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Foreign Direct Investment, Export and Economic Growth in Nigeria: A Re-evaluation

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Abstract: The widely acknowledged disagreement among FDI-growth researchers is increasing as numerous scholars as well as FDI policymakers frequently add their voice. While the submissions of theoretical literatures could be more or less speculative, empirical investigations who handle the statistical raw data are expected to settle the dispute. That is, however, far from the facts. Instead, empirical papers are themselves entangled in the vicious web. But the present study shows a glimpse of hope. Using a previously analysed data, it is found that the reasons for the mixed results of empirical investigations are traceable to superficial or non-rigorous OLS analyses as well as model specifications. We advise that instead of focusing more on literature review, as is currently the case, FDI-economic growth investigators should realize that there is one striking difference between theoretical and empirical literatures. While the former is concerned with literature review, the latter, like a statistician, is preoccupied with data handling and analyses.

Keywords: Autocorrelation, economic growth, foreign investment, granger causality, lagged variables, superficial and rigorous analyses, traditional and standardized OLS

INTRODUCTION

Foreign investors are no santa claus. No country should over rest on her oars and expect fortune seeking foreign investors to develop her economy for her. It is up to the recipient economy of foreign investment to "exploit" the foreign investment through judicious use of her macoreconmic policies deliberately designed to take advantage of the available foreign investment for the national economic benefits (Agbach, 1998) as cited in Chudi (2013).

While we admit that the impact of FDI on the economy of Nigeria is disputable, we are concerned about the way some empirical literatures conduct their investigations. The general method used is OLS technique. It is such a fundamental and essential tool that Gujarati (2004) interestingly pictured it as the bread-and-butter tool of econometrics. The upside of the method, however, lies in the numerous intractable regression problems that are associated with its application. The two major problems are autocorrelation and multicollinearity. The parameter estimates are not only biased but the associated student t-test statistics and F-distribution test are also unreliable in the presence of autocorrelation. The commonest way of detecting it is by using the widely celebrated Durbin-Watson (DW) test statistics. But Andren (2007) find that DW test applicability is dependent on the number of observations used as well as the values of the explanatory variables used in the regression. There is, thus, no precise critical value for the DW test statistic unlike t and F test statistic that have definite critical values. This is evident from the Durbin-Watson decision table that maps a range of limits within which one might speculate autocorrelation and some boundaries within which the test statistic is of no use as it fails out rightly to detect whether there is autocorrelation or not. This is, of course, distressing, considering the number of authors that rely on it and the serious implications of autocorrelation and consequently, the importance of its detection and correction in regression analysis.

Although regression result that contains autocorrelation is described as nonsense or spurious regression (Gujarati, 2004), some researchers (Ayanwale, 2007; Okon *et al*., 2012, Adofu, 2010; Ugwuegbe *et al*., 2013) conduct their analyses on the impact of FDI on the economic growth in Nigeria without detecting/correcting for autocorrelation in their result. Expectedly, such results might lead to misleading policy recommendation.

Bavariate model might be used to investigate the connection between two variables, which is hardly the case in econometrics. This is because economic growth of a nation, for example, demands the inclusion of other variables that are responsible for the economic development of a nation. The use of multiple regression model is, thus, the conventional method of investigating economic growth. However, multicollinearity is a formidable multiple regression problem that might have great consequences on the OLS result. Some authors have adopted a solution of "do nothing" as they fail to make corrections when confronted with this problem and yet they go ahead to loud their result as if they were free from these serious regression problems.

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There are a number of approaches that can be used to overcome the problem of autocorrelation. The two common methods are by the use of instrumental variables or by adopting simultaneous equation approach. The choice of instrument arises if there is simultaneity problem. In that case, the OLS estimates are inefficient and inconsistent. If it can be shown that GDP and FDI are two simultaneous variables that are better connected using simultaneous equation, then the use of instrument is justified. What are these instruments?

First, it should be noted that the reason that guide the choice of instrument is to overcome autocorrelation which usually arise when the dependent variable correlate with the error term. Instrument used should thus be good at predicting FDI without correlating with the simultaneous dependent variable of interest (GDP in our case). Lensink and Morrissey (2001) admit that finding such instrument is problematic.

Aside the regression problems associated with OLS techniques; nonstationarity of data is a problem inherent in some econometric variable. Conducting an OLS analysis without testing for the presence of unit root is an indication that authors are probably unaware of the implications of nonstationarity of data in econometrics. Co-integration and granger causality tests are other important tests which are, disturbingly, just gaining currency among Nigeria FDI-growth investigators.

