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Foreign Direct Investment, Trade Openness and Growth in Nigeria

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Abstract: This study examines the empirical econometric evidence of both causal and long run interrelationships among foreign direct investment, trade openness and economic growth in Nigeria. While the study covers the periods from 1970-2006, the following real variables are employed: Output (Y), capital (K), Labour (L), Foreign Direct Investment (FDI) and Trade openness (Tr). The variables are expressed in their per capita form and the production function is also specified in a log-linear form. The study employs more robust econometric procedures by employing the Toda-Yamamoto non-causality test and the Autoregressive Distributed Lag (ARDL) technique to cointegration. The Toda-Yamamoto non-causality test reveals unidirectional causality running from foreign direct investment to output and trade openness to output. Having established a long run relationship among the variables when their vector is normalized on output, the ARDL cointegration procedure further suggests, however, that both foreign direct investment and trade openness are positively related to and significant in explaining output growth in Nigeria. Therefore, this study concludes by recommending, among other things, more trade openness and inflow of foreign direct investment for output growth dynamics in Nigeria.

Key words: Foreign direct investment, economic growth, causality, autoregressive distributed lag, cointegration

INTRODUCTION

For >2 decades, there have been different strands of theoretical and empirical studies aimed at investigating the relationship between foreign direct investment and growth both in developed and developing countries. The study of foreign direct investment as it impacts on growth is crucial given its relevance in explaining growth dynamics in different economies. Apart from being a major source of capital inflows, foreign direct investment is also less volatile contrary to other capital inflows and does not show a pro-cyclical behavior. Thus, investigating the relationship between foreign direct investment and growth especially in developing countries is very crucial as this helps in understanding the role foreign direct investment plays in the economic growth and development in this current trend of globalization. Foreign direct investment serves as an important source of supply of funds for domestic investment thus, promoting capital formation in the host country. Foreign direct investment can also enhance knowledge and technological transfer and increase job opportunities thus boosting overall growth in the host country.

Different studies have been able to identify major channels through, which foreign direct investment impacts growth. Factors such as economic and technological conditions, financial system effectiveness, skills, infrastructures, institutional framework and macroeconomic stability in the host country also influence the efficiency of foreign direct investment in promoting growth. Though the consensus in the study seems to establish a significant positive linkage between foreign direct investment and growth such that foreign direct investment increases growth, productivity and efficiency gains in the host country, however, the empirical evidence is rather not unanimous. So far, there have been different and sometime conflicting empirical evidences in both cross-country and country specific foreign direct investment-growth nexus analyses. Among other factors, differences in data used, data measurement and definitions, methodological approaches and time frame have been identified as major factors responsible for these differences.

More specifically, the role of foreign direct investment in explaining growth also depends on the economic, institutional and technological conditions in the host country (Zhang, 2001). More recent studies have been able to identify a link between the impact of foreign direct investment and growth and the effectiveness and regulation of financial market (Alfaro *et al*., 2004; Durham, 2004). These studies argue that a sound, functioning and better financial systems can encourage foreign direct investment inflow in achieving higher growth. Again, other studies have investigated the role of market in foreign direct investment and growth relationship by adopting the market size hypothesis

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(Bajorubio and Rivero, 1994). According to the market size hypothesis, the market with large population size and/or more rapid growth tend to offer international firms more opportunities to generate greater sales and profit, thus, become more attractive to their investment.

Nigeria provides an interesting research venue given the foreign direct investment attraction and trade liberalization policy, which have been the integral preoccupation of its government since the adoption of structural adjustment policy in 1986. While, various studies have attempted examining the determinants, structure and potentials of foreign direct investment in Nigeria (Odozi, 1995; Anyanwu, 1998), others have focused on the magnitude, direction and prospects of foreign direct investment in Nigeria (Jerome and Ogunkola, 2004; Ayanwale, 2007). Among other empirical studies carried out on Nigeria are those that examined the impact of foreign direct investment on growth (Aluko, 1961; Brown, 1962). Despite rigorous empirical exercises, the evidence as it relates to the determinants and impact of foreign direct investment on economic growth in Nigeria remains ambiguous.

