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Effects of Trade Openness on Economic Growth: The Case of African Countries

Osei-Yeboah

Cephas Naanwaab

Shaik Saleem

Akua Akuffo (Graduate Student)

Agribusiness, Applied Economics and Agriscience Education- NC A&T

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Abstract

The relationship between trade and productivity has not been established theoretically. Some researchers have indeed found some, if not complete, support for the view that increasing openness has a positive impact on productivity. This study used a Cobb-Douglas production function as in Miller and Upadhyay (2000) to estimate the impact of FDI, exchange rate, capital-labor ratio and trade openness on GDP for 38 African countries from 1980 to 2008. Data were transformed to natural logs and estimated using alternative panel models; which included one- or-two-way fixed or random effects models. The results found trade openness having a positive relationship with GDP; which is comparable to findings of Ahmed et al.; (2008).

Key Words: Trade Openness, Productivity, Africa, Cobb Douglas Production Function.

EFFECTS OF TRADE OPENNESS ON ECONOMIC GROWTH: THE CASE OF AFRICAN COUNTRIES

1. Introduction

The performance of the African continent in the late 1970s and early parts of the 1980s became progressively worse as a result of; structural and institutional bottlenecks, adverse external developments and policies. While other nations in the rest of the world were busily trying to restore growth after the lost decade of the 1980s, Africa continued in stagnation and decline during the first half of the 1990s. Most of the African countries adopted structural adjustment programs during the Bretton Woods era which were made up of rapid and extensive liberalization, deregulation and privatization of economic activity in search of a solution to the stagnation and decline (UNCTAD, 2001).

Trade in Africa as a share of GDP increased from 38% to 43% between 1988 to 1989 and 1999 to 2000, respectively. The marginalization of the African continent is the outcome of the interaction of declining terms of trade with the inability of the region to expand its productive capacity and shift to dynamic products. The region has been resisting open trade regimes. African countries need to focus on growth enhancing policies including promotion of exports of dynamic products.

The relationship between trade and productivity has not been established theoretically even though some researchers have indeed found some, if not complete, support for the view that increasing openness has a positive impact on productivity. Bernard and Jensen (1999) reported that mainly through reallocation of resources from less efficient to more efficient plants (Ricardian theory); manufacturing exporters within the same industry tend to grow faster than

non-exporters. Lawrence (2000) also established that trade with developing countries boosts total factor productivity (TFP) growth in manufacturing industries with a relatively large share of imports from developing countries (UNCTAD, 2001). Many economic research papers have measured the effects of international trade on economic growth of some African countries. The use of cross-country data, multiple regression and a few others have used the fixed effect model (Puente et al; 2009) to measure the impact of trade openness on productivity. Miller and Upadhyay (2000) estimated parsimonious production functions and determined the levels of total factor productivity with and without the stock of human capital as an input.

By estimating a Cobb-Douglas production function, the impact of trade on the economic performance of 38 African countries is measured by testing the following objectives;

1. Determination of the overall returns-to-scale (RTS) for these African countries
2. Determination of individual economic growth as a function of FDI/capita, exchange rate, capital-labor ratio and trade openness/capita.

The rest of the paper progresses as follows. Section 2 focuses on a brief literature review on trade and its impacts on Africa's economic growth; Section 3 outlines a description and assumptions of the methodology, data used and their sources; Section 4 presents results and discussion; and Section 5 draws conclusions based on the findings. These sections are followed by the references and appendix.

2. Literature review

The relationship between trade and productivity has not been theoretically established even though some researchers have found some, if not complete, support for the view that increasing openness has a positive impact on productivity (Elwell, 2005). Africa's economic growth was relatively slow from the mid 1960s right up until the end of 1970. As a result of structural and

institutional bottlenecks, adverse external developments and policies in the early 1980s, Africa's economic situation became progressively worse (UN Economic Development Report on Africa, 2001).