How about the time lag between FDI injection and the economic growth response time? This is, apparently, an exotic topic to Nigeria FDI-development researchers. Many authors are content with the traditional OLS that use current values of growth variables. But when the time lag between FDI registration in Nigeria and the actual operation as well as the time taken for the FDI to start exerting significant effects on the Nigeria economy are taken into consideration, one tends to doubt the submission of such works. Otepola (2002) and Badeji and Abayomi (2011) are examples of works that used the current values of FDI and thus, arrive a negative conclusion.

In spite of this array of issues in FDI-growth related studies, almost every new paper boasts of its readiness to settle the controversy among researchers on whether FDI inhibits or promotes the economic growth of Nigeria. Obviously, settling such an age long dispute is tasking and requires holistic OLS regression techniques as well as econometric theories in respect to the parameters of interest. This is the ambition of the present study.

In order to drive our point home regarding the literature gap or pitfalls of the existing FDI-growth related studies with respect to methodology, we will not introduce a new data. Rather, we will revisit already existing works and use one of the papers as well as its data as a case study.

LITERATURE REVIEW

FDI is an investment made to acquire a lasting management interest (normally 10% of voting stock) in a business enterprise operating in a country other than that of the investors defined according to residency (World Bank, 1996). There are, nonetheless, other definitions of FDI. This is because it is a complex field as it touches almost all facets of human endeavour. Consequently, its definition as well as its usefulness depends on the investing multinational corporations (MNCs) or the recipient/host country positions. The present review will focus more on the relevance of FDI to the Nigeria economy.

Two schools of thought exist with a strong wall of partition separating them. On one side are the pro-foreign international schools that see FDI as adding new resources in terms of capital, technology, managerial skill and technical know-how, productivity gains and so on to the host economy. They regard FDI as potent enough to improve the prevailing efficiency in the productive sector, stimulate changes for faster economic growth, create jobs, foster growth and improve the distribution of income by bidding up wages in the host economics.

On the other side of the wall are the opposing dependency school drawing their arrangement from Marist dependency theory. They doubt whether FDI - which do soak up local financial resources for their own profits - can bring about industrialization because foreign investors see host economics as merely serving the interest of their home countries in supplying basic needs for their companies. This school views foreign investors as “imperialistic predators” that specialize in exploiting the entire globe for the sake of corporate few as well as creating a wet of political and economic dependence among nations to the detriment of the weaker ones. This group thought that foreign investors set artificial prices to extract excessive profits, make insufficient transfer of technology at too high cost, crowds-out domestic investment and exert serious strains on the balance of payment of the host country.

Robu (2010) assert that FDI is usually sought by countries that are going through the transition period and/or those that face severe structural unemployment. This is the situation of Nigeria. Aremu (1997) noted that Nigeria as one of the developing countries of the world, has adopted a number of measures aimed at accelerating growth and development in the domestic economy. One of such measures is FDI attraction. The realization of the importance of FDI had informed the radical and pragmatic economic reforms introduced since the mid-1980s by the Nigeria government. According to Ojo (1998), the reforms were designed to increase the attractiveness of Nigeria’s investment opportunities and foster the growing confidence in the economy so as to encourage foreign investors in Nigeria. The reforms

resulted in the adoption of liberal and market-oriented economic policies, the stimulation of increased private sector participation and the elimination of bureaucratic obstacles which hinders private sector investments and long-term profitable business operations in Nigeria. One of the targets of these reforms is to encourage the existence of foreign MNCs and other private investors in some strategic sectors of the Nigeria economy like the oil industry, banking industry, communication industry and others. Since the enthronement of democracy in 1999, the government of Nigeria has taken a number of measures necessary to woo foreign investors in the country. Some of these measures include the repeal of laws that are inimical to the foreign investment growth, promulgation of investment laws, various overseas trips for image laundry by some presidents among others. Umah (2002, 2007) asserts that the Nigeria government has instituted various institutions, policies and laws aimed at encouraging foreign investors.

These efforts have not been in vain as the country has witnessed amazing inflow of FDI in the recent times (Adofu, 2010). But whether FDI plays the acclaimed role of pushing the economy forward is a topic that is currently generating a dramatic wave among researchers and economic law makers. The policymakers do not have much analytical tool to assess the performance of FDI in Nigeria economy. They generally add their voice by citing other countries of the world that actively engage in FDI and thus, hopefully, argue that FDI might be playing the same role in Nigeria's economy. They rather look forward to the empirical analyst to show, them the way forward.

