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**Promoting Industrial Development in Africa: Serendipity or Good
Policy?**

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Abstract: Following the success of East Asian countries with export-led industrialization strategy, many African countries have made concerted efforts to spur industrial development through structural and institutional reforms. While a few African countries like Botswana, Mauritius, Morocco, South Africa, Swaziland and Tunisia have achieved impressive levels of industrial development, many others have not. Indeed, a few have experienced a process of deindustrialization over the past 20 years. What did the successful countries do right? Can their stellar performance be attributed to sheer luck, better governance or good policies? If so, what is the nature of those policies, and can they be replicated in other countries? What lessons might the unsuccessful countries learn in their efforts to promote industrial development, especially in the post-crisis era when employment generation has become a crucial policy goal in Africa? Rather than comparing African countries with the “Asian Tigers” as most studies do, it is more useful to compare African countries with their successful peers in Africa.

This paper investigates whether variations in economic, institutional, and trade reforms explain differences in the industrial performance of African countries. As a prelude to this goal, the paper constructs an index of industrial development, and uses it to classify African countries according to levels of industrial performance. Second, cross-country regression models are used to ascertain the relationship between economic, institutional, and trade reforms on the one hand, and industrial development on the other. Third, the regression analyses are reinforced with a review of some of the major policies that contributed to the success of the top industrial performers in Africa. The paper concludes that a combination of good policies and serendipity played a major role in the impressive industrial performance of these countries.

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INTRODUCTION

African countries cannot sustain growth and alleviate poverty without transforming their economies, from dependence on the export of agricultural and mineral products to the export of manufactured goods. According to the United Nations Industrial Development Organization (UNIDO), “selling raw materials leads to insecurity and does little to ease poverty for the bottom billion or those living on less than \$1 a day.” As development economists like Arthur Lewis argued long time ago, growth in Africa requires moving labor from unproductive sectors such as traditional agriculture and primary production, to higher-productivity sectors like manufacturing and modern agriculture.

Recognizing the salience of industrial development, many African countries began implementing economic reform and liberalizing their economies in the 1980s in order to create an enabling environment for 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 the Pacific (United Nations, 2008, p.54). While East 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 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 attempts to identify the factors responsible for those variations.

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 some of the policies and factors that may have played important roles in the success of the top industrial performers in Africa (Botswana, Mauritius, Morocco, South Africa, Swaziland, and Tunisia).

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 Import-Substitution Industrialization (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 the illusion that African economies were "modernizing," "civilizing," and "developing."

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.

It was not until the late 1970s that the ineffectiveness of ISI began to be manifested in the form of stagnating MVA, 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 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. During this period, many African countries began to witness the process of de-industrialization, coupled with negative growth rates, unsustainable debt burdens, and high unemployment rates (Onyeiwu, 1991, pp.57-59).

It was therefore obvious, even to left-leaning scholars, that there must be a radical shift in Africa’s development trajectory. The implementation of economic reform by African countries in the 1980s was expected to not only reverse Africa’s unsustainable economic and 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 in Africa 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, 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

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

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

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. Depending on the measure of industrial development used, it is possible to have different classifications of the industrial performance of African countries. In this paper, I use the average of the following measures to compute what I call the Index of Industrial Performance (IPI): manufactured exports as percentage of GDP and manufacturing value added as percentage of GDP. Using the 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 of the top performers are located in southern and northern Africa. No southern or northern African country is classified as a poor performer. One of the issues discussed in Section V of the paper is the role played by geography in the success of the top industrial performers. Another common feature of these countries is that they have been the top growth performers in Africa within the past decade, a manifestation of the positive correlation between industrial development and economic growth.

