

**G-LOCALIZATION AS A DEVELOPMENT MODEL:
ECONOMIC IMPLICATIONS FOR AFRICA**

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Abstract

In this paper, we investigate the G-Localization thesis in which we postulate that developing economies can achieve stable economic growth by active participation in the global economy while exploring the virtue of intraregional trade. We employ the augmented Solow growth model to capture the relationship between the growth rates of the economy using trade, industrial and technology explanatory variables in a panel of data for 41 selected African countries. We commence the empirical analysis with a description of Panel Vector Autoregression, PVAR model. In order to assess the long run relationship, we carried out the panel unit roots tests, the panel cointegration and a panel-based vector error correction model, PVEC, estimation. The panel Granger causality test is used to examine the direction of causality in a bivariate manner. The empirical results provide clear support for the need for African countries to look more inward while they participate in global economy: that is they should “G-localize”.

Keywords: Panel VAR data, Panel VEC, G-Localization, two-gap, export-led,.

JEL Classification: F15, F43, G01

1 Introduction

One of the standpoints for development options has been the need for developing countries to open-up, a belief rooted in the export-led and two-gap models of development. However, these models have not brought about the desired growth in developing countries especially in Africa. According to UNCTAD (2008), the real growth rate of GDP per capita is, between 2003-2007, 6.2 percent in Asia, 7.5 percent in economies in transition, 2.0 percent in developed economies, 3.0 percent in Africa and in particular 3.0 percent in Sub-Saharan Africa. That period represented the era of steady growth in SSA but truncated by the advent of global financial and economic crisis of 2007/2008.

The argument for developing countries to globalize is pertinent and is designed to enhance access to foreign capital, improved technology in order to enhance the prospect for larger markets. Notwithstanding, the current global economic order implies serious concerns for African countries. The peripheral nature and structure of their economies constitute constraining factors to their effective participation in global trade. In effect, the proportion of African trade in total world trade has been very low and the pattern of trade has been in favour of the industrial world while intra-African trade remains low.

Intra-African trade was 5.5 percent in 1960 and rose slightly to 8.4 percent in 2006, according to UNCTAD (2008: 45). However, trade between the African region and the developed economies stood at 77.1 percent and 69.4 percent in 1960 and 2006, respectively. In addition, there are some other international institutional constraining factors such as the rules guiding the operation of World Trade Organization (WTO) which stipulates the reduction or removal of tariffs on imports, resulting into two major problems for African countries. On one hand they will lose revenue they would have earned on imports. Secondly, 'unguided' opening-up would result to massive importation from the rest of the world and hence unfair competition in the domestic markets leading to firm closures and unemployment.

These challenges, amongst others, stem from the fact that African countries do not have sufficient economic 'muscle' to compete adequately with other regions of the world. Thus, the possibilities for these countries to be further relegated to the background in international trade

arrangements are imminent. The current global economic melt- down that has resulted in fallen prices in the West and Asia is manifesting as global ‘boil-up’ in most Africa economies as prices have been on the upward trend. This may not be unconnected with (1) the mono-cultural structure of their economies, (2) dependency on primary non-value addition exports, (3) non competitiveness in manufactured merchandise and (4) unfavourable international trade environment.

Many African countries trade more with industrial economies than with other African countries. In the period 2004-2006, the total trade of Europe and United States of America was 49.78 percent with South Africa, 59.45 percent with Ghana, 59.55 percent with Cote d’Ivoire, 71.16 percent with Nigeria, 72.16 percent with Cameroon, and 76.1 percent with Gabon. However, trade within African countries is low. Within the same period (2004-2006), intra-African exports were 8.7 percent while intra-African imports stood at 9.6 percent. In terms of individual countries, total trade between the African region and Gabon was 5.1 percent, Nigeria 8.78 percent, Cameroon 12.26 percent, South Africa 14.87 percent, Ghana 26.30 percent and Cote d’Ivoire 28.95 percent (UNCTAD, 2009). The argument, therefore, in this research is not for African countries to close their doors to trade and remain in autarky as no such can be done by any single country given the ‘moving global train’ in an inter-dependent world, it is rather a call for more inward looking strategies, between similar countries, in a bid to solving enormous developmental challenges staring the continent on the face.

Consequently, the immediate research questions include: what are the economic implications of globalization on Africa; what should African economies be doing for optimal benefit from globalization; and what should be the immediate policy agenda for Africa in the global economy? Therefore, the main objectives of this paper are to: (1) provide statistical analysis of trade and growth variables, (2) empirically investigate the impact of these variables on African economic growth and (3) discuss policy framework for an enhanced trade within the confine of globalization. This study explores the globalization maxims and the related growth models. We adopt the Solow type, which privileged capital and labour in the explanation of the sources of growth. The discussion on the relationship between the growth rate of GDP and capital and labour on the other hand and the inclusion of as well as other macroeconomic variables in the

sense of extended Solow model on the other hand has been expressed in the literature both theoretically and empirically and it is on-going.

The remaining part of the paper is structured as follows. In Section 2 we present a brief review of related literature. Section 3 provides the theoretical direction of the paper while Section 4 is on the Econometric Model and Estimation Technique. In Section 5, we present the results of our empirical estimation. Section 6 concludes.

2 Brief Review of Related Literature

Trade-growth nexus has been an interesting issue of debate. This is especially with regards to African countries that have not had many benefits to show for its trade. In this regard scholars such as Yang and Gupta (2007) have noted that regional trade arrangements in Africa have not promoted trade adequately due to some constraints. On the other hand others like Agbeyegbe, Stotsky and WoldeMariam (2004) have acknowledged that trade liberalisation in most African countries have not considerably improved their welfare as a result of ineffective exchange rate policies, among others. Foroutan and Pritchett (1993) and Subramanian and Tamirisa (2003) have pointed out that Africa's share of world products and world trade declined mainly due to the following factors growth of income, size of population, geography, etc. This was similar to recent submission made by Djankov, Freund and Pham (2010) that time is crucial for trade.

The perception that trade openness/liberalization can be important for economic growth in a country can be traced to Solow (1956) which has significantly influenced literature on growth. The main thesis of Solow's submission was that market-centred trade liberalization will accelerate the dynamics of economic growth. The situation in most African countries has brought to fore the distinction between African countries' experiences-their propensity to actively participate in world trade needs adjustment despite the promise of economic growth.