Africa's GDP growth trend is closely linked with its exports volumes to other parts of the world. The growth rate was slow during the 1960s to the mid 1970s compared to the global average of 6.1%; this caused the region's export share in the global market to decline to about 3.1% which is almost half of the original growth rate. But with time, as most African countries began to open up their markets to the rest of the world, the share of exports in GDP has reversed its descent (Anderson et al; 2008).

In Ghana, Kenya and Zimbabwe, Bigsten et al. (2000a) found that exports had a positive effect on productivity growth. Ahmed et al.(2008) observed that trade liberalization had a positive and significant effect on financial and trade related reforms and these worked to enhance market efficiency, reduced distortions in price and fostered Africa's competitiveness and access to the global market; thus promoting inflow of capital and expansion of exports. In the 1970s, Africa already had a growing fiscal deficit, a current account imbalance and an overvalued exchange rate and all these were supported by project aids and loans at an interest rate of zero or even negative due to bad decisions made by governments to ration credit and foreign exchange instead of increasing the money supply. This resulted in weak market institutions (Yu et al., 2011). GDP growth rates in Africa have shown little or no improvement, but countries that adopted trade liberalization and export-led growth strategies have seen some improvement (Ahmed et al., 2008)

The participation in international trade and an improvement in export performance are believed by many economists to contribute largely to developing countries' economic growth since the

1960s and 1970s (Ahmed et al., 2008). There have been increasing arguments and discussions in favor of export-led strategy development: an expansion of trade will enhance productivity through increased economies of scale in the export sector, productivity will be positively affected through an increase in better allocation of resources which will be driven by specialization and increase in efficiency. This will, in the long run, generate dynamic comparative advantage through reduction in costs for the exporting country (Ahmed et al., 2008). Another advantage in the export-led strategy is through the process of interaction with the international markets, there will be diffusion of knowledge through learning-by-doing and a greater efficiency in management through efficient management techniques which will have a net positive effect on the other parts of the economy and overall enhance economic productivity, export growth will also foster capital accumulation and foreign exchange which will enable import of capital and intermediate inputs necessary for the production of export goods. This is supported by Asafu-Adjaye and Chakraborty (1999) who observed that importation of intermediate and capital goods are important inputs in the production of exports in less developed countries (Ahmed et al., 2008).

Apart from the diffusion of knowledge in open economies, technology and efficient allocation of resources are also advantages and this causes monopolists in the local economy to lose ground (Sachs and Warner, 2011). Bigsten et al. (2004) carried out studies in Ghana, Kenya and Zimbabwe where they reported exports having a positive effect on productivity growth. Trade is not just exports and imports, other factors such as foreign direct investment (FDI) impacts productivity and serves as a catalyst for economic development through enhancing job creation and trade growth through the inflow of capital stock (Ram and Zhang, 2002).

Exchange rate is a major determinant of balance of payments (BoP) position and external competitiveness of a country. The exchange rate exerts a major influence on the resource allocation and also the use of productive resources between tradable and non-tradable goods. A devaluation causes an increase in the volume of exports while that of imports reduces as they become more expensive, this causes an improvement in the balance of trade for that country (Khim-Sen et al., 2003). There exists mixed progress with respect to exchange rate policy determination in Southern African economies. Like the majority of Sub-Saharan economies, most regional economies required a real depreciation of their exchange rates to compensate for the worsening terms of trade in the 1980s (Ndlela and Ndlela, 2002).

A series of cross-country econometric studies in the 1970s and 1980s attempted to test the relationship between economic growth and trade. Balassa (1978) did a regression of growth rate of exports on the growth of output; he included and excluded exports as part of the measure of output. He observed that the strongest positive relationship was when exports were included in output, but he also found a significant positive effect when they were excluded for GDP.

Krueger (1978) also found that the faster exports grew, the faster the growth of GDP. A number of regressions models were developed in the Papageorgiou-Michaely-Choksi study (1990), Ioannis Kessides (1991) using data on indices of liberalization relating growth to liberalization (Baldwin, 2003). Among the findings of this study, countries which have strong and sustained trade liberalization incidences were associated with higher increases in GDP as compared to those with weaker and failed trade liberalization episodes who experienced lower GDP.