This study intends to contribute to literature by charting its path differently. The study aims at investigating and evaluating the impacts of foreign direct investment and trade openness on economic growth in Nigeria within the theoretical framework of neoclassical Cobb-Douglas production function.

Therefore, this study is guided by the following specific research objectives: to examine the causal interrelationship among foreign direct investment, trade openness and economic growth in Nigeria. To estimate the long run relationship and short run dynamics of foreign direct investment, trade openness and economic growth in Nigeria using recent and more robust econometric technique.

The main empirical findings from this study (contrary to some studies, which fail to establish any significant relationship among foreign direct investment, trade openness and output growth in the case of Nigeria), reveal that on the long run foreign direct investment and trade openness contribute positively to the growth of output in Nigeria.

MATERIALS AND METHODS

Data definitions and sources: In order to examine the relationship among foreign direct investment, trade openness and economic growth in Nigeria, this study employs the Nigerian annual time series from 1970-2006. These variables are output (Y), Foreign Direct Investment (FDI), Trade openness (TR), Labour stock (L) measured in terms of labour force and capital stock (K), which is also measured by gross capital formation, respectively. The variables employed are sourced from World Development Indicator (WDI, 2007) and Central Bank of Nigeria Statistical Bulletin (2006). All variables are expressed in their per capita values and also stated in real forms.

Model specification: In order to investigate the impact of foreign direct investment and trade openness on growth in Nigeria, this study shall employ the Aggregate Production Function (APF) framework. This production function, which has been widely applied in the analysis of foreign direct investment and trade impact on growth assumes unconventional inputs such as foreign direct investment and trade openness along the conventional inputs of labour and capital in the model. The approach used in this study follows that of Fosu and Magnus (2006).

The aggregate production function to be estimated is specified thus:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} \quad (1)$$

From Eq. 1, Y_t represents the aggregate production of the economy (proxied by GDP) at time t; A_t, K_t and L_t also denote the Total Factor Productivity (TFP), capital stock and labour stock at time t, respectively. Following the Bhagwati's hypothesis, it is assumed in this study that foreign direct investment, trade openness and other factors, which are exogenously determined all influence the behaviour of TFP (Bhagwati, 1978; Ewards, 1998). Consequently, TFP is therefore specified thus:

$$A_t = f[FDI_t^{\phi}, TR_t^{\delta}, C_t] \quad (2)$$

Equation 2 can thus be expressed as:

$$A_t = FDI_t^{\phi} TR_t^{\delta} C_t \quad (3)$$

Equation 1 and 3 therefore, give:

$$Y_t = C_t K_t^{\alpha} L_t^{\beta} FDI_t^{\phi} TR_t^{\delta} \quad (4)$$

In this study, the effect of trade liberalization through the introduction of structural adjustment policy in 1986 is examined. Thus, a dummy variable is included in Eq. 4, which thus, become:

$$Y_t = C_t K_t^{\alpha} L_t^{\beta} FDI_t^{\phi} TR_t^{\delta} D_t^{\psi} \quad (5)$$

To estimate Eq. 5, we take the natural logs of both sides, which result in the following Eq. 6:

$$y_t = c_t + \alpha k_t + \beta l_t + \phi fdi_t + \delta tr_t + \psi d_t + \mu \quad (6)$$

$$f_k \geq 0,\ f_l \geq 0,\ f_{tr} \geq 0 \text{ and } f_d \geq 0$$

Here, d denotes dummy variable, which accounts for trade regime shifts in Nigeria. d = 0 from 1970-1985 and 1 from 1986-2006. On the other hand, c_t represents a constant parameter, μ_t denotes the white noise error term and y_t, k_t l_t, fdi_t, tr_t remain as earlier defined. Equation 6 represents the long run equilibrium relationship. Meanwhile, α, β, δ and ψ are constant elasticity coefficients of output with respect to k_t, l_t, fdi_t tr_t and d_t. All coefficients are expected to be positive.