In empirical studies, authors such as Winters (2002), Mackay and Winters (2004) etc have reached the conclusion that the liberalization of world trade has possibility of significantly improving economic growth of countries. Other empirical studies that relate trade to economic growth have noted that a better economic growth exists over a short period (Levine and Renelt, 1992 and Taylor, 1998). However, Tilat (2002) on his own reached the conclusion that trade has

no significant association with long-term economic growth. The author found that short-run effects outweigh the perceived benefits of trade liberalization. Mackay and Winters (2004) have established that in the short run, trade liberalization may not yield desired results in the economy and even in the long run, successful open states may create a return to low income level.

Furthermore, Oyejide (2007) has observed that real exchange rate depreciation could improve exports relative to GDP, holding other things constant. This is based on the maxim that overvaluation of a country's currency would act as tax on exports, which will inhibit their prices compared to the prices of domestic products. In furtherance to this position, Alege and Ogun (2004) has indicated that trade policies are usually inconsistent despite of various trade reforms in Nigeria, a typical case of African scenario. Hence, they clamoured for duty-free importation of intermediate goods to enhance the productivity of the manufacturing sector.

Agama (2001)'s study on 41 African countries examined the connection between trade openness and economic growth where it was argued that between 1980 and 1999, the more open countries in Africa experienced higher economic growth rates than those that remained closed. In summary, the debate still persists with regards to the relevance of trade and some other factors of economic growth in different countries especially those of Africa. This is where this current paper is poised to contribute.

3 Conceptual Framework

This section briefly relates some trade theory as underpinning spring for the study's navigation of ideas. For example, trade theory developed by Helpman and Krugman (1985) and the new growth theory by Grossman and Helpman (1991) has shown that the benefits from trade is essential for free trade, which is imperative for economic growth of countries. The maxim of two-gap model has been applied in empirical studies. The fundamentals of the model rest on the fact there are some gaps needed to be filled in an economy to 'kick-start' economic growth.

The major gaps that consist the two-gap model include: saving-investment gap and export – import gap (also known as foreign exchange gap). In the saving-investment gap, it is posited that resources needed by a country to maintain steady growth rate is quite limited and as a result, there must be a 'balancement' between domestic savings and investment rate. The main

assumptions in this context is that : there is the existence of linear relationship between savings and income; the existence of constant capital –input ratio; and a desired/pre-specified growth rate for such an economy (Yamashita and Khachi,2003).

The second major gap is referred to as export –import gap. It anchors on the maxim that foreign exchange earnings is a constraints to growth in an economy. This gap is rooted on the assumption that : import is linearly dependent on income level; export is linearly dependent on income level; there is also a desired/targeted economic growth rate. The two-gap model that is usually linked to Harrod-Domar growth model maintain that foreign capital can increase economic growth rate by increasing the level of available capital for production given the fact that the capital-output ratio is constant (Chenery and Strout, 1966; Findlay 1973, etc).

The contention with the two-gap model is that it makes the growth model exogenous. Assuming that no economy would want to ‘sit-down and look’ without taking frantic measures to improve her economy, the endogenous growth model that was pointed out by Solow (1956; 1957) was brought to limelight (Osabuohien,2007). This has being extended greatly by others such as Lucas (1990); Romer (1990); Mankiw, Romer, and Weil (1992). This is based on the understanding that human capital accumulation is crucial to the economic growth. Given the focus of this present paper that is positing for inward-looking for African economic growth challenges, the endogenous growth model becomes handy. This is brought to bear in the model formulation section of the paper.

The above is crucial given the fact that in a globalized world, there are opportunities to access markets but how far a country/region can go depends on what they have to offer for trade at the global market. Thus, improvement of domestic efficiency will engender competitiveness of these economies and thus increase effective participation in the global economy.

4 Econometric Model and Estimation Technique

4.1 Model Specification and Data

The issue of economic growth is seemingly intractable in Africa in spite of various policies proposed locally and internationally by bilateral and multilateral institutions/agencies. Failure of these policies may not be much of quantum or lack of it but to inappropriate structure to

implement the designed policy. In the context of this paper, a sustained growth rate of the economy is necessary for economic development. However, the economy will not grow without certain factors in place. The experiences of advanced economies are pertinent. In fact these countries have managed a sustained macroeconomic stability, relied on market forces to varying extents, sought to integrate in the world economy, protect property rights, and ensure social-political stability (Rodrik, 2007). These have encouraged a dynamics and productive system. In a global village, African countries need to tackle the issues of diagnostic analysis, policy design and the institutional framework that will engender a sustained growth.

The challenges of African economies are multifold: underemployment of resources, unstable fiscal and monetary policies, poorly managed institutions, poor access to credits, uncompetitiveness in the world market and political/social instability. According to Rodrik (2007), addressing all these problems simultaneously is tantamount to signing for chaos. What could be done is to identify a central issue where reform will yield maximum return. It is our contention that in a global economy, a successful growth strategy begins with the identification of the most binding constraints. In this paper, we address the issue of provoking and managing increased economic activities. In effect, growth cannot be generated without increase in economic activities. To achieve this, there must be a substantial influence of adequate capital and labour in quantity and quality, the private sector must be willing to produce and produce. Technology created domestically or transferred from abroad must be encouraged in value addition ventures. Major external sector macroeconomic variables such as exchange rate must be monitored to ensure competitiveness in the international markets.

This paper is an attempt at addressing these problems through diagnostic and policy analysis approach. In doing this, we adopt the extended Solow growth model. Consequently, sustained economic growth rates, RGDP, depend on some growth factors including capital (KAPI), and labour force (LBF), the level of industrialization proxied by the manufacturing output (MANVA), the level of technology measured by the contribution of transport, storage and communication sub-sectors (TECH), the degree of openness of an economy (OPN), and the domestic exchange rate in relation to the US\$1.00. Thus, the paper in an attempt to capture determinants of growth assumes a non-linear relationship between RGDP and these variables in a multi-country panel data set with a view to estimating a common macro-dynamic structure of

the countries considered in the paper. The paper formulates and tests our common-model structure in a Vector Auto-regression (VAR) framework, subject to the restrictions of homogenous slope coefficients and error term. We, thus, specify an extended Solow-type model in the spirit of endogenous growth model which can be written as follows:

$$RGDP = f(KAPI, LBF, MANVA, TECH, OPN, EXR) \dots\dots\dots(1)$$

where: $RGDP_{it}$: growth rate of real Gross Domestic product of country i in time t

$KAPI$: stock of capital in country i in time t

LBF : labour force in country i in time t

$MANVA$: value added in the manufacturing sector of country i in time t

$TECH$: technology captured by transport, storage and communication

OPN_{it} : (Export+Import)/GDP as a measure of the degree of openness of country i in time, t

EER_{it} : Nominal exchange rate of the currency of country i currency in relation to US\$1.00 in time t

In a G-Localisation framework, we capture the importance of trade by adopting the notion of degree of openness, OPN, measured as the ratio of the sum of total export and total imports to the GDP. African economies can be regarded as largely open in view of OPN at an average of about 104.85% over the period of study and 82.26% in 2007 only. Open economies are preferred by market seeking and efficiency seeking investors since there are fewer trade restrictions, broader market access, numerous advantages from international division of labor and wider economic linkages. In addition, openness encourages economies of scales through international markets Lim (2001) and open economies enable countries to capitalize on new technologies and technical expertise that can be gained from the international exposure. Hence, the hypothesis here is that the greater the extent of openness the higher the growth rate of African economies.