Results from a study by Miller and Upadhyay (2000) showed that the trade variables were all significant at 1%, implying that a more open economy, all things being equal goes to increase total factor productivity.

3. Methodology and Data

Methodology

This study adopts the Cobb-Douglas production function in estimating the effects of trade openness on the economic growth of 38 African countries.

The Cobb-Douglas production function is widely used to represent the relationship between outputs and inputs. Proposed by Knut-Wicksell (1851-1926) and statistically tested by Charles Cobb and Paul Douglas in 1928. They used it to model growth of the American economy during the 1899-1922 periods. The dependent variable was output, capital invested (K) and amount of labor used (L) as the independent variables. The function they used was modeled as below;

$$P(L, K) = bL^{\alpha}K^{\beta}$$

P = total production (monetary value of all commodities produced per annum)

L= labor input (the total number of people-hours worked in a year)

K = capital input (the monetary worth of all machinery, equipment, and buildings)

b = total factor productivity

α and β are the output elasticities of labor and capital, respectively.

The elasticities measure the responsiveness of the dependent variable to a change in the levels of the independent variables used in the production process (Bao Hong, 2008).

Another feature of the Cobb-Douglas function is the concept of returns to scale. There are three forms; constant, increasing and decreasing returns to scale. Constant returns to scale means that the proportional change in inputs and outputs is equal. It is represented as $\alpha + \beta = 1$.

Increasing returns to scale means a proportional change in input is less than the proportional change in output. It is represented as $\alpha + \beta < 1$.

Decreasing returns to scale is when the proportional change in inputs is more than the proportional change in the outputs. This is represented as $\alpha + \beta > 1$.

Several studies have used the Cobb-Douglas production function in estimating economic growth, productivity and the utility of commodities and inputs to individuals and firms respectively.

A study was done by Miller and Upadhyay (2000) on the effects of openness, human capital and trade orientation on total factor productivity; they used a pooled cross sectional time series data and tested for robustness to find out important links between openness, trade orientation and FDI on a sample of 83 developed and developing countries. They estimated two Cobb-Douglas production functions; one with stock of human capital and the other without it, real GDP as the dependent variable, total physical capital stock, labor force and an index of total factor productivity as the independent variables. The equations were transformed to natural logs and the variables estimated.

The model used is expressed below;

$$G = g \left(F, E, \frac{C}{L}, T \right) \dots \dots \dots (1)$$

$$Y = A F^\alpha E^\beta C/L^\delta T^\varepsilon \dots \dots \dots (2)$$

$$0 < \alpha < 1, 0 < \beta < 1, 0 < \gamma < 1, 0 < \delta < 1 \text{ and } 0 < \varepsilon < 1$$

Where;

Y = output/capita

A = an index of economic growth

F = Foreign Direct Investment

E = Exchange rate

C/L = Capital-Labor ratio

T = Trade openness/capita

α , β , δ and ε = elasticities

There was no restriction applied to the production function, that is $(\alpha + \beta + \gamma + \delta + \varepsilon)$ is not equal to one (1) so that a return to scale can be determined from the model. All variables were transformed to natural logs to generate equation (3);

$$\ln Y = \ln A + \alpha \ln F + \beta \ln E + \delta \ln C/L + \varepsilon \ln T \dots\dots\dots (3)$$

The elasticities are used to explain the average growth of the continent and the individual countries.

Empirical Econometric Model

The Cobb-Douglas production function defined in equation (3) can be econometrically estimated using alternative panel models. This include one- or two-way fixed and or random effects model. Hausman test can be used to test whether fixed or random effects model is appropriate for the data. In general, the panel model can be represented as:

$$y_{it} = \sum_{k=1}^K x_{it,k} \beta_k + u_{it}$$

where $i=1,\dots,N$ cross-sectional units, $t=1,\dots,T$ time-series data, and $k=1,\dots,K$ endogenous variables.