A key manifestation of the impressive industrial performance of the top countries is the growth in their manufacturing value added. As Table 5 shows, with the exception of Botswana, the top countries have outperformed other SSA African countries in terms of MVA as a percentage of GDP over the period 1980-2009. Nearly all of the top countries witnessed increases in their MVA, with that of Swaziland more than doubling within this period. Of all the top countries, industrial growth in Botswana is the least phenomenal, a fact that may be explained by the country’s huge endowment in diamond, which constitutes a major share of the country’s GDP. Annual growth in MVA has also been mainly positive for the top countries, with the exception of 2009 during which most countries in the world experienced the negative impact of the global financial crisis (Table 6). The crisis resulted, among other things, in decreases in the demand for African goods, which explain the zero or negative growth rates in the MVA of many African countries. Tunisia is the only country amongst the top performers whose MVA was not affected significantly by the global economic crisis.

Non-agricultural and non-mineral products constitute a major component of the exports of the top performers (Table 7), but those exports consist mainly of low-tech consumer products. Exports are mainly to western countries such as the United Kingdom, United States, France, Spain, Germany and Switzerland. Although the top performers are

currently producing low-tech products, they can over time use their capabilities in these products to leapfrog into the manufacture and export of high-tech products. To meet this challenge, they will have to invest significantly in Research and Development (R&D); invest in skills that would lead to the emergence of a critical mass of scientists and engineers; develop a vibrant national systems of innovation that establishes research institutes linked to production enterprises in the economy; avoid distortionary policies that grant enterprises monopoly powers and privileges, and the creation of a competitive economic environment.

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 why the region's industrial performance has been disappointing.

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." Adee (1990) also found that the failure of the Bansa 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.”

The extent to which weak technological capability, institutional and other macroeconomic factors have affected Africa’s industrial performance is unclear, and requires empirical investigation. This task is undertaken in the next section.

IV. 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, 2007 and 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 8.

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 9. 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 9 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 Innovation⁵) 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 10 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 10, 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.

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-

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.

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

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 9, 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 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. EXPLAINING VARIATIONS IN THE INDUSTRIAL PERFORMANCE OF AFRICAN COUNTRIES: SERENDIPITY OR GOOD POLICY?

The regression results from the previous section do not offer a complete and definitive picture of why some African countries have performed better than others. Given the existence of different measures of industrial development, and the lack of good data for undertaking an empirical analysis of the industrial performance of African countries, results from regression analyses will be necessarily mixed. In order to gain more insights into the determinants of industrial performance in Africa, this section reviews some of the policies implemented by the top performers, and attempts to draw inferences from those policies for the purpose of understanding why they have done well relative to other African countries.

Compared to other African countries, the best industrial performers in the region have implemented trade, exchange rate and FDI policies that are supportive of a vibrant industrial economy. They have moved away from the policies of the 1960s and 1970s in which the government shielded local enterprises from competition, and created uncompetitive economic structures that discouraged private investment. With regard to trade policy, the top performers have promoted levels of openness that surpass those of their counterparts. According to the 2008 *Enabling Trade Index*⁸ ranking for Africa (Table 11), Mauritius, Tunisia, South Africa, and Morocco rank top four amongst the 25 African countries in the

⁸ This index is computed on the basis of the following criteria: Market Access, Border Administration, Transport and Communications Infrastructure, and the Business Environment. Each of these criteria is composed of the following indicators: tariffs and non-tariff barriers, proclivity to trade, efficiency of custom's administration, efficiency of import-export procedures, transparency of border administration, availability and quality of transport infrastructure, availability and quality of transport services, availability and use of ICTs, regulatory environment, and physical security (WEF, 2009, pp. 112-113).

survey sample. Mauritius and Tunisia rank top 50 amongst the 118 countries surveyed globally.

A common characteristic of the top performers is their rigorous and consistent implementation of economic reforms during the past three decades or so. Mauritius was the first African country to embark on a series of stabilization and structural adjustment programs in 1979 that consisted of “reductions in consumer subsidies, wage restraints, restrictive credit and monetary policies, reductions in the overall fiscal deficit, agricultural diversification, and the maintenance of a liberal system of trade and payments.” (Meier and Steel, 1989, p.143). Botswana, Morocco, South Africa, and Tunisia are also known as some of the top and consistent reformers in Africa, which explain their impressive growth rates during the past two decades or so (African Economic Outlook Report, 2009).