But the empirical literatures do not have one voice as well. Some of the authors that find positive linkages between FDI and economic development in Nigeria are Aluko (1961), Brown (1962), Oyaide (1977), Obinna (1983), Ariyo (1998), Chete (1998), Anyanwu (1998) and Oseghale and Amenkhienan (1987). Others such as Oyinlola (1995), Badeji and Abayomi (2011) and Otepola (2002) argue that FDI retard economic growth in Nigeria. Amidst those who report positive connections are those that find that the contribution is statistically insignificant (Aremu, 1997; Adofu, 2010) and as such frown at, according to Adofu (2010), "undue attention" given to FDI in Nigeria. The implication of the conflicting economic advice that arises from these multifarious results is palpable.

The question that hangs on all lips at this stage is what is responsible for these contradictions and what could be the way out of the dilemma. But section one already blamed methodology as well as OLS regression problems as the kingpin that upsets the apple cart.

The next section will attempt to illustrate how this confusion about the place of FDI on the economy of Nigeria can be minimized. One of the papers that submit that FDI has positive but insignificant impact on Nigeria economy will be used as a case study. If investment is, indeed, the most development indicator that determines the economic growth of a country, then economic data need be rigorously investigated in order to draw a definite and unbiased conclusion that could have true policy impact.

DATA SOURCE AND METHODOLOGY

Data source: The data is taken from the study of Oyatoye *et al*. (2011) published in European Journal of Humanities and Social Sciences. The authors use the data to examine the impact of FDI on economic growth in Nigeria.

Econometric research methodology:

Introduction: Due to the indeterministic nature as well as the complex interplay between the economic growth variables, research methodology is of great importance to the economist. This is because the results and conclusions drawn from the research depend greatly on the method adopted. There is, thus, a need for a researcher to understand and hence, explain in details, the various techniques employed in a particular study. This will give some other person the room to assess the validity of the researcher's claim. This is the main focus of this section.

Conceptual framework and description of variables: This section intends to highlight the nature and measurement of these economic growth variables around which the whole study revolves while the next section concentrates on the methodology of analysis of these variables. The chief corner-stone among these variables are FDI and GDP and they are, therefore, considered first.

- **FDI:** Tadaro (1999) defines FDI as investment by large multinational corporations with headquarters in the developed nation of the world. To buttress the definition, Makola (2003) noted that FDI is the primary means of transfer of private capital (i.e., physical or financial), technology, personnel and access to brand names and marketing advantage. Viewed as a private investment, some authors (e.g., Adofu, 2010) refer to it as private Foreign Direct Investment (FPI). Amadi (2002) explains that FDI is not just an international transfer of capital but rather, the extension of enterprise from its home country which involves flows of capital, technology and entrepreneurial skills to the host country where they are combined with local factors in the production of goods for local and for export markets (Root, 1984).

  Still on the definition of FDI as a strong world development indicator, one of the pioneering study on FDI, Hymer (1960), described FDI as asset transfer by the formation of subsidiaries or affiliates abroad, without lots of control. The summary of these definitions is that FDI means asset (capital, technology, managerial abilities) transfer from the developed to the developing

world. This is the reason why FDI is regarded as an important world development yardstick.

- **Market size and economic growth:** GDP is taken as a measure of both market size and economic growth. GDP itself refers to the monetary measure of the total market value of all final goods and services (total output) produced within a country in one year. Lipsey (1986) defines economic growth as a positive trend in the nation's total output over long term. Thus economic growth implies sustained increase in GDP for a long time. Dolan *et al*. (1991) and Katerina *et al*. (2004) submit that economic growth is most frequently expressed in terms of GDP; taken as a measure of the economy's total monetary output of goods and service. Factors that determine whether Multinational Enterprises (MNEs) that engage in market seeking FDI invest in a country are the host country's market size and economic growth, both of which are represented by GDP in the present study.
  Since FDI is expected to have positive effect on the economic growth of Nigeria, other economic variables that are known to influence the economic development of the nation are included in the present models. Understandably, factors that correlate with GDP may equally have a link with FDI.
- **Export:** This refers to the amount of goods export to other countries per annum. It is a good indicator of economic progress and is expect to be positively connected with GDP growth.

Model specifications: In order to estimate the relationship between FDI and economic growth in Nigeria, the present study will employ single equation models. Ordinary Least-Square (OLS) method will be used in the present investigation. OLS is, simply, a method of fitting the best straight line to the sample of XY observations.