The one-way fixed effects model can be represented as:

$$y_{it} = \sum_{k=1}^K x_{it,k} \beta_k + \gamma_i + \varepsilon_{it}$$

and the two-way fixed effects model is represented as:

$$y_{it} = \sum_{k=1}^K x_{it,k} \beta_k + \gamma_i + \alpha_t + \varepsilon_{it}$$

Where γ_i and α_t are the non-random parameters to be estimated that are cross-section and time-series specific, respectively.

Similarly, the one-way random effects model can be represented as

$$y_{it} = \sum_{k=1}^K x_{it,k} \beta_k + \varepsilon_i + \varepsilon_{it}$$

and below represents the two-way random effects model :

$$y_{it} = \sum_{k=1}^K x_{it,k} \beta_k + \varepsilon_i + \varepsilon_t + \varepsilon_{it}$$

Where ε_i and ε_t are the random errors associated with cross-sectional and time-series variation respectively.

Data

To measure the impact of trade openness on the growth of 38 African countries, data on GDP, Foreign Direct Investment (FDI), exchange rate, capital, labor and trade openness are collected. The African countries considered in the study are listed in Table 1.0 in the appendix. These countries were selected based on data availability.

FDI was calculated from each country's balance of payment (BoP), the value of exports expressed in constant 2005 US\$ were obtained from the World Bank website, (www.worldbank.org). Exchange rate was expressed as a ratio of the local currency to the US\$ and was obtained from Penn World Tables 7.0 (PWT7.0) website (www.pwt.econ.upenn.edu). Capital was measured as the gross capital formation in US Dollar. The data on capital consists of outlays on additions to fixed assets of the economy plus net changes in the level of inventories. The total labor force which comprises people ages 15 years and older who meet the International Labor Organization definition of the economically active population. Both capital and labor force was obtained from the World Bank website. The data covered the period 1980 to 2008. Trade openness was calculated as the ratio of the sum of imports and exports to exports for each country. Trade openness is measured as such because some countries might be only exporters; this makes them not open to trade. Imports and exports data were obtained from the World Bank website. All data are in per capita basis with population data from the World Bank website.

4. Results and Discussion

Table 3.0 shows the estimates under the Fixed-One-Way procedure. With the exception of capital-labor ratio (0.07) which was significant at 10% and FDI/capita (0.35) which was not significant at all, all the other variables were significant at 1%. The elasticity coefficient of 0.05 for exchange rate implies that 1% depreciation in the local currency relative to the US Dollar will

cause GDP/capita to increase by 0.05%. The elasticity of 0.69% GDP/capita with respect to trade openness implies a 1% expansion in trade will increase GDP/capita by about 0.69%. This is comparable to results by Onafowora and Owoye, (1998) who also reported a positive effect of trade orientation on some sub-Saharan African countries. Frankel and Romer (1999) also regressed the level of per capita GDP on the share of trade in GDP; they found that on the average, a 1% point increase in trade share raises GDP/capita by 2%. The production function under the one way fixed effects procedure showed a decreasing RTS (0.634%) for the study period.

The Hausman test for random variables under the One-Way procedure is shown in table 5.0. The m value of 6.52 is not significant (0.16) at both 1% and 5%; as such failure to reject the null hypothesis. We draw a conclusion that the Random effects procedure is more appropriate under the One-Way than the fixed effects.

