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Impact of Foreign Direct Investment on Economic Growth in Nigeria: A Re-Assessment

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Abstract
Although ordinary least square technique (OLS) is the general bread-and-butter tool in econometrics, it can at times play the hard game of garbage in, garbage out. There is, thus, a need for pre-processing of economic data variables before feeding them into the OLS computer software analysis. OLS is such a sensitive tool that even a single data point can significantly influence the entire results. The relationship between economic variables is complex. Rigorous OLS method is required to disentangle the individual effects of these parameters. The present investigation shows that Hausman ednogeneity test, granger causality test, two stage methods of least squares (2SLS) and the method of lagged variables are different stages of OLS analysis that could be integrated in order to understand the complex interplay between foreign direct investment and economic growth.

1. INTRODUCTION

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 (e.g. Ayanwele, 2007; Okon et al., 2011, 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 this serious regression problems.

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 Morrisy (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 exacting 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 paper.

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

2. LITERATURE REVIEW

FDI is an investment made to acquire a lasting management interest (normally 10% of voting sock) 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 change for faster economic growth, create jobs, faster 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 schools view 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 the 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 (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), Oseghale and Amenkhienan (1987), Okodu (2009). 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 (e.g. Aynwele, 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 every lips at this stage is what is responsible for this 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 are difficult if not impossible to accept 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

3.1 DATA SOURCE

The data is taken from the work of Onu Agbo Joel Christopher published in Interdisciplinary Journal of Contemporary Research in Business in the year 2012. The author uses the data to examine the impact of FDI on economic growth in Nigeria.

3.2 ECONOMETRIC RESEARCH METHODOLOGY

3.2.1 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.

3.2.1.1 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.

(i) 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.

(ii) 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 work.

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.

(iii) EXCHANGE RATE (EXR): This is the price of one currency in terms of another. It is usually defined in two ways: Domestic currency units per unit of foreign currency or foreign currency per unit of the domestic currency. High exchange rate may discourage investors. Devaluation of local currency, for example, will lead to increase in trade volumes and competiveness. Its connection with GDP tells whether Nigeria exchange rate policy encourages economic growth or not.

(iv) DOMESTIC SAVINGS

This is a crucial factor that not only affects the nation's balance of payment but a key parameter that determines the investment status of a country. Domestic saving is such an important economic variable that its lack of accumulation could lead to economic crises. Domestic saving is an important source of capital which helps to run economic progress and maintain financial stability. But there is a serious doubt about that higher saving leads to higher investment, which in turn leads to higher economic growth or surprisingly, empirical results will provide evidence of causality from economic growth to saving. If growth leads to higher savings, then it is important to know that the changing growth rates are likely to result in changing saving which would be a good implication to the policy setting from Nigeria government.

(v) GOVERNMENT TAX REVENUE (GTR)

This is the amount of money that accrues to the government from tax. This no doubt is expected to impact positively on the economy.

(vi) PUBLIC EXPENDITURE ON EDUCATION

This is the amount of money spent by the government in the course of subsidizing education of its citizenry. This may impact positively or negatively on the economy depending on the level of commitment of the government of Nigeria to training its people

3.3 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 work 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, DS, EXR, GTR, PEE) 1

3.3.1 TRADITIONAL REGRESSION MODEL

Suppose that equation 1 has a linear relationship, it can be transformed as:

$$GDP = \beta_0 + \beta_1 FDI + \beta_2 EXR + \beta_3 DS + \beta_4 GTR + \beta_5 PEE + u_i \quad 2$$

3.3.2 STADNARDIZED REGRESSION MODEL

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

$$GDP = \beta_1 FDI + \beta_2 EXR + \beta_3 DS + \beta_4 GTR + \beta_5 PEE + u_i \quad 3$$

3.3.3 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:

$$GDP_t = \beta_0 + \beta_1 FDI_{t-i} + \beta_2 EXR_{t-i} + \beta_3 DS_{t-i} + \beta_4 GTR_{t-1} + \beta_5 PEE_{t-1} + u_i \quad 4$$

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

3.3.4 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.

3.3.5 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 (3.4.6.1) postulates that current GDP is related to past values of itself as well as that of FDI, and (3.4.6.2) postulates a similar behaviour for FDI. There are four implications for each of the equations. (i) $GDP \rightarrow FDI$ [GDP causes FDI, unilateral causality]; (ii) $FDI \rightarrow GDP$ [FDI causes GDP, unilateral causality]; (iii) $GDP \leftrightarrow FDI$ [feedback or bilateral causality]; and $GDP - FDI$ [independence].