Exchange rate is another variable that can explain the growth rate of the economy in a G-Localisation hypothesis. In effect, the exchange rate (EXR), is the amount of the national currency required in exchange for one unit of another foreign currency, notably the US\$. When this number increases, we talk about depreciation and when it is fewer, we talk of appreciation. This is, however, valid in a floating exchange rate regime. The theoretical expectation is that depreciation will enhance export and lower imports. This position may not be easily attainable in African countries due to the fact that most of them remain mono-cultural, exports are primary

goods and imports are essential raw materials and finished goods. Therefore, it is assumed that most African countries may not benefit from this Marshall-Lerner thesis. Although some African currencies are tied to other foreign currencies, it is not out of place to examine the contribution of exchange rate in the explanation of growth rates of African economies.

4.2 The Econometric Model

Equation (1) is nonlinear in its implicit form in the explanatory variables. In its explicit form it can be written as follows:

$$RGDP = \alpha_0 KAPI^{\alpha_1} LBF^{\alpha_2} MANVA^{\alpha_3} TECH^{\alpha_4} OPN^{\alpha_5} EXR^{\alpha_6} e \dots\dots\dots(2)$$

Linearizing equation 2 by taking the logarithms of both sides of the equation and writing the variables in lower cases, enables us to apply the classical ordinary least squares technique of estimation so that the equation becomes:

$$lrgdp_{it} = \beta + \alpha_1 lkapi_{it} + \alpha_2 llbf_{it} + \alpha_3 lmanva_{it} + \alpha_4 ltech_{it} + \alpha_5 lopn + \alpha_6 lexr + \varepsilon_{it} \dots\dots\dots(3)$$

where $\beta = \log \alpha_0$; and $\varepsilon = \log e \sim iidN(0, \sigma^2)$.

Equation (3) is a simple panel fixed effects model (FEM) specification, as in Husain, Tazhibayeva and Ter-Martirosyan (2008). However, in assessing the impact of economic shocks on the economy of a given nation, it is imperative to take into account the frequent spill over effects of such disturbances on other countries. The transmission trajectory is even more critical in developing countries. It is, therefore, desirable to use appropriate econometric technique that allows us to investigate this transmission mechanism across countries. This paper employs the unrestricted panel data Vector Error Correction (PVEC) model.

The general framework of an individual country model in a PVAR can be written as in Gavin and Theodorou (2004: 4) and Assenmacher-Wesche and Gerlach (2008: 8) as follows:

$$Y_{it} = A_{it} + B_i(L)Y_{it-1} + V_{it} \dots\dots\dots(4)$$

$$\text{where } Y_{it} = \begin{bmatrix} lrgdp_{it} \\ lkapi_{it} \\ llbf_{it} \\ lmanva_{it} \\ ltech_{it} \\ lopn_{it} \\ lexr_{it} \end{bmatrix}; \quad A_i = \begin{bmatrix} \alpha_{yi} \\ \alpha_{kapii} \\ \alpha_{lbfi} \\ \alpha_{manvai} \\ \alpha_{techi} \\ \alpha_{opni} \\ \alpha_{exri} \end{bmatrix}; \quad V_i = \begin{bmatrix} v_{yt} \\ v_{kapii} \\ v_{lbfi} \\ v_{manvai} \\ v_{techi} \\ v_{opni} \\ v_{exri} \end{bmatrix}$$

The vector of endogenous variables are as defined previously in equation 1 for time t and for each of country, i , considered in the paper for $i=1, \dots, 41$. A_i is a (7×1) vector of country specific intercept terms and $B_i(L)$ is a (7×7) matrix of lag polynomial with the VAR coefficients. The disturbance term, V_{it} , is a (7×1) vector of residuals such that its mathematical expectation is zero and a country-specific variance, σ_i^2 suggesting that the error term is normally identically distributed. The working assumption is that within a country, the disturbances are contemporaneously correlated across equations but serially uncorrelated. For each country i , in the panel model, we can estimate the VAR individually. In this respect, the first equation of the VAR for the individual country can be written as follows:

$$y_{it} = \alpha_{yi} + \sum_{j=1}^n \beta_{iyij} y_{t-j} + \sum_{j=1}^n \beta_{iykapij} lkapi_{t-j} + \sum_{j=1}^n \beta_{iyllbfj} llbf_{t-j} + \dots \dots \dots (5)$$

$$+ \sum_{j=1}^n \beta_{iymanvaj} lmanva_{t-j} + \sum_{j=1}^n \beta_{iytechj} ltech_{t-j} + \sum_{j=1}^n \beta_{iyopnj} lopn_{t-j} + \sum_{j=1}^n \beta_{iyexrj} lexr_{t-j} + V_{it}$$

The lower case letter indicates the natural logarithm of the various independent variables. In the above settings, there are six other similar equations for each of the endogenous variables including stock of capital, $lkapi$; labour force, $llbf$; manufacturing value added, $lmanva$; technology, $ltech$; degree of openness, $lopn$; and exchange rate, $lexr$.

The PVAR equations for all the 41 countries in the model are obtained by stacking the seven-equation system in equation (4) for each of the countries to create a larger system that can be estimated by OLS technique given the cross-country assumption. The advantages of using panel data include (1) ability to increase the precision of regression estimates by increasing the number of observations and thus the degree of freedom, (2) control of individual fixed effects that allows

for individual country heterogeneity, and (3) the ability to model temporal effect without the problem of aggregation bias Ojo and Alege (2009).

4.3 Technique of Estimation

The econometric method applied in this paper is in two main parts. First, we carry out a PVAR estimation using dynamic panel Generalized Method of Moment (PGMM). Second, we use the Panel Vector Error Correction (PVEC) in addressing the issues of short- and long run dynamics of the model.