Table 6.0 presents the parameter estimates for the Fuller and Battese Variance Components. All the parameters were significant at 1% with the exception of capital-labor ratio (0.09) which was significant at 10% and FDI/capita (0.22) which was not significant at all. The elasticity coefficient of 0.70 for trade openness implies that 1% expansion in trade will increase GDP/capita by 0.70%. The coefficient of elasticity of -0.03 for exchange rate implies that 1% depreciation in the local currency relative to the US Dollar will increase GDP per capita by 0.03%. The overall return to scale (RTS) exhibited was decreasing returns to scale (0.62%). The parameter estimates for the Fixed-Two-Way procedure are shown in Table 8.0. All parameters were significant at 1% with the exception of capital-labor ratio (0.18) and FDI/capita (0.14) which were both significant at 10%. The elasticity coefficient of 0.62 implies that a 1% expansion in trade will increase GDP/capita by 0.62%. The elasticity 0.03% GDP/capita with respect to exchange rate implies that 1% depreciation in the local currency against the U.S Dollar

will increase GDP growth by 0.03%. For the Two-Way Fixed Effects model, the average growth of the continent was 0.54%.

Table 10.0 is a summary of the Hausman test for Random effects under the Two- Way procedure. The m value of 19.91 is significant (0.0005) at both 1% and 5%. Consequently, we reject the null hypothesis; bringing to conclusion that the Two-Way Fixed effects procedure is more appropriate than the Two-Way Random effect.

Table 11.0 shows the results of the parameters under the Fuller and Battese Variance Components. All parameters were significant at 1% besides FDI/capita (0.14) and capital-labor ratio (0.14) which were both significant at 10%. The elasticity coefficient of 0.69 implies 1% expansion in trade will increase GDP/capita by 0.69%. The coefficient of 0.03 implies that 1% depreciation in the local currency relative to the U.S Dollar will increase GDP/capita by only 0.03%. The negative coefficients of elasticities for exchange rate are comparable to the results of Ndlela and Ndlela (2002). The estimated coefficients for trade openness are concurrent with the results of Sjöholm (1997) who reported that establishments that participated in exports and imports had relatively high levels of productivity. They also reported a positive relationship between trade openness and productivity.

The overall RTS under the Fuller and Battese Variance Components method is decreasing return to scale (0.60%) as in all the other procedures.

Table 13.0 shows the parameter estimates of the Parks Estimation procedure. The estimated average growth for the continent was 0.65%. The estimates of all parameters were significant at 1% with the exception of the FDI/capita (0.37) which was not significant even at all. All parameters had the expected signs with the exception of exchange rate. The coefficient 0.02 implies that GDP per capita will increase by 0.02% with 1% rise in the ratio of capital to labor. The elasticity of 0.59% GDP with respect to trade openness signifies that a 1% expansion in

trade will increase GDP per capita by 0.59% with 1% expansion in trade. The elasticity coefficient of 0.001 implies that 1% increase in FDI per capita will increase GDP per capita by only 0.001%. This result is comparable to the findings of Ahmed et al. (2008) who reported a positive effect of FDI on the productivity of Africa. The elasticity coefficient of 0.02 implies a 1% appreciation in the local currency relative to the U.S. Dollar will increase GDP/capita by 0.02%.

Figure 1.0 below shows individual growth of all countries from 1980 to 2008.

