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Modeling Long-Run and Short-Run Dynamics of Foreign Direct Investment on the Manufacturing Sector Growth in Nigeria: The ARDL Bound Testing Approach

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Abstract

This paper econometrically examines the long run and the short run dynamics of foreign direct investment (FDI) on the manufacturing sector growth in Nigeria between the period 1981 and 2015. Data used in this study were obtained from the Central Bank of Nigeria statistical bulletin published in 2016. The econometric methodology adopted was the bound test and auto regressive distributive lag (ARDL) approach to estimate cointegrating relationship as well as short run and long run dynamics of the FDI and other explanatory variables on output growth in the manufacturing sector. Results of the long run behaviour and short run dynamics (error correction model) indicate that economic liberalization is significant in influencing changes in manufacturing output growth. However, FDI has no significant effect in both the short run and the long run episode. Therefore, it is recommended that policies aimed at encouraging increased participation of private domestic investors in collaboration with multinational corporations in the manufacturing sector be crafted.

Keywords: foreign direct investment, autoregressive distributive lag, bound test, manufacturing sector growth, domestic investment

1. Introduction

The unrelenting concern of most governments the world over, especially the developing countries, has been the promotion and stability of the national economy. This goal is attained through policy initiative aimed at reinvigorating key sectors of the economy, such as manufacturing, agricultural, mining and extractive sectors, among others. Indeed, a robust manufacturing sector potentially increases output, generates employment opportunities, creates productivity efficiency, and promotes exports and foreign reserves. All these ultimately result in favourable balance of payments position.

Therefore, policy makers expect that the manufacturing sector of a country has the capability of exercising an overriding role in a country’s growth endeavors. In recognition of this important role, successive governments in Nigeria persistently formulate policies and programmes for the robustness and the promotion of the manufacturing sector.

Undoubtedly, over three decades ago, increased global economic integration has gained prominence in global economic globalization and information communication technological advancement, etc. In consequent to the above and in acknowledgement of the significance of the manufacturing sector in the growth and development of developing economies that policies and programmes are articulated to favour inward flow of foreign direct investment to the manufacturing and other sectors. The amplification of this policy is presumed to act as a catalyst for economic growth and development.

Before Nigeria became independent state in 1960, the paramount economic activities were agricultural production. Additionally, imports of goods were massive and businesses were involved in the marketing of these imported goods. During this period, domestic investment plummeted due to inadequate capital in the domestic financial markets. Thus, private investors were pre-occupied with trading, transportation, and construction businesses. Domestic private investors were not adequately equipped with the required technical know-how and technological competence needed to boost output growth in the sector. Similarly, domestic investors relied on crude know-how as emphasis was on the development of cottage industries. After this era, textile, cement, breweries, and other industrial activities assumed greater relevance which required enormous capital investment. The huge capital requirements attracted attention of the government and foreign investors.

After 1970s and early 1980s, large scale capital intensive industries in the petroleum, petrochemicals, iron and steel, and fertilizer, etc were established primarily by the government to boost industrial activities and output. These industries performed abysmally poor due to deficient management, and so most of them ceased functioning and were privatized.

The landmark in the country’s industrial revolution efforts manifested between 1960s and 1970s when the country witnessed vast inflow of foreign direct investment, huge revenue from oil exports, and friendly import policy. Furthermore, between 1970s and 1981 government policy incentive and framework stimulated domestic production and boosted supply to the domestic market. Based on the numerous policy measures initiated in the various national development plans and the structural adjustment progrmme, expectations were high that the manufacturing sector would perform creditably well and significantly contribute to growth and promotion of export diversification. In spite of vast capital outlay and programmes put in place to attain the goal of sustainable growth, very infinitesimal accomplishment was recorded.