4.3.1 Panel Vector Autocorrelation

We adopt a model that links growth rates of output to both domestic and external trade related variables in the tradition of endogenous growth models projected on a Panel Vector Autoregressive (VAR) framework using data collected on selected African countries. The PVAR approach enables us to understand the economic dynamics using a random effect method. The study adds to the literature by using panel VAR method to investigate common and country-specific shocks across SSA on the determinants of growth rates of the economies considered but distinguish itself by identifying the dynamic effects of domestic, technological and degree of openness shocks using the impulse-response functions.

The equation to be estimated is the natural logarithm of equation 5. The method of estimation for equations 4 and 5 is informed by the objective of the study and the nature of data available for the study. Just as in Walker and Punzi (2007), the panel VAR model used in this paper allows us to test for the response of logarithm of growth rate of real GDP, $\ln gdp$, from within an individual economy to the specific $\ln kapi$, $\ln lbf$, $\ln manva$, $\ln tech$, $\ln opn$, and $\ln exr$, while allowing for the possibility of elasticities, and changes in elasticities among different countries.

According to Walker and Punzi (2007:10), “the use of vector autoregressions in panel data setting is still relatively new and there are some variations in the methods used by different researchers”. For example Gerlach (2008) use panel data to investigate the fact that the effects of economic disturbances frequently spill over to other countries. Others have used panel data to examine international transmission of shocks in a multi-country VAR framework (Schurmann and Weiner, 2004; Canova and Ciccarelli, 2006; Peseran, and Dees, Mauro, Peseran, and Smith, 2006). Alege (2009) observes that the main strength of the method lies in the fact that it helps to

observe impulse-response mechanisms, study variance decomposition of variables in the system, for forecasting, causality and policy analysis. However, a dynamic panel GMM two-step procedure with time dummy variables and lagged dependent variable of order two is known to produce biased and inefficient estimates.

4.3.2. Panel Vector Error Correction

This method is commonly used to investigate long run relationship between variables in a model. Its application is effected in three steps: the panel unit root test, Panel Cointegration and Panel Vector Error Correction Model.

First the panel unit root test, according to Im et al. (2003), Maddala and Wu (1999), Levin et al. (2002) is to ascertain that the seven variables in the model are integrated of order one in the first difference since individual unit root tests may be distorted. The null hypothesis of the test is that all the seven variables contain a unit against the alternative hypothesis that the test allow for both unit roots and stationarity among the individual variables (Eriksson, 2005: 25). This test is required so that we can go ahead with the co-integration test. As in Christopoulos (2003: 62), the Im et. al. (IPS henceforth) statistic is based on averaging individual Dickey-Fuller unit root tests (t_i) given as follows:

$$t_{IPS} = \frac{\sqrt{N}(\bar{t} - E(t_i / \rho_i = 0))}{\sqrt{\text{var}(t_i / \rho_i = 0)}} \rightarrow N(0,1) \dots\dots\dots(6)$$

where $\bar{t} = N^{-1} \sum_{i=1}^N t_i$. The MW statistic is obtained by $P = -2 \sum_{i=1}^N \ln p_i$ and combines the p-values from individual from Augmented Dickey-Fuller (ADF) tests. Under the null hypothesis, the P test is distributed as χ^2 with degrees of freedom equals to 2N under the null hypothesis.

Second, we examine the existence of long-run relationship between the variables of the model. A common test statistics is to use Johansen's procedure. According to Christopoulos and Tsionas (2003: 62), the power of Johansen test can be distorted in multivariate systems with small sample sizes. The authors use three-step procure to obtain an efficient test. This consists (a) estimate the residual from the long run relationship of a panel unit roots using Levin and Lin (1993) to obtain the t-statistics, t_{ρ} associated with the panel data model, (b) use unit root tests in step (a) to obtain

the distribution of the statistic given the case of fixed effects or fixed effect and a time trend and (c) address the problem of heteroscedasticity by using Fisher's test to aggregate the p-values of individual Johansen maximum likelihood Cointegration test statistics.

Finally, we adopt the vector error correction model as a natural extension of cointegration analysis. In this respect, the Granger Representation Theorem states that variables which are co-integrated must follow an error correction model (Engle and Granger, 1987). The application of PVEC is germane to testing whether or not the causality between the *lrgdp* and other variables in the model is short run. Thus, a PVEC associated with this study can be written as follows:

$$\Delta y_{it} = \alpha_i + \sum_{l=1}^m \beta_l \Delta y_{i,t-l} + \sum_{l=1}^m \gamma_l \Delta x'_{i,t-l} + \psi_{it} ECT_{it-1} + \delta_{it} + v_{it} \dots\dots\dots(7)$$

where $x'_{i,t-1}$ vector of all endogenous variable except the current dependent variable, α_i represents fixed country effects, δ_i is the time dummy variable and ψ_{it} is the coefficient of the error correction term, ECT_{t-1} , that measure the short run dynamics of the model. Equation (7) is a dynamic panel data model. However, it is known that if LSDV estimation technique is used, the estimated coefficient will be biased and inconsistent. To resolve this problem, instrumental variables estimator is used to deal with the correlation between the error term and lagged dependent variables Δy_{it-1} . It is also known that setting the lag length $m=2$ is necessary to satisfy the classical assumptions on the error term. In view of this the instruments used are Δy_{it-3} and Δy_{it-4} .

Equation (7) is tantamount to testing for co-integrating relations. In effect, the ECT_{it-1} is the lag of order one of the residuals obtained from equation (5). To be able to capture long run relationship it must be integrated of order $I(0)$ and satisfy three conditions that: (a) $\psi_{it} \neq 0$ otherwise the cointegration findings will not be reliable (b) $|\psi_{it}| < 1$ so that the system will be convergent and (c) ψ_{it} is statistically significant.

4.3.3 Panel Granger Causality Tests

The last stage is to carry out the Panel Granger causality test between the dependent variable, LR GDP and the explanatory variables in order to establish the direction of relationships between the variables in a bivariate process. Such test is useful for policy advise.

4.4 Data Sources

The model is built around the following variables: growth rate of real GDP, capital stock, labour force, manufacturing output, a proxy to capture technology, degree of openness and exchange rate. The labour force was sourced from World Development Indicator (WDI) Database. All others were sourced from United Nations Statistical Division (UNSTAT) database and they were measured at 1990 constant prices in million US dollars. Where necessary the data are transformed into natural logarithm in response to model design. The definition and measurement of these variables are contained in Table 1.