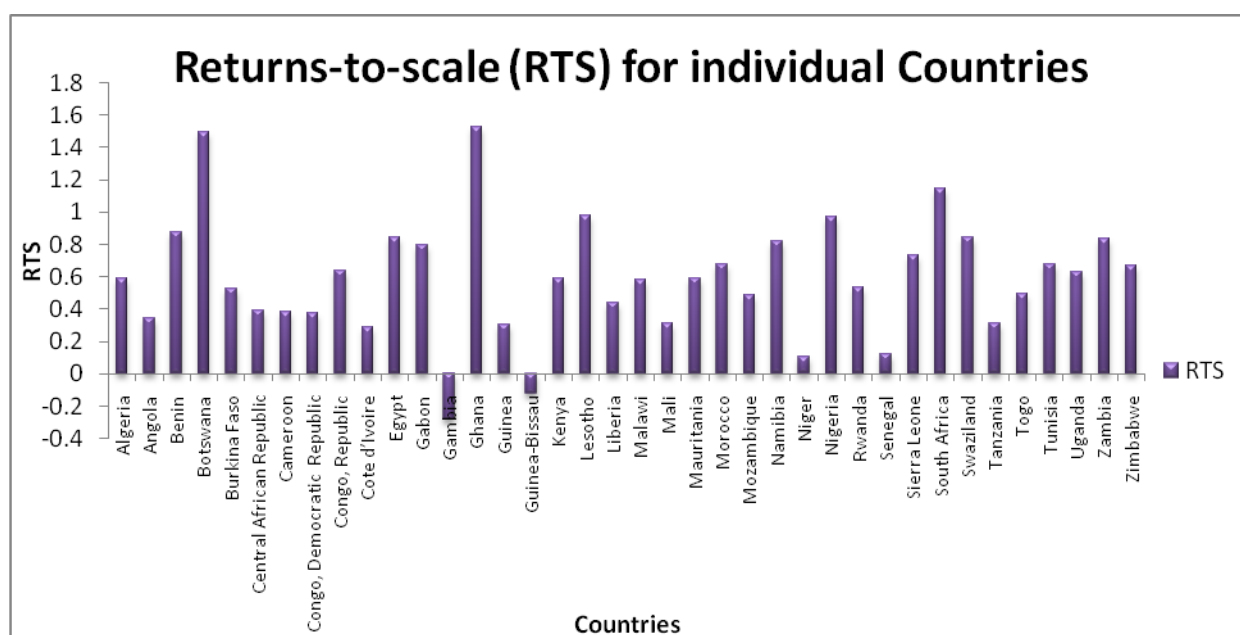


Figure 1.0: Returns-to-Scale (RTS) for Individual Countries

Using the RTS under the Fixed-One-Way effects, seventeen (17) countries exhibited RTS above the average (0.63%). Table 14.0 below shows the RTS of all countries over the study period.

Ghana, Botswana and South Africa recorded average growths of 1.53%, 1.50% and 1.43% respectively. Other countries that had above average growth include Egypt (0.84%), Lesotho (0.98%), Nigeria (0.97%), Benin (0.88%) and Swaziland (0.84%).

Ghana's GDP after the adoption of trade liberalization policies in 1983 increased from 7.2% in 1972 to 8.6% in 1984 (Sakyi, 2010). Exports are dominated by cocoa, which contributed US\$280

million in 1993. Other significant export commodities were gold (US\$416 million) and timber (US\$140 million).

Botswana's economy is one of the fastest growing economies in the world for the past 30 years. The diamond sector accounts for 35% of the country's GDP and more than 80% of exports (www.gaborone.diplo.de).

South Africa in the last ten years has reduced tariffs and subsidies in line with the country's WTO commitments and Free trade Agreements (FTAs). Gold's percentage contribution to total exports is about 40% with manufacturing accounting for 25% and less than 10% from agriculture. The country's exports also include coal and platinum (Teweldemedhin et al., 2010). The rest of the countries exhibited decreasing-returns-to-scale with Guinea- Bissau and Gambia being the only nations with negative RTS, -0.13% and -0.28% respectively.

Agriculture employs about 70% of Gambia's population but forms only a third of GDP. The country's economy is mainly reliant on agricultural exports including peanuts, fish, cotton fabric, and palm kernel. Food, industrial products, and fuel, machinery and equipment goods are imported (www.accessgambia.com).

Guinea-Bissau is the third largest producer of cashew nuts in the world but has to import rice and oil due to farmers transforming farmlands into cashew plantations. About 60% of imports are made up of commodities such as rice, flour and sugar and 30% is oil (www.economywatch.com).

5. Conclusion

The study looked at the impact trade liberalization had on the productivity of African countries. The study made use of the Cobb-Douglas production function which was estimated using alternative panel models. The continent on the whole exhibited a decreasing return to scale which is to be expected. The FDI/capita and capital-labor ratio coefficients showed negative signs implying no effects or reduction in GDP/capita with an increase in FDI or capital-labor

ratio. However, exchange rate and trade-openness/capita exhibited positive and significant impacts on GDP/capita. Majority of the countries showed below average returns-to-scale with about 17 countries exhibiting above average growth. According to the World Bank classification, countries with strongly outward-oriented economies tend to have increase in economic growth and productivity. The effect of trade on productivity is much greater in outwardly-oriented economies than the inwardly-oriented nations. This agrees with results from Sachs and Warner (1995).