Arising from the above narration, the precarious state of the economy weakened the purchasing power of Naira and thus causing depressed demand. Similarly, depreciating, fluctuating, and uncertain Naira exchange rate resulted in abysmal performance of the manufacturing sector. Furthermore, decay in infrastructural facilities (such as telecommunication services, epileptic and frequent disruption of electric power supply, poor water supply, poor road networks and other transportation hiccups) places upon the private investors the responsibilities for the provision of these facilities which unwittingly escalates the operational cost. Moreover, inadequate domestic savings and insufficient inflow of foreign investments in Nigeria could be responsible for epileptic performance of the manufacturing sector. Therefore, the mobilization of both domestic and foreign capital especially FDI, is usually assume to be crucial for the transformation of the manufacturing sector. Nevertheless, the desired increase in investment has to be achieved through an increase in FDI, at least in the short-run (De Gregorio, 2003).

In the past decades, Nigeria and other Sub-Saharan African countries did not realize the critical and unique features of FDI as a catalyst for transformation of national economy, as well as sectoral growth, especially manufacturing sector. The relevant policy agencies entertained fears of potential loss of political and economic sovereignty and the possibility of run and long run growth in the manufacturing sector of the Nigerian economy with the application of auto-regressive distributed lag (ARDL) bound crowding out domestic investment.

Studies on FDI and economic growth relationship in Nigeria are certainly numerous. Nonetheless, studies examining the role of FDI in the manufacturing sector growth are scarce in context. Theoretically, foreign private capital can expedite the process of growth and development in the sector by providing capital, employment, infrastructural facilities, and access to international markets, revenue from exports and tax, and technology. From above narration, attempt will be made to empirically analyze the role of FDI in enhancing short testing model

Following from the introduction, the rest of the paper is structured as follows. In section two we briefly outline both theoretical issues and empirical results of prior studies relevant to this work. In section three we consider data and specification of econometric methodology, and analyze the empirical results in section four, while conclusion of the study is made in section five.

2. Brief Review of Related Literature

Financial theory predicts that foreign capital flows potentially elicits growth in the host economy. Several studies have been undertaken by researchers to ascertain the growth enhancing capability of FDI and the nexus between FDI and absolute output growth and growth rates of the host country.

Ayanwale (2007) empirically examined the relationship between non-extractive FDI and economic growth in Nigeria as well as the determinants of its inflow for a period between 1970 and 2002 and reported that market size, infrastructural development and government policy on macro-economy are essential determinants of FDI in Nigeria. The result also indicates that FDI contributes positively to economic growth, even though; the overall effect may be statistically insignificant.

Similarly, a study by Li and Liu (2005) using panel data of 8 countries to evaluate the implications of inbound FDI on economic growth indicated a significant relationship between FDI and economic growth. In addition, a stronger relationship was established when FDI interacted with human capital. The reason behind this relationship is that stronger human capital possesses better absorptive capacities due to the complimentary nature of the FDI and human capital, most importantly for developing countries.

According to a study conducted for a period of 1981-2009 by Ugwuegbe, Okore and John (2013), a positive and insignificant relationship was established between growth and FDI in Nigeria. Conversely, there have been several studies that show adverse or no relationship between FDI and economic growth. Example of this is a study conducted by Akinlo (2004) which investigated the impact of FDI on growth in Nigeria adopting Error Correction mechanism (ECM). The result revealed insignificant and negative relationship between FDI and growth. It was further concluded that extractive FDI might not elicit significant outcome on growth compared to manufacturing FDI. From the study, FDI may influence growth negatively if evidently it is confirmed that foreign investors engage in transfer profits, or other benefits of the investment to their home country.

Specifically, considering the relationship between FDI and manufacturing sector, Akinlo (2004) posits that empirical linkage between FDI and growth in the manufacturing sector in Nigeria is yet unclear. Thus, most of the previous studies of FDI and manufacturing sector growth in Sub-Saharan Africa are multi-country studies. Nevertheless, recent evidence suggests that the relationship between FDI and manufacturing sector performance may be country and period specific. According to Imodu (2012) there has been some diversification into the manufacturing sector in recent years, although FDI in Nigeria has traditionally been concentrated in the extractive industries.

Kola and Olalekan (2011) investigated the influence of foreign direct investment on the development of small and medium scale enterprises in Nigeria. The researchers adopted the generalized linear model (GLM) estimation technique in selecting businesses and found that FDI had negative effect on the development of SMEs.