The central goal of the present study is to investigate the role of FDI on the growth economy of Nigeria. Other economic variables believed to impact on growth are also included for completion and comparison purposes. A function that relates these parameters can be of the form:

$$GDP = f(FDI, EXP) \quad (1)$$

Traditional regression model: Suppose that Eq. (1) has a linear relationship, it can be transformed as:

$$GDP_t = \beta_0 + \beta_1 FDI_t + \beta_2 EXP_t + u \quad (2)$$

Stadnardized regression model: Regression on standardized variable has a number of advantages over the traditional regression model Eq. (2). In order to exploit these advantages, standardized model Eq. (3) is also run:

$$GDP_t = \beta_t FDI + \beta_t EXP + u \quad (3)$$

Lagged OLS variable model: Gujarati (2004) asserts that time lag exists between some economic growth variables. Wilhelms and Witter (1998) equally emphasize the need for using the lagged values of the explanatory variables of economic growth data. It is believed that it takes one to six years for FDI projects to exert any significant effects on the economy of a country. This time lag accounts for registration to actual operation. In order to account for this time lag, a model of the form is equally specified:

$$GDP_t = \beta_t FDI_{t-1} + \beta_t EXP_{t-1} + u \quad (4)$$

where i = 1, 2, 3,.....

Approri expectation: The regression models above set out to test if there is a relationship between GDP and FDI. Other variables, believed to impact on the economy, are equally included. The coefficient of FDI is expected to be positive since FDI is thought to boost economic growth. The coefficient of domestic investment is equally expected to be positively related with the economy. The coefficient of exchange rate is not certain as it depends on its variability within the time period. The coefficient of government tax rate is supposed to impact positively on the economy.

Granger causality: Although OLS results can establish the existence of a relationship between two data time series, it cannot explain the direction of the relationship. Since the future cannot predict the past, Granger causality test attempts to establish if changes in FDI precede changes in GDP, that is, FDI causes GDP and not GDP causing FDI. Given:

$$GDP_t = \beta_0 + \sum \beta_j GDP_{t-j} + \sum c_j FDI_{t-j} + u_t \quad (5)$$

$$FDI_t = \beta_0 + \sum \beta_j FDI_{t-j} + \sum c_j GDP_{t-j} + u_t \quad (6)$$

Equation (5) postulates that current GDP is related to past values of itself as well as that of FDI and (6) postulates a similar behaviour for FDI. There are four implications for each of the equations:

- GDP→FDI [GDP causes FDI, unilateral causality]
- FDI→GDP [FDI causes GDP, unilateral causality]
- GDP↔FDI [feedback or bilateral causality]
- GDP-FDI [independence]

The null hypothesis is H_0: $\sum c_j = 0$, that is lagged FDI and GDP terms do not belong to Eq. (5) and (6), respectively. The symbol GDP↔FDI implies bilateral causality and is explained thus: Bidirectional causality

Table 1: Unit root test for stationary with constant only

Unit root test for stationarity with constant only						
		Level		1st Difference		
	Variables	DF	ADF	DF	ADF	Conc
1	GDP	-1.70	-1.22	-1.72	-2.63	N.A
2	FDI	-3.65*	-	-	-	I(1)
3	EXP	-1.81	0.97	-8.45**	-	I(1)

From Critical Dickey–Fulle table, 1 and 5% significance level for sample size less than 50 is given as -3.75 and -3.00 respectively; In this table, '**'and '*', represent 1 and 5% level of significance, respectively

Table 2: Unit root test for stationarity with constant and time trend

Unit root test for stationarity with constant and time trend						
		Level		1st Difference		
	Variables	DF	ADF	DF	ADF	Conc
1	GDP	-2.59	-2.67	-0.82	-2.21	N.A
2	FDI	-2.21	-0.88	-0.65	0.27	I(1)
3	EXP	-5.49**	-	-	-	I(1)

From Critical Dickey–Fulle table, 1 and 5% significance level for sample size less than 50 is given as -4.38 and -3.60, respectively; In this table, '**'and '*', represent 1 and 5% level of significance, respectively

exists between GDP and FDI in the two equations above if the null hypotheses H_0: $\sum c_j = 0$ for the two equations are rejected. The test of significance of the overall fit can be carried out with an F test while the number of lags can be chosen with AIC criteria. The above equations are for bivariate causality model. For a multivariate causality, other variables in the model will be included. The details of granger tests are explained in the section below.