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Appendix

Table 1.0: List of African Countries

| | |
|--------------------------------|--------------|
| Algeria | Mali |
| Angola | Mauritania |
| Benin | Morocco |
| Botswana | Mozambique |
| Burkina Faso | Namibia |
| Central African Republic (CAR) | Niger |
| Cameroon | Nigeria |
| Congo, Democratic Republic | Rwanda |
| Congo, Republic | Senegal |
| Cote d'Ivoire | Sierra Leone |
| Egypt | South Africa |
| Gabon | Swaziland |
| Gambia | Tanzania |

| | |
|---------------|----------|
| Ghana | Togo |
| Guinea | Tunisia |
| Guinea-Bissau | Uganda |
| Kenya | Zambia |
| Lesotho | Zimbabwe |
| Liberia | |
| Malawi | |

Table 2.0: Fit Statistics for the Fixed One Way Estimates

| SSE | MSE | R-Square | DFE | Root MSE |
|----------|--------|----------|------|----------|
| 141.4532 | 0.1236 | 0.8884 | 1144 | 0.3516 |

Table 3.0: Parameter Estimates for the Fixed One Way

| Variable | DF | Estimate | Standard Error | T value | Pr > t |
|----------------|----|----------|----------------|---------|---------|
| Intercept | 1 | 2.013968 | 0.1934 | 10.42 | <0.0001 |
| LnER | 1 | -0.05346 | 0.00456 | -7.12 | <0.0001 |
| LnCL | 1 | -0.00582 | 0.0293 | -1.820 | 0.0684 |
| LnTrade/capita | 1 | 0.698787 | 0.0288 | 24.30 | <0.0001 |
| LnFDI/capita | 1 | -0.00582 | 0.00625 | -0.930 | 0.3520 |

Table 4.0: Fit Statistics for the Fuller and Battese Variance Components (RanOne)

| SSE | MSE | R-Square | DFE | Root MSE |
|----------|--------|----------|------|----------|
| 145.2403 | 0.1227 | 0.4056 | 1184 | 0.3502 |

Table 5.0: Hausman Test for Random Effects

| DF | mValue | Pr > m |
|----|--------|--------|
| 4 | 6.52 | 0.1632 |

Table 6.0: Parameter Estimates for Fuller and Battese Variance Components

| Variable | DF | Estimate | Standard Error | T value | Pr > t |
|----------------|----|----------|----------------|---------|----------|
| Intercept | 1 | 2.184214 | 0.1704 | 12.82 | < 0.0001 |
| LnER | 1 | -0.03146 | 0.00439 | -7.16 | < 0.0001 |
| LnCL | 1 | -0.04804 | 0.0290 | -1.660 | 0.0978 |
| LnTrade/capita | 1 | 0.704786 | 0.0263 | 26.82 | < 0.0001 |
| LnFDI/capita | 1 | -0.00754 | 0.00620 | -1.220 | 0.2237 |

Table 7.0: Fit Statistics for the Fixed Two Way Estimates

| SSE | MSE | R-Square | DFE | Root MSE |
|----------|--------|----------|------|----------|
| 134.4289 | 0.1205 | 0.8940 | 1116 | 0.3471 |

Table 8.0: Parameter Estimates for the Fixed Two Way

| Variable | DF | Estimate | Standard Error | T value | Pr > t |
|----------------|----|----------|----------------|---------|---------|
| Intercept | 1 | 2.697198 | 0.2659 | 10.14 | <0.0001 |
| LnER | 1 | -0.03353 | 0.00510 | -6.57 | <0.0001 |
| LnCL | 1 | -0.03957 | 0.0297 | -1.330 | 0.1831 |
| LnTrade/capita | 1 | 0.620246 | 0.0361 | 17.20 | <0.0001 |
| LnFDI/capita | 1 | -0.00967 | 0.00658 | -1.470 | 0.1417 |