Table 1 **Description of Variables**

Names	Description and source
<i>rpgdp</i>	Real Gross Domestic Product (GDP) per capita income in country <i>i</i> measured at 1990 constant prices in US dollars
<i>kapi</i>	Gross fixed capital formation (including Acquisitions less disposals of valuables) in country <i>i</i> measured at 1990 constant prices in US dollars
<i>lbf</i>	Total labour force in country <i>i</i>
<i>tech</i>	Value added by transport, storage and communication sectors in country <i>i</i> measured
<i>manva</i>	Value added by manufacturing sector in country <i>i</i> measured
<i>opn</i>	Defined as degrees of openness measured as sum of export and import divided by GDP
<i>exr</i>	International Monetary Fund (IMF) based definition of exchange rate of country <i>i</i> 's currency to US dollars

Source: UNSTAT and WDI Databases.

Table 2: List of Countries

Central	East	Southern	West
Cameroon	Burundi	Botswana	Benin
Central Africa Republic	Comoros	Lesotho	Burkina Faso
Congo, Republic	Djibouti	Namibia	Cape Verde
Chad	Kenya	South Africa	Cote d'Ivoire
Equatorial Guineas	Madagascar	Swaziland	Gambia
Gabon	Malawi		Ghana
Sao Tome and Principe	Mauritius		Guinea
	Mozambique		Guinea Bissau
	Rwanda		Liberia
	Somalia		Mali
	Tanzania		Mauritania
	Uganda		Niger
	Zambia		Nigeria
			Senegal
			Sierra Leone
			Togo

Source: UNCTAD (2009) .

The empirical analysis reported in this paper is based on a yearly data (1980-2008) and a sample of forty-one (41) African countries. The number of countries included in the paper is informed by data availability over the period of estimation. These countries are shown in Table 2 below:

5 Empirical Results

5.1 Introduction

In this section, we present the summary descriptive statistics both by region and then all regions in SSA combined. The paper also tested for multi-collinearity using the correlation coefficient matrix. We noted the short comings of the PVAR and then examine our hypothesis using Panel Vector Error Correction representation, PVEC, given due attention to the issues of the unit roots and cointegration tests. Finally, we discuss the Panel Granger causality tests in order to investigate the direction of causation of the variables in our model.

5.2 Preliminary Analysis

Table 3 reports the summary statistics for both the dependent and the independent variables in the study. It reports the overall mean, and standard deviation for all the variables in the model by regions as well as for all the regions combined. The mean of growth rate of RGDP is calculated

at US\$7,653 for all regions combined. This figure contrasts very sharply with the different regional means. It could be seen that the mean RGDP for Southern region of SSA is US\$26,991 which constitutes the highest in the whole of Africa, while a mean of US\$3,735.7 Eastern region of Africa was the lowest. The high disparity in exchange rate is better appreciated using the standard deviation. This is an indication of the divergence in macroeconomic policies and structure of African economies. The dissimilarities between regions within the African region is also shown in the other indicators such as capital stock, labour force, manufacturing output, technology, exchange rate and the degree of openness.

The degree of openness, OPN seems to be similar among the regions of Africa. For each of the regions, OPN remains very close to unity. While the average for all the regions combined stood at 0.67, it is highest in Southern region at 1.18 and lowest in the Eastern region at 0.61. Overall, these figures suggest that trade policies adopted over the sample period, 1980-2008, has not translated into improved trade openness. There are also appreciable differences in the mean values of manufacturing output across the regions. In all the regions, there is the indication that the manufacturing sector can do better. This is more evident when the ratio of MANVA is considered in relation to that of the RGDP. In effect, while the aggregate for that variable is 15.3, the same ratio is 10.7, 12.8, 14.1 and 18.4 percent in West, Central, East and South region, respectively.

Table 3 Summary Statistics of Variables

Variables		Central	East	Southern	West	All
<i>rpgdp</i>	Mean	3873.05	3735.71	26991.4	6446.51	7653.10
	Std. Dev.	4416.17	3542.06	50443.85	13374.38	20951.34
<i>kapi</i>	Mean	1042.84	746.45	5882.90	1101.02	1561.82
	Std. Dev	1310.39	843.50	11247.75	2324.48	4536.15
<i>lbf</i>	Mean	1.58	5.14	3.07	4.43	4.00
	Std. Dev	1.77	4.64	5.27	7.81	6.01
<i>tech</i>	Mean	304.92	298.74	2380.11	313.70	559.46
	Std. Dev	451.15	337.21	4954.28	514.79	1899.96
<i>manva</i>	Mean	497.22	526.95	5310.54	690.02	1168.88
	Std. Dev	798.54	514.10	10315.02	1331.22	4021.28
<i>exr</i>	Mean	979.81	910.24	4.09	385.51	606.84
	Std. Dev	2268.52	2553.57	2.54	592.69	1786.67
<i>opn</i>	Mean	1.01	0.58	1.18	0.61	0.74
	Std. Dev	1.17	0.47	0.49	0.23	0.64
<i>No. of units (id)</i>		7	13	5	16	41
<i>Period (T)</i>		29	29	29	29	29
<i>No. of Observations (N)</i>		203	377	145	464	1189

Source : Authors' computation using STATA 5.1.

Table 4: Correlation Matrix

Variables	<i>Lkapi</i>	<i>Llbf</i>	<i>Lmanva</i>	<i>Ltech</i>	<i>Lopn</i>	<i>Lexr</i>
<i>Lkapi</i>	1.0000					
<i>Llbf</i>	0.6163	1.0000				
<i>Lmanva</i>	0.8595	0.7463	1.0000			
<i>Ltech</i>	0.8438	0.6770	0.8674	1.0000		
<i>Lopn</i>	0.0790	-0.4386	-0.0513	-0.0905	1.0000	
<i>Lexr</i>	-0.1126	0.0018	-0.1293	-0.0576	-0.1930	1.0000

Source: Authors' computation using E-views 5.0

We also test for the possibility of the presence of multi-collinearity among the independent variables in the model by examining the pairwise correlation matrix as contained in Table 4. The table indicates that there exists a significant positive correlation between *Lkapi* and *Lmanva*, between *Lkapi* and *Ltech*, between *Lmanva* and *Ltech*, and finally between *Llbf* and *Lmanva*. All other variables show varying degrees of correlation. Overall, it can be established that the magnitude of the correlation coefficients indicate that multi-collinearity is not a potential problem in the models and the data set in conjunction with the variables are appropriate for the study.