Details of analyses: The above section specifies a number of models ranging from the usual OLS models to granger causality or lagged models. While the ordinary OLS (un-lagged models) is an old and familiar method common in the literatures, other methods such as Granger Causality Test (GCT), unit root test and co-integration test are yet at the infancy stage in the development literatures. Some investigators are in the habit of indicating, for instance, that they conducted GCT but one may have no idea what or how the test is conducted. This section intends to give some little details of these relatively new techniques before quoting the final results in below section.

Unit root tests: The results of FDI-economic growth can only be useful to the society if policy makers can accept the validity or significance of the results. In order to do any meaningful policy analyses with the OLS results, it is important to distinguish between correlations that arise from sheer trend (spurious) and one associated with an underlying casual relationship. To achieve this, all the data used in the study are first tested for unit root (non-stationarity) by using the Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) tests. Since our data cannot be mere noise, we assumed them to be stationary data with a constant only or stationary data with a constant and time trend. The results in Table 1 and 2 shows that all the variables except GDP are integrated of order one, I(1).

The implication of the presence of unit root is such that the regression result is spurious or nonsense result. This is why the above test is extremely necessary. Since GDP is not stationary even after the first difference, regression results involving it needs be validated to ensure that it does not arise by chance.

Granger test (Vector Autoregression model (VAR): Do past values of FDI help to explain the present values of GDP? Or do past values of FDI help to predict the present values of GDP? The test is conducted as follows. The first difference of GDP and FDI was taken resulting in the growth equation. The current GDP growth is regressed on all lagged GDP growth terms and other variables in the model, if any. The lagged FDI growth will not be included in this regression. This is called the restricted regression and from this, restricted residual sum of squares, RSS_R, is obtained. This is the first stage. The second stage involves re-running the first regression but including the lagged terms of FDI growth form. From this regression, the unrestricted sum of squares, RSS_{UR}, is obtained. The Akaike information is calculated using the Equation below:

$$AIC = \ln(\frac{RSS_{UR}}{T}) + (\frac{2j}{T}) \quad (7)$$

where,

RSS_{UR} = Error sum of squares of the unrestricted regression
T = Current time
j = Number of estimated parameters in the unrestricted regression

The overall goodness of fit is measured by F values. The F value here is not, however, the normal F values embedded (F_{output}) in the regression packages. Instead, the F, generally referred to as F_{cal}, in this project is calculated from:

$$F_{cal} = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} \quad (8)$$

where,

RSS_R = Restricted Sum of Square Residuals
RSS_{UR} = Unrestricted Sum of Square Residuals
m = Number of the lagged terms of the variable\ that is being tested for dependability. That is the parameter whose control on the depended variable is being investigated
n = Number of observations
k = Number of parameters estimated in the unrestricted regression

It is the F_{cal} that is used to test the goodness of fit of the regression. In order words, if F_{cal} of a regression is greater than the critical F-values for a regression of the type $FDI_t \rightarrow GDP_t$, then FDI is said to granger cause GDP and, otherwise, if not.

RESULTS AND DISCUSSION

Three models - traditional OLS, standardized OLS and lagged OLS - were specified in the above section. The results are presented and compared in this section. It should be noted that the traditional OLS is the general method used by FDI-growth researchers. The comparison here will illustrate the differences between the traditional OLS and the standardized OLS.

The use of instrumental variable is another method that significantly affects the results of both types of OLS. The choice of instrument arises if there is simultaneity problem. In that case, the OLS estimates are inefficient and inconsistent. A number of authors find that there is simultaneity bias between GDP and FDI. This justifies the use of Instrumental Variable Estimate (IVE). Ayanwale (2007) submits that FDI = 100X (FDI/GDP) can be used as an instrument for FDI. The same instrument is used in the present study. The first question is whether our choice of instrument is valid?

First, it should be noted that the reason that guide the choice of instrument is to overcome autocorrelation which usually arise when the dependent variable correlate with the error term. Instrument used should thus be good at predicting FDI without correlating with the simultaneous dependent variable of interest (GDP in our case). Does our instrument fulfil these criteria? Although Lensink and Morrissey (2001) admit that finding such instrument is problematic, the result presented will confirm that our choice of instrument is good.