Table 9.0: Fit Statistics for Fuller and Battese Variance Components (RanTwo)

| SSE | MSE | R-Square | DFE | Root MSE |
|---------|--------|----------|------|----------|
| 143.370 | 0.1211 | 0.3638 | 1184 | 0.3480 |

Table 10.0: Hausman Test for Random Effects

| DF | mValue | Pr > m |
|----|--------|--------|
| 4 | 19.91 | 0.0005 |

Table 11.0: Parameter Estimates for the Fuller and Battese Variance Components (RanTwo)

| Variable | DF | Estimate | Standard Error | T value | Pr > t |
|----------------|----|----------|----------------|---------|---------|
| Intercept | 1 | 2.290891 | 0.1722 | 13.31 | <0.0001 |
| LnER | 1 | -0.03134 | 0.00456 | -6.87 | <0.0001 |
| LnCL | 1 | -0.04259 | 0.0290 | -1.470 | 0.1425 |
| LnTrade/capita | 1 | 0.686565 | 0.0274 | 25.10 | <0.0001 |
| LnFDI/capita | 1 | -0.00922 | 0.00631 | -1.460 | 0.1443 |

Table 12.0: Fit Statistics for the Parks Estimation Model

| SSE | MSE | R-Square | DFE | Root MSE |
|---------|--------|----------|------|----------|
| 688.041 | 0.5811 | 0.8208 | 1184 | 0.7623 |

Table 13.0: Parameter Estimates for Parks Method of Estimation

| Variable | DF | Estimate | Standard Error | t-value | Pr>(t) |
|----------------|----|----------|----------------|---------|----------|
| Intercept | 1 | 2.619737 | 0.0698 | 37.53 | < 0.0001 |
| LnER | 1 | 0.02112 | 0.00237 | -8.90 | < 0.0001 |
| LnCL | 1 | 0.027822 | 0.0106 | 2.63 | 0.0086 |
| LnTrade/capita | 1 | 0.59966 | 0.0117 | 51.22 | < 0.0001 |
| LnFDI/capita | 1 | 0.001465 | 0.00162 | 0.900 | 0.3668 |

Table 14.0: Return to Scale Results for Individual Countries

| Country | Return-to-Scale (RTS) |
|--------------------------------|-----------------------|
| Algeria | 0.5881 |
| Angola | 0.3423 |
| Benin | 0.8759 |
| Botswana | 1.4966 |
| Burkina Faso | 0.5250 |
| Central African Republic (CAR) | 0.3916 |
| Cameroon | 0.3826 |
| Congo, Democratic Republic | 0.3752 |
| Congo, Republic | 0.6352 |
| Cote d'Ivoire | 0.2847 |
| Egypt | 0.8397 |
| Gabon | 0.7935 |
| Gambia | -0.2833 |
| Ghana | 1.5258 |
| Guinea | 0.3009 |
| Guinea-Bissau | -0.1251 |
| Kenya | 0.5895 |
| Lesotho | 0.9802 |

| | |
|--------------|--------|
| Liberia | 0.4367 |
| Malawi | 0.5797 |
| Mali | 0.3143 |
| Mauritania | 0.5932 |
| Morocco | 0.6787 |
| Mozambique | 0.4864 |
| Namibia | 0.8198 |
| Niger | 0.1042 |
| Nigeria | 0.9726 |
| Rwanda | 0.5321 |
| Senegal | 0.1242 |
| Sierra Leone | 0.7285 |
| South Africa | 1.1430 |
| Swaziland | 0.8401 |
| Tanzania | 0.3099 |
| Togo | 0.4916 |
| Tunisia | 0.6772 |
| Uganda | 0.6328 |
| Zambia | 0.8322 |
| Zimbabwe | 0.6658 |