Model estimation: To investigate the long- and short-run relationships among our variables of interest, this study shall employ the approach of Pesaran *et al.* (2001) to cointegration. Pesaran *et al.* (2001) proposed an Autoregressive Distributed Lag (ARDL) bounds testing approach to investigating the existence of cointegration relationship among variables.

Compared to other contegration procedures, such as Engle and Granger (1987) and Johansen and Juselius (1990), the bounds testing approach appeared to have gained popularity in recent times due to the following reasons: both long and short-run parameters of the specified model can be estimated simultaneously, the test is applicable irrespective of the order of integration whether the variables under consideration are purely I (0), purely I (1) or fractionally integrated and finally and the approach is also suitable for small samples. The (ARDL) bounds testing equation is thus, specified in Eq. 7.

The 1st step in the (ARDL) bounds testing procedures is to estimate Eq. 7 by ordinary least square method and thus conduct an F-test for the joint significance of the coefficients of the lagged level of the variables with the aim of testing for the existence of long run relationship among the variables in Eq. 7 that is H_o: $\eta = \alpha = \beta = \delta = 0$ against the alternative H_i: $\eta \neq \alpha \neq \beta \neq \phi \neq \delta \neq 0$.

$$\Delta y_t = c + \eta y_{t-1} + \alpha k_{t-1} + \beta l_{t-1} + \phi fdi_{t-1} + \delta tr_{t-1} + \sum_{i=1}^{p} \eta_{2i} \Delta y_{t-i} + \sum_{i=1}^{q} \alpha_{2i} \Delta k_{t-i} + \sum_{i=1}^{r} \beta_{2i} \Delta l_{t-i} + \sum_{i=1}^{s} \phi_{2i} \Delta fdi_{t-i} + \sum_{i=1}^{w} \delta_{2i} \Delta tr_{t-i} + \mu_t$$

Consequently, the computed F-statistic is then compared to the non-standard critical bounds values reported by Pesaran *et al.* (2001). If the computed F-statistic exceeds the critical upper bounds value, then the null hypothesis of no cointegration is rejected. If the computed F-statistic falls below the critical lower bounds value, then the null hypothesis of no cointegration is not rejected. However, when the computed F-statistic falls between the critical lower and upper bounds values, then the knowledge of integration of the variables of under consideration is required or else, no conclusion can be reached about cointegration status.

Once cointegration relationship is established, the next step is to estimate Eq. 7 using ARDL procedure and then obtain the short-run dynamic parameters from Eq. 8 specified:

$$\Delta y_t = c_0 + \sum_{i=1}^{k} \alpha_i \Delta k_{t-i} + \sum_{i=1}^{k} \beta_i \Delta l_{t-i} + \sum_{i=1}^{k} \phi_i \Delta fdi_{t-i} + \sum_{i=1}^{k} \delta_i \Delta tr_{t-i} + \sum_{i=1}^{k} \psi_i \Delta d_{t-i} + ECM_{t-i} + \mu_t \quad (8)$$

RESULTS AND DISCUSSION

Unit root test: The result of stationary/unit root test is indicated in Table 1. Ng and Perron (2001) modified unit root tests are employed in order to test the order of integration of the variables under consideration. This is necessary for the purpose of determining the underlying properties of the process that generate these time series variables. The test result shows that all the time series data employed in this study are stationary at first difference. Thus, the evidence suggests that first differencing is sufficient for modeling the time series considered in this study.