Traditional OLS model results: The results of the traditional OLS are presented in Table 3 and 4 while Table 3 is without instrument and Table 4 uses instrument. They are striking differences between the results presented in the two tables. While the coefficient of FDI is positive in Table 3 it is negative in Table 4. The opposite is the case in Table 4 with respect to expect. The constant term is positive in both models though it is larger in the table with instrument. Another striking difference is the statistical significant of the parameters in the two tables. While table without instrument show statistically insignificant results, the table with instrument shows highly statistically significant coefficients. Expectedly, the question is what makes the differences and which of the results are econometrically correct?

Table 3: Dependent variable: GDP

Variables	Coefficient	S.E.	T-values	p-value
Constant	1682000.00	1189000.00	1.4140	0.1754
FDI	20.08	11.37	1.7650	0.0955*
EXP	-0.08	0.86	-0.0930	0.9272

'***', '**', '*' and '.' imply significance at 0, 0.1, 1 and 5%; Multiple R^2: 0.3229; Adjusted R^2: 0.2432; F-statistic: 4.053, DW = 1.507949

Table 4: Dependent variable: GDP (with instrument)

Variables	Coefficient	S.E.	T-values	p-value
Constant	3316000.00	782100.00	4.2400	0.000552 ***
FDI	-436500.00	104000.00	-4.1980	0.000604 ***
EXP	2.37	0.49	4.8710	0.000144 ***

'***', '**', '*' and '.' imply significance at 0, 0.1, 1 and 5%; Multiple R^2: 0.6066, Adjusted R^2: 0.5603; F-statistic: 13.11; DW = 1.904904

Table 5: Dependent variable: GDP (With instrument)

Variables	Coefficient	S.E.	T-values	p-value
FDI	-0.8009	0.1854	-4.3200	0.000412 ***
EXP	0.9292	0.1854	5.0120	9.05E-05 ***

: '***', '**', '*' and '.' imply significance at 0, 0.1, 1 and 5%; Multiple R^2: 0.6066; Adjusted R^2: 0.5629, F-statistic: 13.88; DW = 1.904904

The major differences between the two results can be attributed to the use of instrument and the attendant control for autocorrelation. The value of DW statistic indicates that there is autocorrelation in Table 3 (DW = 1.507949) whereas it is absent in Table 4 (1.904904). The result of the table with instrument is thus better with respect to sign although the sizes of the coefficients fault the two models as they are not econometrically feasible. The sizes of the standard error in the two models equally suggest that there is something intrinsically wrong with the two traditional models. There is thus a need to investigate the data using another model.

Standardized OLS model results: Gujarati (2004) concludes that all the variables in a regression are put on equal basis when the variables are standardized. The implication for this is that all the coefficients can be compared directly with one another. If the coefficient of one standardized regressor is larger than that of another standardized regressor appearing in the model, then the former contributes more relatively to the explanation of the regressand than the latter. The intercept term of a regression involving standardized regressand and regressors is always zero. And better still, such constant term is of secondary importance here since the primary objective is not to investigate the value of GDP when FDI is not being injected into the system.

The result of the standardized OLS is presented in Table 5 where it is evident that FDI makes negative impact whereas export contributes positively to the economic growth of Nigeria. The impacts of the two are highly statistical. The DW (= 1.904904) equally indicates that there is no autocorrelation in the regression. A comparison of this with that of the

Table 6: Multivariate granger causality test (Var)

Regression type	No of lags	F_{cal}	Critical F values 1%	5%	10%	df_1/df_2
FDI→GDP	1	0.26	7.82	4.26	2.93	1/25
GDP→FDI	1	15.10***	7.82	4.26	2.93	1/25
GDP→EXP	1	15.13***	7.82	4.26	2.93	1/25
EXP→ GDP	1	49.12***	7.82	4.26	2.93	1/25
EXP→FDI	1	58.66***	7.82	4.26	2.93	1/25
FDI→EXP	1	31.41***	7.82	4.26	2.93	1/25
GDP→FDI	2	2.76*	6.01	3.55	2.62	2/18
FDI→GDP	2	0.76	6.01	3.55	2.62	2/18
GDP →EXP	2	2.23	6.01	3.55	2.62	2/18
EXP→ GDP	2	18.39***	6.01	3.55	2.62	2/18
EXP→FDI	2	24.36***	6.01	3.55	2.62	2/18
FDI→EXP	2	10.96***	6.01	3.55	2.62	2/18
FDI→GDP	3	2.40	5.56	3.34	2.52	3/14
GDP→FDI	3	1.52	5.56	3.34	2.52	3/14
GDP →EXP	3	0.56	5.56	3.34	2.52	3/14
EXP→GDP	3	17.72***	5.56	3.34	2.52	3/14
EXP→FDI	3	15.14***	5.56	3.34	2.52	3/14
FDI→EXP	3	6.47***	5.56	3.34	2.52	3/14