Table 5: Diagnostic Tests for the PVEC (Normality Test)

Component	Skewness	Kurtosis	Jorqe-Bera
lrgdp	-1.3122 (305.05) [0.000]	111.7405 (523726.8) [0.0000]	524031.9 - [0.0000]
lkapi	0.2974 (15.67) [0.0001]	9.6792 (1975.92) [0.0000]	1991.585 - [0.0000]
llbf	3.7022 (2428.29) [0.0000]	53.4088 (112547.0) [0.0000]	114975.3 - [0.0000]
lmanva	2.5117 (1117.68) [0.0000]	125.4180 (663762.0) [0.0000]	664879.7 - [0.0000]
ltech	-1.1217 (222.93) [0.0000]	48.4042 (91309.18) [0.0000]	91532.11 - [0.0000]
lopn	0.0497 (0.437) [0.5084]	26.0945 (23623.23) [0.0000]	23623.67 - [0.0000]
lexr	3.3584 (1998.28) [0.0000]	33.7183 (41794.35) [0.0000]	43792.63 - [0.0000]

Note: Figures in () are chiz and figures in [] are probability values.

Source: Authors' Computations using EViews 5.0

5.3 G-Localisation Regressions

5.3.1 Econometric Issues

Before estimating our model we shall address some econometric issues. The empirical part of this paper deals with the estimation of the linearized model given in equations (5) and (7). With a multi-country panel nature of the data, one important issue is scalability (Walker and Punzi, 2007). In effect, there are substantial variations in the magnitude of the variables in the model for the countries selected for the study, suggesting that regressions with these variables may produce inconsistent estimates of some coefficients. In order to circumvent this problem, we effect logarithmic transformation of equation (5) which reduces the extent of variations between the data from the different countries. Third, it is the norm to determine the lag length and ordering of variables in a VAR process. In this case we have VAR (p) , p=1, 2, 3 and 4 and run the estimation of the model. The model with the minimum AIC is one with the lag length of 2. We, thus, apply a lag length of two. The ordering of the variables is chosen to highlight the dynamic

effects of innovations on some macroeconomic variables. Thus, lkapi is ordered first, followed by llbf, then comes lmanva, ltech, lopn and finally, lexr.

5.3.2 Diagnostic Report

As part of the diagnostic test, we carried out the normality test. Table 5 contains the asymptotic p-values for the normality test of errors. All the three statistics show that all the variables are normally distributed at least at the level of 5 percent except variable Lopn which is significant at the level of 10 percent under the Skewness test statistic. In table 6, we show the Lagrange Multiplier Test (LM) to test the null hypothesis that there is no second order autocorrelation in the panel. The results indicate that that there is no serial correlation up to the 12th order lag given the probability values.

Table 5: Diagnostic Tests for the PVEC (Normality Test)

Component	Skewness	Kurtosis	Jorqe-Bera
<i>Lrgdp</i>	-1.3122 (305.05) [0.000]	111.7405 (523726.8) [0.0000]	524031.9 - [0.0000]
<i>Lkapi</i>	0.2974 (15.67) [0.0001]	9.6792 (1975.92) [0.0000]	1991.585 - [0.0000]
<i>Llbf</i>	3.7022 (2428.29) [0.0000]	53.4088 (112547.0) [0.0000]	114975.3 - [0.0000]
<i>Lmanva</i>	2.5117 (1117.68) [0.0000]	125.4180 (663762.0) [0.0000]	664879.7 - [0.0000]
<i>Ltech</i>	-1.1217 (222.93) [0.0000]	48.4042 (91309.18) [0.0000]	91532.11 - [0.0000]
<i>Lopn</i>	0.0497 (0.437) [0.5084]	26.0945 (23623.23) [0.0000]	23623.67 - [0.0000]
<i>Lexr</i>	3.3584 (1998.28) [0.0000]	33.7183 (41794.35) [0.0000]	43792.63 - [0.0000]

Note: Figures in () are chiz and figures in [] are probability values.

Source: Authors' Computations using EViews 5.0

Table 6: Panel VEC Residual Serial Correlation LM Tests

H0: no serial correlation at lag order h (Included observations: 1063)		
Lags	LM-Stat	Prob
1	106.1976	0.0000
2	133.4891	0.0000
3	163.0342	0.0000
4	91.6615	0.0002
5	152.7376	0.0000
6	126.0193	0.0000
7	96.2267	0.0001
8	74.88812	0.0101
9	63.17707	0.0839
10	92.82753	0.0002

Probs from chi-square with 49 df

Next, we consider the results of the panel unit roots test. The stationarity property of the variables in the system ensures that the variables converge in the long run. This test is carried out using three statistics: Levin, Lim and Chin (LLC), Im, Pesaran and Shin (IPS) and Hadri z-score. All the variables are integrated of order zero, $I(0)$ under the Hadri statistic. Similarly, Lexr is stationary under LLC and IPS with Llbf being integrated of order zero under LLC. The remaining variables are $I(1)$ processes under LLC and IPS at the level of 5 percent as shown in Table 7.

Given the fact that our aim is to investigate the G-Localisation hypothesis using a PVEC model, it is required that we examine the co-integration thesis. We, thus, posit a cointegration relationship between Lrgdp and the other variables. We use Johansen's (1995) ML-based trace and maximum eigenvalue statistics and their asymptotic distribution to test for the cointegration rank of the PVEC in equation 7. Table 8 depicts the results of this test. From it could be seen that we accept the null hypothesis that the cointegration rank is the PVEC is two. To obtain this results, we assume Akaike and Schwartz information criteria to determine the specification of the deterministic components and the number of lagged, inclusion of a constant term in both the cointegration equation and the PVEC.