The null hypothesis is $H_0 : \sum c_j = 0$, that is lagged FDI and GDP terms do not belong to equations 3.4.6.1 and 3.4.6.2 respectively. The symbol $GDP \leftrightarrow FDI$ implies bilateral causality and is explained thus: Bidirectional causality 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 details of granger tests are explained in section 3.5

3.4 DETAILS OF ANALYSES

Section 3.3 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 section 4.

3.4.1 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 a 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 3.1 and 3.2 shows that all the variables are integrated of order one, I(1).

TABLE 3.1 UNIT ROOT TEST FOR STATIONARITY WITH CONSTANT ONLY

UNIT ROOT TEST FOR STATIONARITY WITH CONSTANT ONLY						
		LEVEL		1st Difference		
	Variables	DF	ADF	DF	ADF	Conc
1	GDP	0.28	0.29	-3.87	-1.94	I(1)
2	FDI	1.46	3.01	-4.24	0.90	I(1)
3	DS	10.68	-	-	-	I(0)
4	EXR	-0.52	-0.69	-3.79	-	I(1)
5	GTR	0.89	1.93	-3.68	-	I(1)
6	PEE	1.24	1.68	-4.73		I(1)

Note: 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 3.2 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	-1.14	-0.81	-4.27	-	I(1)
2	FDI	0.14	1.96	-5.63	-	I(1)
3	DS	8.80	-	-	-	I(0)
4	EXR	-1.83	-1.90	-3.65	-	I(1)
5	GTR	-1.21	0.24	-4.31	-	I(1)
6	PEE	-1.22	-0.51	-6.39	-	I(1)

Note: 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.
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. It is necessary to acknowledge in the two tables that only domestic saving is both stationary at the zero order. This is implies that it is more stable than the rest of the variables.

3.5 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 to 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 formula below:

$$AIC = \ln(\frac{RSS_{UR}}{T}) + (\frac{2j}{T}) \quad 17$$

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:

$$F_{cal} = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} \quad 18$$

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.

4.0 RESULTS AND DISCUSSION

4.1 TRADITIONAL OLS MODEL RESULTS

The result presented in the table below is no doubt interesting as it agrees quite well with the result of the Onu (2012) who first investigated the data. The major difference is that tax revenue's contribution to economic growth is statistically insignificant whereas we find large and highly statistically significant contribution of GTR to GDP growth. One wonders where the difference lies as there was no indication of how they arrived at such conclusion. Otherwise, the coefficient of FDI and DS are both positive and insignificant as they reported. The coefficient of EXR and PEE are also negative and insignificant, consistent with their finding. The differences apart, the main question is whether the entire result can be validated. That is, can these coefficients be attributed to any data issues or multiple regression problems? We focus on this question in the next section.

TABLE 4.1A. DEPENDENT VARIABLE: GDP (WITH THE OUTLIERS)

VARIABLES	COEFFICIENT	STD ERROR	T-VALUE	P-VALUE
FDI	0.03256	0.08197	0.39700	0.69600
DS	0.06282	0.27200	0.23100	0.82000
EXR	-0.27189	0.18259	-1.48900	0.15500
GTR	1.15296	0.20829	5.53500	3.63e-05 ***
PEE	-0.05295	0.35967	-0.14700	0.88500

Multiple R-squared: 0.9314, F-statistic: 46.15, DW=2.945506

4.2 DATA TREATMENT

Although OLS is a common tool in econometrics, the numerous problems associated with it makes its usage tricky more than as many researchers do realize. One may claim an effect that does not exist or deny the ones existing if one is not familiar with these problems. A data, for instance, needs be processes before feeding to regression package. And the starting point is to examine the scatter plot of a data and remove any outlier that might exist. The scatter plot of the present data is presented in Appendix A1. Evidently, the FDI data is plagued by outliers. Those outliers could have a dramatic effect on the result of OLS. In fact, Katerina et al. (2004) found that a single outlier is capable of giving a biased and misleading result. Consequently, before doing further analysis with the raw data, the three data points that appear to be outliers were removed. The plot is put in Appendix A1 and the OLS is presented in the table 4.1B. There is, no doubt, the two results are not the same. While it may be easy to explain why the contribution of EXR to growth within the time is negative, that of FDI might be quite contentious, especially to pro-FDI analysts. Appendix A shows that EXR was highly variable within the period under study. Such unpredictable variation in exchange rate is the bane of any economy. Thus, its inverse connection with GDP can be understood. The positive coefficient of PEE is also better as is expected that human development should impact positively on the economy.