Causality test: In Table 2, causality result is depicted. The essence of this test is to investigate and test for causality

Table 1: Ng-Perron unit root test result

Variables	MZa	MZt	MSB	MPT
y	0.35254	0.22226	0.63045	28.1953
Δy	-13.64260*	-2.61147**	0.19142*	1.79699*
k	-0.21825	-0.14159	0.64875	26.1825
Δk	-12.71770*	-2.51366*	0.19765*	1.95741*
l	0.62588	0.43787	0.69960	34.9663
Δl	-13.41000*	-2.61057**	0.18281*	1.75329**
fdi	-13.31700*	-2.57990*	0.19373*	1.84169*
Δfdi	-13.74520*	-2.61798**	0.19047*	1.79615*
tr	-0.29967	-0.17395	0.58049	21.9469
Δtr	-15.53080**	-2.77518**	0.17869*	1.62046**
Level of significance				
1	-13.80000	-2.58000	0.17400	1.78000
5	-8.10000	-1.98000	0.23300	3.17000

The variables are expressed in their natural logarithms. While Δ symbolizes first difference, **(*) denotes the rejection of the null hypothesis at 1 (5%) significance level. The asymptotic critical values for each of the test for 1 and 5% level of significance are specified

Table 2: The Toda-Yamamoto non-causality test result

Direction of causality	k + d	Wald statistics	Probability value	Status
y→fdi	2	0.09153	0.91279	Reject
fdi→y	2	3.83952	0.03424*	Accept
tr→y	2	5.12589	0.01216*	Accept
y→tr	2	1.05806	0.35973	Reject
fdi→tr	2	0.59491	0.55799	Reject
tr→fdi	2	0.60934	0.55030	Reject

* and *** indicate the rejection of null hypothesis at 1 and 5% level of significance, respectively

relationship among foreign direct investment, trade openness and growth. This test is important in the sense that it informs us about the direction of causality among these variables. There are basically three possibilities of this test. There could be a unidirectional, bidirectional or neutrality relationship. In this study, the result reveals a unidirectional causal relationship ruining from foreign direct investment to output and trade openness to output. The intuition from the causality test is simple. Trade openness and inflow of foreign direct investment in Nigeria impact on growth through transfer of technical know-how, man power development and increased employment generation.

Cointegration test: The result of bounds testing cointegration relationship further elucidates the relationship in Nigeria as already revealed in the causality result. The result reveals that there exists a long run (cointegration) relationship among foreign direct investment, trade openness, capital, labour and output growth in Nigeria. It should be noted that the outcome this long run relationship among the variables is as a result of the fact that the vector of variables is normalized on output. Again, this therefore reinforces the role of foreign direct investment and trade openness in explaining output growth in Nigeria (Table 3).

Estimated long and shot-run (ARDL) models: As already demonstrated both in the causality and bounds testing contegration results, the result of the estimated (ARDL) output model evident in Table 4 clearly supports the hypothesis that foreign direct investment and trade openness are significant in the explanation of output growth in Nigeria. Table 4 reveals that about 10% increase in foreign direct investment would lead to about 3% growth of output. Again, increasing trade openness by 10% would result in about 7% increase in the growth of output. Even though, these increases appear negligible, however, judging by their probability values, they are significant and positively related to output growth in Nigeria.

On the other hand, the result fails to establish any meaningful relationship between the adoption of structural adjustment policy and the level of output growth in Nigeria. This therefore, seems to be counter intuitive as it is expected that the impact of SAP on the output growth in Nigeria should be significant. Meanwhile, as indicated in Table 5, the result of the estimated (ARDL) output model clearly refutes any short run significance of the explanatory variables under

Table 3: Bounds testing cointegration result

Dependent variables	Lags	F-statistic	Outcome
F_y (y|k, l, fdi, tr)	1	4.59	Cointegration

Table 4: The estimated (ARDL) output model (Y)