'***', '**'and '*', represent significant at 1, 5 and 10% level of significance; The fraction, df_1/df_2; represents degrees of freedom (numerator and denominator respectively); It is used to reference upper (critical) points of the F Distribution table

Table 7: Dependent variable: FDI

Variables	Coefficient	S.E.	T-values	p-value
GDP	-0.6356	0.1471	-4.3200	0.000412 ***
EXP	0.8869	0.1471	6.0280	1.06e-05 ***

'***', '**', '*' and '.' imply significance at 0, 0.1, 1 and 5%; Multiple R^2: 0.6878; Adjusted R^2: 0.6532, F-statistic: 19.83

Table 8: Dependent variable: EXP

Variables	Coefficient	S.E.	T-values	p-value
GDP	0.6269	0.1251	5.0120	9.05e-05 ***
EXP	0.7540	0.1251	6.0280	1.06e-05 ***

'***', '**', '*' and '.' imply significance at 0, 0.1, 1 and 5%; Multiple R^2: 0.7346, Adjusted R^2: 0.7051

traditional OLS shows improved results. The standard errors are minimal whereas coefficients of the variables are also econometrically sensible. The coefficients are quite small when compared to the result of the traditional OLS, they are still quite high the light of economic growth. The coefficients of FDI and GDP are, respectively -0.8 and 0.93, implying that 80 and 93% variations in GDP within the period of study are accounted for by FDI and GDP. The result in Table 5 could have pronounced policy implications. It is thus important to test the validity of the result before making policy advice.

Result validation/cointegration test: Recall that the result of stationarity test in Table 1 and 2 shows that GDP contains unit root. The results of analysis conducted with such variables should be taken with caution as it might be spurious. In order to test whether the result presented in Table 5 does not arise by chance, the residuals of the regression is tested for unit root. The variables in the regression have no long run relationship if the residual contains unit root. They are, however, co-integrated if the residuals are without unit root. The test is conducted as:

$$\Delta u_i = -0.9529\, u_{t-1}$$

$$\tau_{cal} = (-4.065)***$$

$$\tau_{critical} = -3.58(1\%) \text{ (from DF Table)}$$

Using the DF test, $\tau_{cal} \succ \tau_{tab}$ at 1% level of significance. This implies that the three variables are co-integrated.

Granger causality test: Another means of validating the above result is by conducting granger causality test. Since the GDP is a non-stationary data, the impact of the contributing variables (FDI and GDP) could as well be highly variable (unstable) and thus periodic. Should that be the case, then policies made using the result of Table 5 might be misleading. Since causality test uses lagged variables, it is an appropriate tool that can be used to test if the significant negative but large coefficient of FDI is sustainable or periodic. Table 6 shows that it is the unstable GDP that granger causes FDI for the first and second year lag. The F-statistic equally shows that the influence of GDP on FDI is strongest in the first lag and relatively very weak in the second year. In fact, this influence disappeared before the third lag as is evident from the table. This is an indication that the large and negative contribution of FDI to GDP should be taken cautiously. How about export? Is its contribution to GDP growth sustainable?

Table 6 shows that there is strong bilateral causality between GDP and FDI for the first and second lags. The large values of F-statistic equally reflect the large coefficient of export variable in Table 5. It is interesting to observe that export continues to granger cause GDP even in the third lag, though GDP no longer causes export. Since this is a multivariate causality, other results are presented vis-a-vis the causality between GDP and FDI. The strong bilateral causality between FDI and export is quite interesting. It is, however, impossible to interpret this causality as positive or negative relationship between the two variables without conducting another traditional or standardized OLS regression. The next section presents the OLS result that test the relationship between FDI or export and other variables.

Other OLS results: Table 7 and 8 present the determinants of FDI and export respectively. The relationship between GDP and FDI remains negative. Where the direction of causality (Table 6) is from GDP to FDI, implying that low GDP or poor economic development discourages FDI attraction into the economy of Nigeria. It is again important to note that the negative coefficient of GDP is large and highly statistically significant.