TABLE 4.1B. DEPENDENT VARIABLE: GDP

VARIABLES	COEFFICIENT	STD ERROR	T-VALUE	P-VALUE
FDI	-0.08612	0.07187	-1.198	0.250710
DS	0.07800	0.28455	0.274	0.788003
EXR	-0.31982	0.18823	-1.699	0.111417
GTR	1.08682	0.22329	4.867	0.000249 ***
PEE	0.04383	0.38809	0.113	0.911689

Multiple R-squared: 0.9356, F-statistic: 40.67, DW=2.789372

4.3 RESULT VALIDATION

If FDI impacts on the economy negatively, then it would have far reaching economic implications for Nigeria investment laws and FDI policies. Consequently, the resulted presented in table 4.1B needs be taken with caution except otherwise established. There could be some factors responsible for the negative coefficient of FDI. The first suspect is autocorrelation especially as the DW static is large. That autocorrelation is expected if there is simultaneity bias between FDI and GDP. The best way of handling this problem is to test if GDP and FDI are simultaneous and solve simultaneous equation if that be the case.

4.4 ENDOGENEITY TEST

This method is based on the work of Wooldridge (2006) and Gujarati (2004). This method is simpler than the method of lagged variables. In the present work, for instance, GDP and FDI are the two variables whose co-variability is being tested. This method involves regressing FDI on all other variables excluding GDP. This is called the first stage of hausman endogeneity test. While there is consensus among authors on the first stage method, the second stage apparently, differs with authors.

Gujarati (2004), for instance, confirms that the second stage involves regressing GDP on all its exogenous variables used in the first stage including FDI and the residual from the first stage. Dominic and Derrick (2002), on the other hand, regressed the second endogenous variable (GDP in our case) on the reduced first endogenous variable (FDI). The latter method (Dominic and Derrick, 2002) is more of a solution to simultaneous equation than of a test, while in the first method (Gujarati, 2004), the null hypothesis of endogeneity is rejected if the residual from the first stage is statistically significant in the second stage regression.

The Dominick and Derrick method subsumes all other variables in the result, such that not even a comment can be made about them in the GDP structural equation. Although the method is justifiable, since the only parameter of interest in the regression is GDP, Andren (2007) provides alternative approach. In this method, the reduced form of FDI is first obtained as in the case of Gujarati (2004) and the reduced form of FDI is used in the second GDP growth equation.

We adopt the method of Gujarati for endogeneity test and the method of Andren for simultaneous equation solution.

4.4.1 THE FIRST STAGE OF HAUSMAN ENDOGENEITY TEST

The table below is the result of regressing FDI on other variables except GDP. This is called the first stage of Hausman endogeneity test. As noted earlier, what is important here is the residual. It is obtained and used in the second stage regression.

TABLE 4.2A: DEPENDENT VARIABLE: FDI

VARIABLES	COEFFICIENT	STD ERROR	T-VALUE	P-VALUE
CONSTANT	83.310	13.242	6.292	1.98e-05 ***
DS	6.447	37.243	0.173	0.865
EXR	77.356	57.069	1.355	0.197
GTR	-36.147	43.461	-0.832	0.420
PEE	-45.051	76.540	-0.589	0.566

4.4.2 THE STAGE OF HAUSMAN ENDOGENEITY TEST

The table below presents the result of the second stage. The variable labelled 'Res' is the residual from the second stage. The test is positive if the residual is statistically significant. It is evident that the residual from the first stage is significant in the second stage regression and there is thus, simultaneity bias between FDI and GDP. Ordinary OLS might thus be an inefficient tool while investing the impact of GDP and FDI. Interestingly, the second stage is both a test and a solution. It is surprising the negative contribution of FDI to GDP persists and is even highly significant. The positive contribution of does not only become large here but also highly statistically significant. The only variable whose sign changed is that of PEE. We proceed to solve the simultaneous equation in the next section.

