	28.4	347	57.9
Developed Countries	84.4	2.2	377	71.6	3,033	124.2
Asia	27.9	1.3	46	34.5	537	85.1
Latin America & the Caribbean	3.1	0.5	34	6.7	715	48.2
SSA (excluding Arab States)	0.5	0.3	6	1.0	113	49.1
Arab States (in Africa)	0.2	0.2	7	1.5	489	14.9
Arab States (in Asia)	0.1	0.2	11	0.1	52	211.4
Arab States (All)	0.4	0.2	8	1.6	356	23.6
China	3.9	0.6	17	10.6	454	38.3
India	2.0	0.7	11	2.8	151	75.8

*GERD stands for Gross Domestic Expenditure on Research & Development

Source: Computed from UNESCO statistics published in *The State of Science and Technology in the World,* Paris, UNESCO Institute of Statistics, 2001, p. 7.

Table 6: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
MVA	11.05	5.67	3	20
FDI	4,42	3.86	0	16
EDUC	100.18	25.90	27	132
MACRO	87.58	34.04	22	129
TECH	92.95	25.10	33	132
INST	69.68	28.45	22	120
INFR	86.55	31.47	33	124

Table 7: Regression Results

Variable	Model 1: AME	Model 2: MVA	Model 3: IPI	Model 4 (Panel): MVA	Model 5: MVA
Intercept	42.2	23.35	61.27		16.06
MACRO	-0.11 (0.09)**	0.06 (0.18)	0.03 (0.62)	0.02 (0.72)	0.05 (0.06)**
MKTE	0.25 (0.27)	0.15 (0.35)	-0.21 (0.17)		
OPEN	-0.54 (0.19)	-0.34 (0.24)	-0.74 (0.10)**	0.11 (0.68)	-0.25 (0.24)
TECHR	-0.07 (0.76)	-0.12 (0.46)	-0.18 (0.48)	0.08 (0.38)	0.09 (0.29)
EDUCT	-0.14 (0.35)	-0.17 (0.11)***	-0.29 (0.08)**	-0.33 (0.02)*	-0.17 (0.04)*
INST	-0.28 (0.05)*	0.04 (0.72)	-0.10 (0.54)	0.11 (0.34)	0.05 (0.36)
INFRA	-0.03 (0.83)	-0.03 (0.08)**	0.38 (0.12)	-0.0003 (0.99)	-0.06 (0.40)
DUMMY					4.37 (0.09)**
Observation	22	22	22	38	39
R-Squared	0.73	0.49	0.77		0.46
Adjusted R-Squared	0.59	0.23	0.65		0.34

* significant at the 5 percent level
** significant at the 10 percent level
*** significant at the 15 percent level

Table 8: Pairwise Correlation Matrix

	MVA	FDI	EDUCT	MACRO	TECHR	INST	INFR
MVA	1.00						
FDI	0.02	1.00					
EDUCT	-0.52	-0.04	1.00				
MACRO	0.18	0.32	0.32	1.00			
TECHR	-0.44	-0.03	0.88	0.40	1.00		
INST	-0.23	-0.15	0.64	0.09	0.65	1.00	
INFR	-0.40	-0.02	0.78	0.31	0.81	0.82	1.00

Table 9: Productivity of the Nigerian Textile Mills in 1991

FIRM	Labor Productivity (meters per labor hour)	Machine Productivity (meters per loom hour)
Best Practice*	360.36	39.8
Korean Firm*	224.0	35.4
Afprint	37.9	13.8
Bhojsons	10.0	39.8
Dalamal	50.0	53.6
Fablon	12.9	18.7
Five-Star	41.7	20.4
Jaybee	17.9	31.3
KTM	10.0	N/A
NTM	7.5	N/A
Speco	22.5	13.2
Westex	18.8	39.1

Sources: Field Survey
*Amsden (1989)

Table 10: Export of Manufactured Goods as a % of Merchandise Exports

Country	1965	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Benin	6	4	4	3	6	7	6	8	7	9	9	-
Cape Verde	-	76	78	84	83	90	96	94	88	90	56	38
Cote d'Ivoire	5	6	17	19	21	14	19	21	20	19	19	15
Gabon	11	2	3	4	5	2	4	4	24	7	4	4
Gambia	-	20	25	5	12	17	3	21	27	42	17	14
Ghana	-	10	15	20	20	15	16	-	14	12	24	31
Kenya	-	26	25	24	22	21	23	24	24	26	-	-
Mauritius	-	68	71	73	75	81	74	73	74	71	63	69
Nigeria	1	1	3	2	1	0	0	5	2	-	-	-
Senegal	3	48	46	53	57	27	29	70	34	39	43	44
South Africa	-	55	58	54	55	47	59	63	58	58	57	53

Source: World Development Indicators

Table 11: Export of Textiles & Clothing as a % of Merchandise Exports

Country	1965	1970	1988	1989	1990	1991	1992
Nigeria	0	0	0	0	0	0	0
Cote d'Ivoire	1	1	-	2	2	2	2
Kenya	0	1	-	1	1	2	3
Mauritius	0	1	47	51	24	24	54
South Korea	29	36	22	23	22	21	20
Hong Kong	52	44	29	39	39	40	40
India	36	25	25	23	23	25	25

Source: World Development Report (various years)

Table 12: Training in the Sample Firms

FIRM	Training intensity	Training Emphasis	Engineering Training	Highest Diploma	Annual Training Budget (US$)	Training Budget as % of Sales
ATM	very low	Administrative	None	HND*	5000	0.5
Afprint	Fair	production & maintenance	None	HND	50,000	0.2
Arewa	Low	production & maintenance	None	HND	6000	0.03
Bhojsons	very low	Machine operatives	None	HND	4000	0.03
Churchgate	High	Machine efficiency, safety & quality control	None	HND	40000	0.08
Dalamal	very low	Machine operatives	None	HND	n/a	n/a
Enpee	very low	Productivity improvement & safety	None	HND	6000	0.03
Fablon	very low	Safety	None	HND	5000	0.1
Five-Star	Low	Machine operatives	None	HND	5000	0.02
Issardas	very low	Machine operatives	None	OND	n/a	n/a
Jaybee	very low	Safety, maintenance, & supervision	None	HND	1000	0.05
KTM	Low	no emphasis	None	HND	25,000	0.5
Northern Textiles	very low	Machine operatives	None	HND	8000	0.03
NTM	very low	Machine operatives	None	HND	6000	0.05
Speco	High	Production	None	HND	n/a	n/a
Westex	Low	Production	None	HND	15,000	0.2

Source: Author's Field Survey, 1991

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