Variables	Coefficient	SE	t-statistic	Prob.
y (-1)	0.857278	0.076403	11.220490	0.0000***
k	0.278759	0.108006	2.580956	0.0161**
k (-1)	-0.241014	0.105766	-2.278748	0.0315*
L	-2.197415	1.514736	-1.450692	0.1593
l (-1)	1.875405	1.366509	1.372406	0.1821
fdi	-0.030169	0.012287	-2.455408	0.0214*
fdi (-1)	0.006767	0.014554	0.464927	0.6460
tr	0.076975	0.163948	0.469507	0.6428
tr (-1)	-0.318884	0.137178	-2.324609	0.0285*
dm	-0.031146	0.123493	-0.252205	0.8029
c	9.061882	6.812658	1.330154	0.1955
R^2	0.788123	Mean dependent var	23.512540	-
Adjusted R^2	0.767372	SD dependent var	1.893321	-
SE of regression	0.097052	Akaike info criterion	-1.580678	-
Sum squared resid	0.235476	Schwarz criterion	-1.096825	-
Log likelihood	39.452210	F-statistic	1329.520	-

**(*) indicates 1 (5%) level of significance

Table 5: Short run estimated (ARDL) output model (DY)

Variables	Coefficient	SE	t-statistic	Prob.
D (k (-1))	0.097530	0.123578	0.789217	0.4364
D (l (-1))	0.854947	1.515847	0.564006	0.5771
D (fdi (-1))	0.007078	0.013854	0.510857	0.6133
D (tr (-1))	0.015414	0.188531	0.081756	0.9354
ECM (-1)	-0.159817	0.328584	-0.486381	0.6304
c	0.111143	0.062685	1.773029	0.04867
R^2	0.311760	Mean dependent var	0.153822	-
Adjusted R^2	0.241390	SD dependent var	0.149333	-
SE of regression	0.158331	Akaike info criterion	-0.693448	-
Sum squared raised	0.726996	Schwarz criterion	-0.426817	-
Log likelihood	18.135350	F-statistic	0.249077	-
Durbin-Watson stat	1.183262	Prob (F-statistic)	0.936872	-

consideration as regards short run variability in output. Also, a closer look at the result indicates the insignificance of error correction term (ECM(-1)) (though rightly signed) with the probability value of 0.6304.

CONCLUSION

Given the crucial role of inflow of foreign direct investment and degree of trade openness in the explanation of growth especially in the less developed open economy like Nigeria, different theoretical and empirical expositions have attempted to examine the extent and dimensions and impacts of foreign direct investment and trade openness on output growth. So far different and sometime sharply conflicting empirical evidences have been established in the literature. While some studies argue that the inflow of foreign direct investment in these countries are highly insignificant, others have been able to link the effectiveness or efficacy of foreign direct investment with both the domestic economic and political environment.

Of course, the reasons why different results permeate the literature are not farfetched. Factors such as differences in data used and measurement, scope of the study, the country under investigation and in fact, difference econometric technique and procedures are likely to influence, to some extent, the outcome of these studies. Therefore, the empirical evidence as regards the relationship among foreign direct investment, trade openness and output growth in the less developed open economies becomes inconclusive.

This study is thus, necessitated given the ambiguous empirical evidences recorded among various studies on Nigeria. Consequently, this study aims at investigating the dynamic and long run relationship that exist among the variables under consideration namely foreign direct investment, trade openness and output growth in Nigeria with the scope ranging from 1970-2006. While, the study builds on the foundation of earlier researches on Nigeria in the course of its investigation, the study, however, charts its path differently. This study employs relatively more robust econometric techniques in carrying out its goal. We employ the Toda-Yamamoto non-causality and (ARDL) bounds testing cointegration approach for the dynamic causal and long run relationship, respectively.

The Toda-Yamamoto non-causality test reveals unidirectional causality running from foreign direct investment to output and trade openness to output. Having established a long run relationship among the variables when their vector is normalized on output, the ARDL bounds testing procedure further suggests, however, that both foreign direct investment and trade openness are positively related to and significant in explaining output growth in Nigeria. Based on the results of this study, about 10% increase in foreign direct investment would lead to about 3% growth of output. Again, increasing trade openness by 10 would result in about 7% increase in the growth of output. Even though, these increases appear negligible, however, judging by their probability values, they are significant and positively related to output growth in Nigeria. Therefore, this study concludes by recommending, among other things, more trade openness and inflow of foreign direct investment for output growth dynamics in Nigeria.

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