TABLE 4.2B: DEPENDENT VARIABLE: GDP

VARIABLES	COEFFICIENT	STD ERROR	T-VALUE	P-VALUE
CONSTANT	2.653594	0.548942	4.834	0.000326 ***
FDI	-0.031852	0.006532	-4.876	0.000303 ***
DS	2.539784	0.484960	5.237	0.000160 ***
EXR	-0.077519	0.197454	-0.393	0.700982
PEE	-1.475590	0.550656	-2.680	0.018912 *
Res	0.031804	0.006692	4.753	0.000378 ***

Note: '***', '**', '*', implies significance at 0%, 0.1%, and 1%.
Multiple R-squared = 0.929, F-statistic = 34.01

4.5 SOLUTION OF THE SIMULTANEOUS EQUATION

The table below present the result of the reduced form of FDI. This reduced form is what is used in the final solution.

TABLE 4.3A: DEPENDENT VARIABLE: FDI (Reduced form of FDI)

VARIABLES	COEFFICIENT	STD ERROR	T-VALUE	P-VALUE
DS	77.356	57.069	1.355	0.197
EXR	6.447	37.243	0.173	0.865
GTR	-36.147	43.461	-0.832	0.420
PEE	-45.051	76.540	-0.589	0.566

FDIR = -77.356(DS) + 6.447(EXR)-36.147(GTR)-45.051(PEE)

The next table is the final solution of the simultaneous equation. It is obvious that the sign of FDI remains negative, that of DS positive, EXR negative and that of PEE maintained the negative sign it indicated in Table 4.2B

TABLE 4.3B: DEPENDENT VARIABLE: GDP

VARIABLES	COEFFICIENT	STD ERROR	T-VALUE	P-VALUE
FDIR	-0.031852	0.006081	-5.238	0.000100 ***
DS	2.539745	0.451486	5.625	4.83e-05 ***
EXR	-0.077532	0.183827	-0.422	0.679178
PEE	-1.475586	0.512654	-2.878	0.011488 *

Note: '***', '**', '*', implies significance at 0%, 0.1%, and 1%.
Multiple R-squared: 0.929, F-statistic: 49.05, DW=2.952426

The simultaneity between GDP and FDI as indicated by the Hausman endogeneity test and the simultaneous equation solution can still be validated by granger causality test. The Huasman endogeneity tests and the simultaneous equation solution are mere OLS and consequently cannot tell us the direction of causality nor the time lag, if any; it takes the GDP to respond to FDI injection. Thus, in order to validate the above tests and results further, we conduct causality test. The result is presented in the next table and it shows that FDI granger

causes GDP at three years lag period.

TABLE 4. 6: GRANGER CAUSALITY TEST FOR TWO VARIABLE MODELS (BIVARIATE VAR).

REGRESSION TYPE	NO OF LAGS	F_{cal}	Critical F values			
			1%	5%	10%	df_1/df_2
$FDI \rightarrow GDP$	1	0.3630753	8.86	4.60	3.10	1/14
$GDP \rightarrow FDI$	1	0.660934	8.86	4.60	3.10	1/14
$FDI \rightarrow GDP$	2	0.726263	7.21	3.98	2.86	2/11
$GDP \rightarrow FDI$	2	1.445463	7.21	3.98	2.86	2/11
$FDI \rightarrow GDP$	3	3.505669*	7.59	4.07	2.92	3/8
$GDP \rightarrow FDI$	3	2.982509*	7.59	4.07	2.92	3/8

Note: '***', '**', 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.

4.6 LAGGED OLS RESULTS

Following the implications of the result of granger test above, the possible time lag between these economic variables and economic growth was brought into the picture. FDI and domestic savings are proxies of investments which can take some years to impact on GDP. EXR rate were also included among the variables that can take 3 year period to impact positively or negatively on GDP. GTR and PEE where given special consideration. While GTR will take the shortest lag length, PEE will take the highest lag length. Thus, GTR was assigned 1 lag period and PEE 4 years lag period. The result is presented in table 4.5.