Economic reforms in the top performing countries have resulted in stable macroeconomic environments conducive to private investment, manufacturing and exports. Table 12 summarizes some of the basic macroeconomic indicators of selected African countries. The table shows that the top industrial performers have had better macroeconomic outcomes in terms of relatively low inflation rates, lack of debt service burdens, and current good account balances. One aspect of structural adjustment in the best performing countries that contributed to their impressive industrial performance is their adoption of flexible exchange rate policies. Mauritius and Tunisia have adopted managed floating exchange rate regimes that allow their currencies to depreciate in response to changes in macroeconomic conditions, particularly the inflation rate. For instance, following the high inflation rate precipitated by rising oil and food prices in the late 2000s, the Mauritian *rupee* depreciated significantly to less than 60 per cent of its 1995 level (World Economic Forum, 2009, p.146). This depreciation boosted the price competitiveness of Mauritian goods.

The existence of favorable business environments deliberately created by the government has also helped to strengthen the industrial base of the top-performing countries. Several indicators of the business environment suggest that these countries are more business-friendly than their counterparts. As Tables 13 shows, Botswana, Mauritius and Tunisia rank better than other countries in the table with regard to the procedures and complexities involved in starting a business, contract enforcement, business closures, as well as favorable policies to investors. According to a World Bank report, “Tunisia offers an encouraging framework with easier procedures and real possibilities for investment in diversified sectors of activities.”⁹

Particularly noteworthy is the Export Processing Zones (EPZ) Act enacted by the Mauritian government in 1970, which has been credited with laying one of the foundations for the country’s industrial performance. Under the EPZ program, Mauritian exporters were given “export enterprise certificates” which, among other things, granted them tax holiday on retained earnings for ten years with a possible extension to twenty years. Export-oriented enterprises were also granted tax-free dividends in the first five years, as well as exemption of duty for imports of machinery and equipment. Inputs were also imported duty-free, while firms were allowed greater flexibility in adjusting labor to reflect output requirements (World Economic Forum, 2009, p.145). Other benefits received under the EPZ scheme include: free repatriation of profits, generous work permits for highly skilled expatriate staff, and low-interest export financing. The EPZ focuses on labor-intensive goods such as textiles, electronics, plastics, and leather (WEF, 2009, p.143).

⁹ See *Investing Across Borders*, World Bank, 2010.

Although the regression results in the previous section did not reveal any significant impact of innovation and technological change on industrial performance, anecdotal evidence suggests that some of the top industrial performers in Africa have invested more in science and technology than other African countries. As Table 14 shows, 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). But Table 15 shows that some of the top industrial performers in Africa have done better than others with regard to innovation and technology. Top R&D spenders in Africa, for instance, include Tunisia (1.0% of GDP), South Africa (0.9%), and Morocco (0.7%). In terms of the number of researchers per million inhabitants, the leading countries are Tunisia (1,450) and South Africa (361). Tunisia and South Africa are thus the two leading countries in Africa in terms of expenditure on R&D and the number of scientists. The 2009 *Africa Competitiveness Report* also shows that Botswana, Mauritius, Morocco, South Africa and Tunisia rank higher than several African countries in terms of technological indicators such as availability of latest technologies and firm-level technology absorption.¹⁰ The combination of good macroeconomic and business environments, as well as investment in knowledge/technology has enhanced the competitiveness of the top performers compared to other African countries. Table 16 ranks African countries according to their competitiveness, and it shows that Tunisia and South Africa were more competitive than India and Russia in 2008, while Botswana and Mauritius were more competitive than Brazil.

Apart from innovative policy initiatives, the top performers have also benefited from favorable external environments. Tunisia and Mauritius, for instance, have benefited from the trade preferences offered by the European Union. One key preference is the Multi Fiber Agreement, which granted both countries preferential access to the textile markets of European countries, an agreement that enabled Tunisia to transform its textile industry to the point where it now accounts for about 5 per cent of its industrial output (World Economic Forum, 2009, p.145). While quotas were placed on the export of textiles from Asia to European markets, Tunisian and Mauritian exporters were granted unfettered access. This resulted in Asian textile manufacturers investing in Mauritius, thus generating linkages that spurred the countries industrial development.