Table 7 Panel Unit Root Test

	<i>Levin, Lim and Chin</i>			<i>Im, Persaran and Shin</i>			<i>Hadri Z-stat</i>		
	<i>level</i>	<i>1st diff</i>	<i>order</i>	<i>Level</i>	<i>1st diff</i>	<i>order</i>	<i>level</i>	<i>1st diff</i>	<i>order</i>
<i>Lrgdp</i>	4.5832 (1.000)	-11.6294 (0.000)	I(1)	11.8723 (1.000)	-13.5729 (0.000)	I(1)	19.0916 (0.000)	-	I(0)
<i>Lkapi</i>	3.2607 (0.9994)	-12.2440 (0.000)	I(1)	4.0809 (1.000)	-15.9104 (0.000)	I(1)	17.2572 (0.000)	-	I(0)
<i>Llbf</i>	-5.1634 (0.000)	-	I(0)	3.3469 (0.9996)	-8.2783 (0.000)	I(1)	22.1824 (0.000)	-	I(0)
<i>Lmanva</i>	-0.9081 (0.1819)	-9.3618 (0.000)	I(1)	3.4898 (0.9998)	-14.2489 (0.000)	I(1)	15.7937 (0.000)	-	I(0)
<i>Ltech</i>	4.5239 (1.000)	-12.8036 (0.000)	I(1)	10.203 (1.000)	-15.0082 (0.000)	I(1)	18.1854 (0.000)	-	I(0)
<i>Lexr</i>	-7.0048 (0.000)	-	I(0)	-2.3060 (0.0106)	-	I(0)	20.0137 (.000)	-	I(0)
<i>Lopn</i>	-0.9820 (0.1630)	-12.7422 (0.000)	I(1)	-1.1938 (0.1163)	-18.0080 (0.000)	I(1)	14.0668 (0.000)	-	I(0)

Note: Figures in brackets are probability values

Source: Authors' computation using E-views 5.0.

5.3.3 The PVEC G-Localization Results

We now present the results of the PVEC and the Panel Granger Causality, the PGMM results being attached as an appendix. Table 9 shows the overparameterized error correction model obtained after being assured that the residual from the cointegration test is stationary. We concentrate on the equation of the panel VEC that capture the objective of our study and in this case it is the first equation. Just as in standard VEC, the least significant variables were removed from that equation on the basis of the probability value where the highest probability value represents the least significant variable. The result of this exercise is found in table 10 and contains the parsimonious panel error correction model for the growth rate of GDP. This is the best model and it contains the lagged changes in the independent variable as well as the dependent variable. The criteria used to chose the parsimonious panel error correction model is the Schwartz criterion. The model was chosen at the point where the Schwartz criterion began to increase.

From Table 10, the error correction factor, $ECM(-1)$ indicates the speed of adjustment from short run to long run equilibrium state. It is correctly signed showing tha there was convergence. The result shows that the ECM is highly significant at 5 percent with a t-statistic value of 3.7004. The coefficient of 0.199 shows that about 20 percent of the errors generated in the previous period are corrected in the current period although the speed of adjustment is slow. The coefficient shows that only about 20 percent of the error is corrected within the short run. The

adjusted coefficient of determination, $adjR^2$, is not worrisome at about 39.9 percent since we are faced with a panel data. The coefficients of all the variables are either statistically significant at 1 percent, 5 percent or 10 percent, except changes in the lag of Lrgdp and Ltech.

Table 8: Johansen Cointegrating Test

Hypothesized		Trace	0.05		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	Statistic	Critical Value	Prob.**
None *	0.106637	226.5863	125.6154	0.0000	119.8664	46.23142	0.0000
At most 1 *	0.053566	106.7199	95.75366	0.0071	58.52228	40.07757	0.0002
At most 2	0.025983	48.19759	69.81889	0.7138	27.98542	33.87687	0.2142
At most 3	0.012221	20.21217	47.85613	0.9899	13.07146	27.58434	0.8810
At most 4	0.005201	7.140712	29.79707	0.9990	5.542962	21.13162	0.9904
At most 5	0.001441	1.597750	15.49471	0.9986	1.533338	14.26460	0.9977
At most 6	6.06E-05	0.064413	3.841466	0.7996	0.064413	3.841466	0.7996

Notes: Series - LRGDP LKAPI LLBF LMANVA LTECH LOPN LEXR; Trace and Max-eigenvalue tests indicate 2 cointegrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values; Trend assumption: Linear deterministic trend; Lags interval (in first differences): 1 to 2

Source: Authors computation using Eviews 5.0

Table 9: Over parameterized Panel Error Correction Model

Variable	Coefficient	Std. error	t-statistics
d(Lvgdp9(-1))	-0.1537	0.0380	-4.0492
d(Lrgdp(-2))	0.0383	0.00379	1.0104
d(Kapi(-1))	-0.0156	0.0158	-0.9890
d(Lkapi(-2))	0.0136	0.0155	0.8763
d(Llbf(-1))	0.5999	0.1573	3.8132
d)Llbf(-2))	0.5280	0.0084	3.3872
d(Lmanva(-1))	0.0076	0.0146	0.5190
d(Lmanva(-2))	-0.0364	0.0145	-2.5141
d(Ltech(-1))	0.0305	0.0174	0.4367
d(Ltech (-2))	0.0077	0.0176	0.43668
d(Lopn(-1))	0.0315	0.0202	1.5627
d(Lopn(-2))	0.0346	0.0200	1.7272
d(Lexr(-1))	0.0091	0.0147	0.6181
d(Lexr(-2))	0.0137	0.0142	0.9653
ECM (-1)	-0.0029	0.0004	-7.2956
C	0.0020	0.0065	0.3091
R-squared	0.1150		
Adj. R-squared	0.1023		
SE of equation	0.0998		
F-statistic	9.0696		
Log-likelihood	949.87		
Akaike AIC	-1.7570		
Schwarz SC	-1.6822		

Note: Dependent Variable: Lrgdp

Source: Authors' calculation using EViews 5.0

The variables are all contemporaneously consistent with the a priori expectations. In effect, a change in the elasticity of KAPI with respect to RGDP is 0.189 implying that a 1 percent increase in capital stock will increase growth rate of RGDP by 18.9 percent when other variables are kept constant. Similarly, an increase in all the other variables (LBF, MANVA, TECH, OPN, and EXR) by 1 percent will lead to 21.7 percent, 8.2 percent, 13.9 percent, minus 8.9 percent and minus 2.1 percent in the changes in RGDP, respectively. These results indicate that rate of economic growth in Africa is directly related to capital stock, labour force, manufacturing output, technology and inversely related to degree of openness and exchange rate.