TABLE 4.5: DEPENDENT VARIABLE :GDP

VARIABLES	COEFFICIENT	STD ERROR	T-VALUE	P-VALUE
CONSTANT	1.6525	0.2868	5.7620	0.000182 ***
FDI_{t-3}	-0.8499	0.2296	-3.7010	0.004101 **
DS_{t-3}	5.0292	0.9433	5.3320	0.000332 ***
EXR_{t-3}	-0.5613	0.2820	-1.9900	0.07481•
GTR_{t-1}	0.5998	0.2855	2.1010	0.062009•
PEE_{t-4}	-0.8966	0.2606	-3.4410	0.006321 **

Note: '***', '**', '*', and "." imply significance at 0%, 0.1%, 1% and 5%. Multiple R-squared: 0.9683, F-statistic: 61.17, DW = 2.203482

The result above is quite interesting especially when compared with that of Tables 4.2B and 4.3B. These are same similar results got from three different methods and the sign of the coefficients are, unarguably, true. FDI makes significant but negative impact on economic growth within the time under review. What might be responsible for this is the 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 (see Katerine et. al., 2004 and the references therein) 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 nations.

The positive, large and highly statistical significant impact of domestic savings on GDP is instructive and self explanatory. The negative impact of PEE is disturbing especially as it is not only large but highly statistically significant. This is because human capital accumulation, according to economic theory, can constitute an important source of long-term growth. Since this is not the case for Nigeria, how then can FDI be growth oriented in our nation when Keller (1996) and Xu (2000) contend that technology transfer from FD may fail to increase productivity growth in the host country in the absence of adequate human capital? The negative role of

PEE has a lot of policy implications for Nigerian government.

5. CONCLUSION

The main objective of the present study is to underscore the fact that there is no gap between FDI-growth related study and the methodology employed. That is, the result submitted is method as well as model dependent. It has been shown that a good knowledge of OLS techniques as well as background knowledge of the inter relationship between the variables under study is required to do a good job. Otherwise, the OLS will play the conventional trick of the computer – garbage in, garbage out. And the irony is that the same researcher who has no idea about the significance or validity of the results will make a list of policy recommendation based on spurious (Gujarati, 2004) or nonsense regression results.

Since the focus of the present investigation is not to produce a new policy recommendation, it is important to revise some of the earlier policies in the light of the current findings.