Most importantly, the relationship between FDI and export is positive and highly significant (Table 7)

Table 9: Dependent variable: GDP_t (Lag = 1)

Variables	Coefficient	S.E.	T-values	p-value
FDI_{t-1}	-0.0468	0.1808	-0.2590	0.7988
EXP_{t-1}	0.8331	0.1836	4.5370	0.000292 ***

Multiple R^2: 0.6446; Adjusted R^2: 0.6027; F-statistic: 15.41

Table 10: Dependent Variable: GDP_t (Lag = 2)

Variables	Coefficient	S.E.	T-values	p-value
FDI_{t-2}	-0.8933	0.5680	-1.5730	0.13419
EXP_{t-2}	0.9183	0.2007	4.5750	0.000269 ***

Multiple R^2: 0.5967; Adjusted R^2: 0.5493; F-statistic: 12.58

as suggested by granger causality test. Thus the causality test can safely be interpreted that both export and FDI are strong positive determinants of each other.

Table 8 examines the connection between export and other model variables. It is great to observe that export is positively related to both FDI and GDP. This positive coefficient of export agrees with those of Table 5 and 7.

Lagged OLS results: While the result of standardized OLS shows that the negative impact of FDI on the GDP is large and highly statistically significant, the causality test shows that the connection is lag or period dependent. Another means of validating these results is by conducting lagged OLS regression analysis. The results of lagged OLS are presented in the two below for lag 1 and 2, respectively. The result is not only interesting but safe explanatory. The results surprisingly confirm both the OLS and the causality test results in a number of ways.

First, the impact of FDI on economic growth remains negative at both lags whereas that of export reflects the same positive trend observed previously. The coefficients of export in the results (Table 3 to 8) is larger and of more statistical significant than that of FDI except in the traditional OLS result (Table 3) whose coefficients are not only econometrically senseless but cannot be compared directly one with another. The same pattern is reflected in the lagged and the effect is even more pronounced. Thus, the coefficient of FDI in both lag 1 and 2 are not statistically significant whereas that of export remains highly significant. Note that this agrees quite well with that of causality test (Table 9 and 10).

We summarize this section by noting that the presences of unit root in a data could have more effects than many realize. Table 1 and 2 show that GDP is a non-stationary data even after the first difference. Gujarati (2004) points out, as evidenced in this section, that such moving, unstable or non-stationary data are unreliable and their regression results highly unpredictable. Consequently, no definitive conclusion or policy implications could be attributed to such data without rigorous analyses and various tests of significance.

After a detailed analyses coupled with various result validation, FDI proved to impact negatively on the economy of Nigeria. What might be responsible for this is a sixty four thousand dollar question as FDI is universally believed to be economic growth stimulant. In fact, inflow of large amount of FDI into a country is such an economic miracle that Chingarande *et al*. (2012) who found that their country, Zimbabwe, is not fortunate enough with FDI attraction wondered if Zimbabwe is cursed. Early workers (Katerina *et al*., 2004) and the references therein) find that FDI, in spite of its readiness to raise investment and perhaps the productivity of investments as well as consumption in the host country, it lowers the rate of growth due to factor price distortions or misallocations of resources. Many other reasons have been invoked to explain that FDI is not a Santa Claus. Instead, whether the host country benefits from the bilateral trade depends on the strategic policies and brains put in place by the host country, otherwise the fortune seeking foreign investors are not ready to develop other people's country.

CONCLUSION

Although FDI data are of different types and some can indeed be negatively related with GDP, we contend that the same FDI data should not be author or methodology dependent. FDI-growth data should be carefully analysed such that another author investigating the same data could reproduce the same result. Our review of literature indicates that that is hardly the case. The data of Oyatoye *et al*. (2011) that is the subject of the present submission reveals some bewildering differences arising from different authors using the same data. The common method of using only one or at most two regression equations or models to attempt to arrive at a firmed conclusion about the place of the complex FDI in Nigeria economy is, obviously, fraught with inadequacies as illustrated in methodology section.

Among the major reasons adduced to explain the momentous controversy on the role of FDI on the economy is sample issues. The present study suggests that superficial or non-rigorous analysis, rather than measurement errors, could be the cause of the confusion.

Autocorrelation and the presence of unit root are, for example, some of the potential data issues that could seriously bias any OLS regression results. It has been shown here that consequent upon these manifold regression problems, array of models and techniques such as the use of instrumental variables, are required to validate OLS result. It is not just enough to run one or two OLS regressions and then list multiples of policies to the government of the nation without minding the fact that such result could be spurious and thus of no significance as illustrated here.

After some rigorous analyses, we conclude that FDI inhibits economic growth contrary to the

submission of Oyatoye *et al*. (2011) who first investigated the data. The negative impact is even statistically significant. All the models confirm that export is a strong promoter of economic growth in Nigeria.

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