Botswana, Mauritius and Swaziland have benefited from their proximity to South Africa, which has enabled them to enjoy scale economies, access to technology, skills, as well as sophisticated markets. Likewise, the closeness of Tunisia and Morocco to European markets has enabled them to overcome the constraints of small markets and lack of skills. Thus, geographical proximity may also be a factor in the industrial performance of the top countries. Is it really fortuitous that all of these countries are located either in north Africa or southern Africa, with none from east, central or west Africa?

Lastly, the experiences of the top industrial performers suggest that good governance, leadership, and institutions matter for industrial development. Without the reform-minded leadership that Botswana, Tunisia and Morocco had, the policies discussed earlier on would not have been possible. The role of leadership and governance can be illustrated by the Botswana and Mauritius examples. In Botswana, the leadership under Sir Seretse Khama (President from 1966-1980) was committed to avoiding the “resource curse” that is all too well known in Africa. The leadership was determined to channel rent from minerals into the diversification of the economy, and the development of the productive capacities of the

¹⁰ See pp.176-237 of the 2009 *Africa Competitiveness Report*

country. Through this determination, Botswana became the fastest-growing economy in the world between 1966 and 1980, and was also widely known for its democratic principles, rule of law, respect for human rights, and transparency. Transparency and accountability in Botswana resulted in the successful investment of revenue from minerals in infrastructural development, education and health, which in turn led to the country's prosperity. Mauritius' foundation for successful industrial development was laid by the country's first prime minister, Sir Seewoosagur Ramgoolam. He has been credited with promoting democracy, stability and economic growth in Mauritius. Apart from introducing universal education and improving the welfare of Mauritian workers, Sir Ramgoolam also played a significant role in the building of banks, hotels, industries and an airport.¹¹

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.

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 results also suggest that 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 implies that there are African-specific factors that explain the abysmal industrial performance of African countries. The regressions results in this paper should be interpreted with extreme caution and caveats, as the variables used to proxy macroeconomic, institutional and technological variables are very imperfect and controversial. Further empirical research that uses more observations and alternative sources of data is needed to reach more definitive and reliable conclusions on the determinants of the industrial performance of African countries

To offer additional insights into why some African countries have performed better than others with regard to industrial development, some of the policies implemented by these countries were reviewed. There is strong anecdotal evidence that economic reforms, as well as the creation of a business friendly environment in these countries, have interacted with investment in technology to make these economies very competitive regionally and globally.

¹¹ For details about the role played by these two leaders in their countries' economic and industrial development, see World Economic Forum (2009, pp.113-114).

Lastly, preferential trade relations with western countries and proximity to European and regional markets appear to have played some role in the industrial development of the top countries. In other words, a combination of good policies and serendipity has been the driving force behind the success of the top industrial performers in Africa.

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

Source: UNCTAD, 2008.

*IPI = Average Manufacturing 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 Mauritius Morocco South Africa Swaziland Tunisia	Cote d'Ivoire Namibia Senegal Togo	Burkina Faso Cameroon Egypt Ghana Guinea Kenya Madagascar Malawi Mali Mozambique Seychelles Uganda Zambia	Benin Burundi Cape Verde Ethiopia Gabon Gambia Nigeria Rwanda Sudan Tanzania

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

Table 5: Manufacturing Value Added as a Percentage of GDP, 1980-2009

Country	1980	1999	2000	2005	2007	2009
Botswana	5	5	5	4	4	4
Mauritius	16	24	23	20	20	20
Morocco	17	18	17	16	15	14
South Africa	22	19	19	18	17	15
Swaziland	21	39	39	40	44	44
Tunisia	12	18	18	17	17	16
SSA	17	15	15	13	14	13

Source: World Development Indicators Database

Table 6: Annual Growth of Manufacturing Value Added (%)

Country	1980	1999	2000	2005	2007	2009
Botswana	-13	-3	-3	6	17	-5
Mauritius	-7	2	8	-6	2	0
Morocco	5	2	3	4	4	-3
South Africa	8	1	8	6	5	-11
Swaziland	-8	1	1	1	3	0
Tunisia	12	6	7	1	6	4
SSA	8	1	7	5	6	-7