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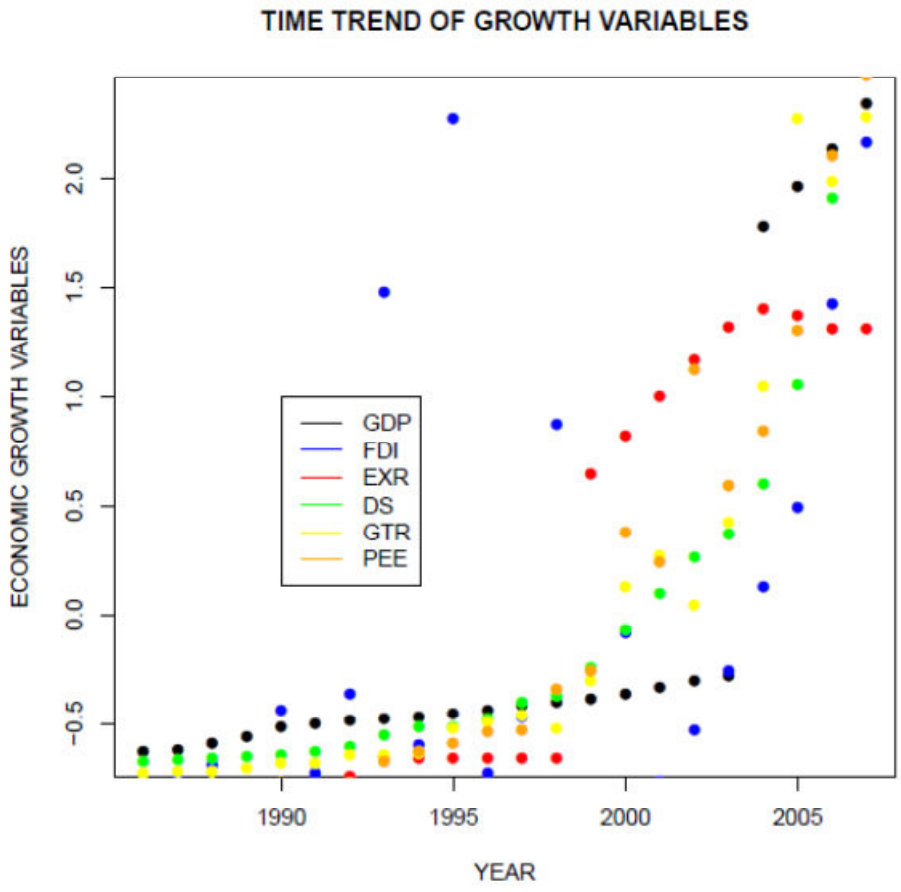
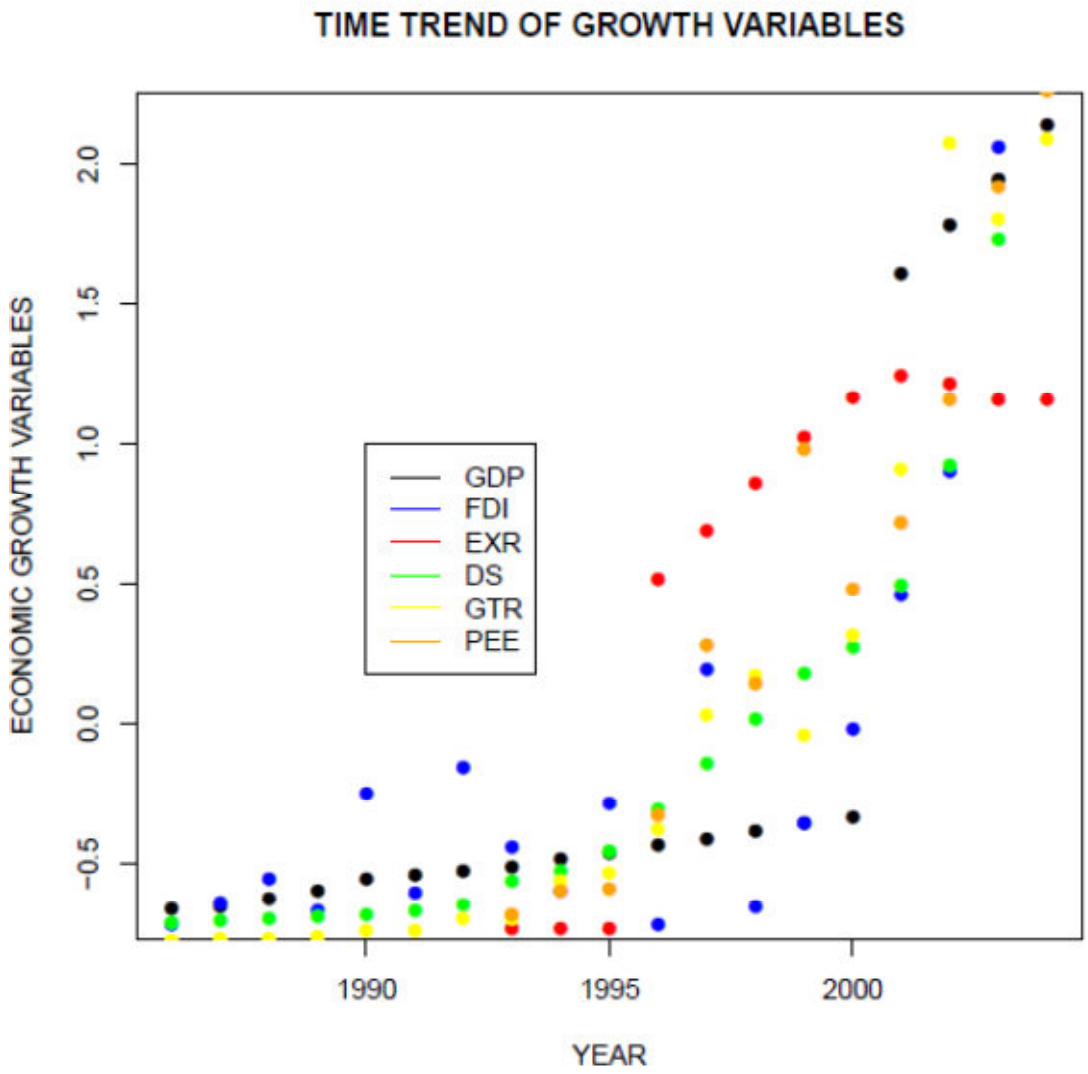
APPENDIX A1



APPENDIX A2


TIME TREND OF GROWTH VARIABLES
ECONOMIC GROWTH VARIABLES
−0.5
0.0
0.5
1.0
1.5
2.0
1990
1995
2000
YEAR
GDP
FDI
EXR
DS
GTR
PEE