In a contrary dimension, Abdul and Barnabas (2012) investigated the impact of FDI on the performance of manufacturing firm in Nigeria. It was revealed in the study that there is a long run relationship between the performance of the manufacturing firm in Nigeria, and that causality run from FDI to manufacturing sector performance. Similarly, the study of Anowor, Ibiam, and Ezekwem (2013) on FDI and manufacturing output revealed that FDI, domestic investment, degree of trade openness, exchange rate were statistically significant in explaining the changes in manufacturing sector output growth in Nigeria.

3. Theoretical Model and Data

The emphasis of this study is on the examining FDI long run behaviour and short run dynamics on manufacturing sector output. Thus, the underlying theoretical structure adopted for analysis is the aggregate production function. The production function is a technical relationship between inputs and outputs, and it is expressed in its general form as:

$$Y = f(L,K) \tag{1}$$

where L is the labour input, K is the capital input, and Y represents output under reference. The production function emphasizes that output Y is a function of the level of utilization of the combined L and K. Specifically, Cobb-Douglas production function is commonly used in economic analysis stated as:

$$Y_t = A_t K_t^{\alpha} L^{\beta}{}_t \tag{2}$$

Where $Y_t$represents the aggregate production of the manufacturing sector at time t, A_t denotes total factor productivity (TFP) at time t, K_t represents capital stock at time t and L_t is the stock of labour at time t. Thus, we consider that TFP in equation 2 is a function of combined influence of foreign direct investment to the manufacturing sector, domestic investment, energy consumption, gross national savings, credit to the manufacturing sector, as well as real exchange rate.

$$A_t = f(MFDI,\ DIN,\ EGY,\ GNS,\ CMF,\ OPN,\ EXR) \tag{3}$$

Arising from the above therefore, the total factor productivity in equation 3 is explicitly expressed as:

$$A_t = MFDI_t^{\alpha} DIN_t^{\beta} EGY_t^{\lambda} GNS_t^{\varphi} CMF_t^{\Omega}\ OPN_t^{\delta} EXR_t^{\psi} \tag{4}$$

Equation (4) is linearized and a stochastic white noise disturbance term is built-in, while an explicit econometric model is stated for estimation as follows:

$$\ell nMFG = \alpha_0 + \beta\ell nMFDI_t + \lambda\ell nDIN_t + \psi\ell nEGY_t + \delta\ell nGNS_t + \pi\ell nCMF_t + \omega\ell nOPN_t + \Omega EXR_t + \mu_t \tag{5}$$

where ℓnMFG represents log of manufacturing sector output which measures the tempo of activities in the manufacturing sector, ℓnMFDI indicates the log of the share of FDI in manufacturing sector, ℓnDIN is the natural logarithm of the proxy of gross domestic investment, ℓnEGY is the natural logarithm of energy consumption. Additionally, ℓnGNS represents the natural logarithm of gross national savings, while ℓnCMF is the log of credit to the sector, ℓnOPN denotes log of trade openness (degree of economic liberalization), and EXR signifies exchange rate fluctuation. The essence of transformation of the variables, except EXR, to natural logarithm is to reduce the problem of heteroskedasticity. Data used in this study were obtained from Central Bank of Nigeria statistical bulletin, volume 26 which was published in 2016.

4. Econometric Technique

We adopt the Auto-Regressive Distributive Lag ARDL) modeling, also known as bound testing approach, developed and made popular by Pesaran, Shin and Smith (2001). ARDL is a least square regression containing lags of the dependent and independent variables and usually with notations p, q_1, q_2,…,q_k, where p is the number of lags of the dependent variable, q_1 is the number of lags of the first explanatory variable, and q_k is the number of lags of the k-th explanatory variables. Thus, we express the ARDL model as:

$$y_t = \alpha + \sum_{i=1}^{p} \theta_i y_{t-1} + \sum_{j=1}^{k} \quad \sum_{i=0}^{qj} Xj,t\text{-}i \;\; \beta j,i \;\; t\text{-}i \;\; \beta j,i + \mu_t \tag{6}$$

Some of the explanatory variables, Xj may have no lagged terms in the model (q_j=0) since there are static regressors. While using ARDL to estimate the dynamic relationship between regressand and regressors, we at the same time transformed the model into a long run representation to show the long run response of the dependent variable to changes in the explanatory variables. The estimated long run coefficient is expressed as:

$$\theta = \frac{\sum_{i=1}^{"} \beta j,i}{1 - \sum_{i=1}^{p} \acute{Y} i} \tag{7}$$

The traditional techniques of estimating cointegrating relationships, such as Johansen's (1991, 1995) processes require all variables to attain stationarity at 1(1), or require earlier understanding or knowledge and specification of which variables are stationary at 1(0) and 1(1).