Source: World Development Indicators Database

Table 7: Export Composition of the Top-Performing Countries

Country	Main Exports	Main Destinations of Exports	Value of Exports (\$ US million), 2007
Botswana	Diamonds, Copper Mates, Nickel Mates, Road Tractors for Semi-Trailers (truck tractors)	United Kingdom South Africa Norway Zimbabwe Switzerland	5,073
Mauritius	T-Shirts, Singlets & Other Vests, Raw Sugar, Men's and Boy's Shirts, Men's and Boy's Trousers & Shorts, Tuna & Skipjack	United Kingdom, France, United States, Madagascar, Italy	2,054
Morocco	Transistors, Electric Conductors, Men's & Boy's Trousers, Phosphoric Acid & Polyphosphoric Acids	France Spain United Kingdom Italy India	14,607
South Africa	Automobiles, Spark Ignition Engine, Filtering or Purifying Machinery for Gases, Platinum in Semi-Manufactured Forms, Platinum Unwrought or in Powder Form, Bituminous coal	United States United Kingdom Japan Germany Netherlands	64,027
Swaziland	Food & Drink, Raw Sugar, Chemical Wood Pulp, Soda or Sulphate, Chemical Industry Products, T-shirts, Singlets & Vests.	South Africa United States Malawi Mozambique Botswana	1,082
Tunisia	Men's and Boy's Trousers, Shorts and Garments, Olive Oil, Petroleum Oils and Diammonium Phosphate	France Italy Germany Spain Libya	15,165

Source: African Statistical Yearbook, 2009

Table 8: 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 9: 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 10: 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 11: Enabling Trade Index Ranking for Africa, 2008

Country	Rank/25	Rank/118	Score
Mauritius	1	40	4.50
Tunisia	2	49	4.23
South Africa	3	59	3.98
Morocco	4	74	3.71
Namibia	5	77	3.66
Uganda	6	79	3.63
Zambia	7	85	3.52
Kenya	8	86	3.51
Egypt	9	87	3.51
Madagascar	10	88	3.49
Mali	11	90	3.42
Cameroon	12	92	3.42
Lesotho	13	95	3.36
Mauritania	14	97	3.34
Benin	15	98	3.34
Burkina Faso	16	99	3.33
Senegal	17	100	3.33
Mozambique	18	101	3.30
Tanzania	19	112	3.27
Ethiopia	20	106	3.06
Algeria	21	108	3.04
Nigeria	22	111	3.02
Zimbabwe	23	112	2.98
Burundi	24	117	2.70
Chad	25	118	2.60

Source: The Africa Competitiveness report, 2009, p.113.

Table 12: Macroeconomic Outlook of Selected African Countries, 2009

Country	GDP per Capita	Inflation Rate	Govt. Expenditure as % of GDP	Govt. Lending/Borrowing as % of GDP	Govt. Debt as % of GDP	Current Account Balance as % of GDP
Algeria	3,996	5.7	41.6	-5.8	1.5	0.31
Benin	709	2.2	24.8	-3.2	-	-8.5
Botswana	6,437	8.1	44.1	-11.5	-12.4	-2.1
Cameroon	1,114	3.0	18.4	-0.1	54.1	-2.7
Egypt	2,450	16.2	34.8	-4.5	61.9	-2.4
Ethiopia	390	36.4	17.2	-0.9	28.1	-5.0
Gambia	579	4.6	21.5	-2.9	58.3	-10.5
Ghana	663	19.3	37.6	-9.8	27.1	-5.2
Kenya	840	9.3	29.0	-5.3	44.0	-6.7
Malawi	339	8.4	34.7	-5.4	-	8.1
Morocco	2,882	1.0	29.0	-	47.0	-5.0
Mauritius	6,703	2.5	25.6	-3.4	49.2	-7.8
Nigeria	1,111	12.4	30.3	-10.3	9.2	14.1
Senegal	998	-1.7	26.9	-5.2	-	-8.7
South Africa	5,824	7.1	32.1	-5.2	26.1	-4.0
Swaziland	2,924	7.6	43.3	-6.5	14.5	-6.2
Tanzania	526	12.1	31.4	-8.0	-	-10.0
Tunisia	4,171	3.5	30.8	0.3	-	-2.8
Uganda	482	14.2	17.9	-2.1	-	-4.0
Zambia	1,070	13.4	22.8	-3.2	21.5	-3.2