Table 10: Parsimonious Panel Vector Error Correction
Dependent Variable: D(LRGDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LKAPI)	0.189118	0.011812	16.01096	0.0000
D(LLBF)	0.240919	0.136675	1.762711	0.0783
D(LMANVA)	0.081834	0.012118	6.753400	0.0000
D(LTECH)	0.138743	0.013742	10.09661	0.0000
D(LOPN)	-0.089716	0.017061	-5.258603	0.0000
D(LEXR)	-0.020053	0.011052	-1.814337	0.0699
D(LRGDP(-1))	0.008830	0.041782	0.211329	0.8327
D(LLBF(-1))	0.124038	0.136132	0.911163	0.3624
D(LLBF(-2))	0.383435	0.135633	2.827009	0.0048
D(LMANVA(-2))	-0.005875	0.011976	-0.490550	0.6239
D(LTECH(-2))	0.020078	0.013357	1.503263	0.1331
D(LOPN(-2))	0.045557	0.015981	2.850635	0.0045
ECM(-1)	-0.196064	0.052792	-3.713892	0.0002
DATEID	-3.64E-09	7.96E-09	-0.457182	0.6476
R-squared	0.398693	Mean dependent var		0.034070
Adjusted R-squared	0.390953	S.D. dependent var		0.106412
S.E. of regression	0.083046	Akaike info criterion		-2.125278
Sum squared resid	6.965527	Schwarz criterion		-2.057855
Log likelihood	1102.142	Durbin-Watson stat		2.068365

Source: Authors' calculation using EViews 5.0

The elasticity coefficient of two period lagged of Llbf is 0.3608 implying that a 1 percent increase in the two lagged variable of Llbf will increase rate of economic growth by 36.08 percent. Since the elasticity value of .3608 is less than 1 in absolute terms, it follows then that the rate of economic growth is two period lagged Llbf inelastic. The result obtained on Lopn can be interpreted in a similar manner. In particular, contemporaneously, Lopn indicates that the immediate effect of that variable is to cause downward movement in the economic growth rate probably because of the lag required in implementing reforms. However, as the economy adjust

to being opened to external world, the degree of responsiveness of the economy improves causing the two period lagged Lopn to have a positive effect on the rate of economic growth.

The results obtained from this panel data analysis tend to strengthen the hypothesis of this study. In effect, capital stock, labour force, manufacturing output, technology degree of openness and exchange rate all have positive relationships with the growth rate of the economy. That the African region may take its place in the world economy, it is necessary that there must be policy convergence in the areas of incentives on capital accumulation, improvement in human capital development, aggressive revival of the manufacturing sector, technology invention, innovation, adoption and adaptation, balanced domestic and foreign trade policies and in particular, the exchange rate policy. All these will boost economy interdependence within the region and therefore strengthen the position of the region in the global economy. Put differently, for African countries to play active role in the global economic order, improvement in the domestic conditions of capital, human capital (labour), the manufacturing sector and technology cannot be overemphasised. This connotes the tendency to ‘G-localize’- looking inward and improve the region’s internal efficiency to be globally relevant.

The panel Granger causality test seems to corroborate these findings. Using the bivariate causality test of the null hypothesis non panel Granger causality, table 11 depicts the causal relationships between Lrgdp and the other independent variables. The table shows that there is a bidirectional relationship between Lrgdp and Lkapi i.e. $Lrgdp \leftrightarrow Lkapi$. Similarly, there is a feedback between Lmanva and Lrgdp as well as Ltech and Lrgdp i.e. $Lrgdp \leftrightarrow Lmanva$ and $Lrgdp \leftrightarrow Ltech$. We also observe a unidirectional relationship going from Lopn to Lrgdp on one hand and from Ltech to Lexr on the other hand i.e. $Lopn \rightarrow Lrgdp$ and $Lrgdp \rightarrow Lexr$. In both cases, Lopn causes Lrgdp while Lrgdp causes Lexr. However, it seems there is no causation in either direction between Lrgdp and Llbfi suggesting that there is a strict exogeneity between these two variables. In effect, this result may be a bit contentious in the sense that it is expected that at least labour force will contribute to changes in rate of economic growth. What we can infer from this is that there is a lot of effort required to optimally utilize the potentials in human capital in order that it may influence positively the rate of growth of the economies of African region.

Table 11: Panel Granger Causality Test

Null Hypothesis	F-statistics	Probability	Decision	Causality
Lkapi does not Granger cause Lrgdp	31.6406	2.3E-08	Reject	Feedback
Lrgdp does not Granger cause Lkapi	4.0722	0.0438	Reject	
Llbf does not Granger cause Lrgdp	0.3262	0.5680	Accept	None
Lrgdp does not Granger cause Llbf	0.3814	0.5370		
Lmanva does not cause Lrgdp	5.3501	0.0209	Reject	Feedback
Lrgdp does not Granger cause Lmanva	51.4541	1.3E-12	Reject	
Ltech does not Granger cause Lrgdp	8.2756	0.0041	Reject	Feedback
Lrgdp does not Granger cause Ltech	24.5488	8.3E-07	Reject	
Lopn does not Granger cause Lrgdp	17.3805	3.3E-05	Reject	Unidirectional
Lrgdp does not Granger cause Lopn	0.3644	0.5462	Accept	
Lexr does not Granger cause Lrgdp	1.0782	0.2993	Accept	Unidirectional
Lrgdp does not Granger cause Lexr	4.2478	0.0395	Reject	

Source: Authors' computations using EViews 5.0.

6.0 Conclusions

This study has examined what Africa countries should be doing in order to ensure a long run economic growth. The paper proposes a G-Localization model as a development strategy. In this respect, the hypothesis is that African countries must cooperate at the level of problem identification and policy implementation so that they can compete effectively in the global world. We adopt the extended growth model as our theoretical approach. Both standard growth variables and some control variables were introduced into the model to capture economic growth in a multicountry model of 41 African countries. The control variables were designed to capture industrialisation proxied by manufacturing output, technological development proxied by value added in transport, storage and communication sectors while trade were captured by the degree of openness and exchange rate. Our contention is that Africa's poor growth and consequently the pervasive low income and poverty may not be unconnected with poor policy diagnosis and implementation.

First, we built a Panel Vector Autoregressive model around the our model. We noted that the variables included in the model are very often none stationary. In view of the fact that we intend to capture the long run relationships in the study, we specified a Panel Vector Error Correction Model. We then conducted the necessary statistical tests including the panel unit roots test, the Johansen panel cointegration test and estimated a parsimonious Panel Vector Error Correction Model. Finally, we conducted a Panel Granger causality test with a view to ascertaining the direction of causality among the various variables in the model.

The results of the estimations indicate that the variables in the model are stationary, that all the explanatory variables are inelastic with respect to the growth rate of real gross domestic product,

that there are two cointegrating equation and that long run relationship exists. We also found feedback relationships between some of the variables and unidirectional relationship in two cases.

In conclusion, that the African region may be competitive in the world economy, it is necessary that there must be policy convergence in the areas of incentives on capital accumulation, improvement in human capital development, aggressive revival of the manufacturing sector, technology invention, innovation, adoption and adaptation, balanced domestic and foreign trade policies and in particular, the exchange rate policy. All these will boost economy interdependence within the region and therefore strengthen the position of the region in the global economy.

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