Source: *World Economic Outlook, IMF*

Table 13: Doing Business in Three African and Three Non-African Countries

	Botswana	Mauritius	Tunisia	Venezuela	Uruguay	Thailand
Rank out of 181 countries	38	24	73	174	109	13
Procedures for starting a business	10	5	10	16	11	8
Duration (days)	78	6	11	141	44	33
Cost (percent GNI/capita)	2.3	5.0	7.9	26.8	43.5	4.9
Procedures for enforcing contracts	29	37	39	29	40	35
Duration (days)	987	750	565	510	720	479
Cost (percentage of claim)	28.1	17.4	21.8	43.7	19.0	14.3
Time spent closing a business (years)	1.7	1.7	1.3	4.0	2.1	2.7
Protecting investors index	6.0	7.7	3.7	2.7	5.0	7.7

Source: The Africa Competitiveness Report, 2009

Table 14: Regional Science and Technology Indicators

Regions/Countries	GERD as % of 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 15: Technology Output, Absorptive Capacity and Economic Growth for Selected African Countries, 2005

Country	R&D as % of GDP*	Researchers per 1 million inhabitants*	Economic Growth in 2005 (%)**	Economic Growth in 2006 (%)**	Average Economic Growth (2005-2006) %***
Algeria	0.1	170	5	2	3.5
Botswana	0.4	-	5	3	4.0
Burkina Faso	0.2	22	6	6	6.0
Cameroon	-	26	2	3	2.5
Cape Verde	-	127	7	11	9.0
Dem. Republic of Congo	0.5	-	6	5	5.5
Cote d'Ivoire	-	68	1	1	1.0
Egypt	0.2	-	4	7	5.5
Ethiopia	0.2	20	12	11	11.5
Gambia	-	28	5	7	6.0
Lesotho	0.1	10	3	7	5.0
Madagascar	0.2	43	5	5	5.0
Mauritius	0.4	-	5	4	4.5
Morocco	0.7	-	3	8	5.5
Mozambique	0.5	-	8	9	8.5
Niger	-	8	7	5	6.0
Senegal	0.1	-	6	2	4.0
Seychelles	0.4	157	1	5	3.0
South Africa	0.9	361	5	5	5.0
Sudan	0.3	-	6	11	8.5
Tunisia	1.0	1,450	4	6	5.0
Uganda	0.2		6	11	8.5
Zambia	0.0	52	5	6	5.5
India	0.7	111	9	10	9.5
China	1.4	926	10	12	11.0
Ireland	1.3	2,882	6	6	6.0
South Korea	3.2	4,162	4	5	4.5

Table 16: Global Competitiveness Index, 2008 and 2007 Comparisons

Country	GCI Rank 2008 *	GCI Rank 2007**
China	30	34
Tunisia	36	32
South Africa	45	44
India	50	48
Russian Federation	51	58
Botswana	56	76
Mauritius	57	60
Brazil	64	72
Morocco	73	64
Namibia	80	89
Egypt	81	77
The Gambia	87	102
Libya	91	88
Kenya	93	99
Nigeria	94	95
Senegal	96	100
Algeria	99	81
Ghana	102	n/a
Benin	106	108
Cote d'Ivoire	110	n/a
Zambia	112	122
Tanzania	113	104
Cameroon	114	116
Mali	117	115
Malawi	119	n/a
Ethiopia	121	123
Lesotho	123	124
Madagascar	125	118
Burkina Faso	127	112
Uganda	128	120
Mozambique	130	128
Mauritania	131	125
Burundi	132	130
Zimbabwe	133	129
Chad	134	131

*Out of 134 economies

**Out of 131 economies

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