To circumvent this limitation, Pesaran, Shin, and Smith (1999) expressed that cointegrating techniques could be estimated as Auto Regressive Distributed Lag (ARDL) models which ignores the level of stationarity property of the series even if the series are either 1(1) or 1(0) without pre-specification whether they are 1(0) or 1(1). It is important to note that ARDL does not require equilibrium lag lengths from all the variables as each variable can have different number of lag terms. Thus, the cointegrating form of an ARDL model is obtained by transforming eq. 7 into difference equation and substituting the long run coefficients from eq. 8, thus obtaining :

$$\Delta y_t = -\sum_{i=1}^{p-1} \gamma_i \Delta y_{t-1} + \sum_{j=1}^{k} \quad \sum_{1=0}^{q\,j-1} \Delta X_{j,\; t\text{-}j \;\; \ddot{\imath}} - \theta EC_{t-1} + \mu_t \tag{8}$$

According to Pesaran, Shin and Smith (2001), we used eq. 8 to test whether there is existence of long run cointegrating relationships in the ARDL model, and thereafter proceed with the bound testing procedure and transform eq. 8 into the following representation:

$$\Delta y_t = -\sum_{i=1}^{p-1} \gamma_i \Delta y_{t-1} + \sum_{j=1}^{k} \quad \sum_{1=0}^{q\,j-1} \Delta X_{j,\, t\,\text{-}\,\ddot{\imath}} - \beta j,\ddot{\imath} - p y_{t-1} \text{-} \alpha - \sum_{j=1}^{k} X_{j,\; t-1}\text{'}\delta j + \mu_t \tag{9}$$

Arising from eq.5, the ARDL representation of the manufacturing sector growth function is empirically expressed as:

$$\begin{aligned} \Delta mfg_t = {} & \pi_0 + \pi_1 mfg_{t-1} + \pi_2 mfdi_{t-1} + \pi_3 cmf_{t-1} + \pi_4 din_{t-1} + \pi_5 egy_{t-1} + \pi_6 opn_{t-1} + \pi_7 gns_{t-1} + \pi_8 exr_t \\ & + \sum_{i=1}^{P} \alpha_i \Delta mfg_{t-i} + \sum_{j=1}^{q} \delta_j \Delta mfdi_{t-j} + \sum_{k=1}^{q} \varphi_k \Delta cmf_{t-k} + \sum_{\ell=1}^{q} \partial_\ell \Delta din_{t-\ell} + \sum_{m=1}^{q} \lambda_m \Delta egy_{t-m} \\ & + \sum_{n=1}^{q} \Omega_n \Delta opn_{t-n} + \sum_{p=1}^{q} \sigma_p \Delta gns_{t-p} + \sum_{r=1}^{q} \psi_r \Delta exr_{t-r} + \mu_t \end{aligned} \tag{10}$$

where Δ = the first difference of variable

π_0= regression constant

q = maximum lag length

π_1……………π_8 = short run dynamics

t = time trend, and μ_t is an indication of stochastic white noise.

In the implementation of ARDL technique, the existence of the long run equilibrium (cointegration) relationship between the variables being investigated is examined based on the computed F-statistic. According to Pesaran, Shin and Smith (2001), there are two sets of appropriate critical values for different numbers of variables. The ARDL model contains an intercept or trend or both. One set assumes that all the regressors in the ARDL model are of 1(0), and another supposes that all the regressors are 1(1). If the F-statistic lies above the upper-bound critical value, it is concluded that there is existence of non-spurious long run equilibrium relationship among the variables. If the F-statistic lies below the lower-bound critical value, there is no existence of long run relationship between the explanatory variables and dependent variables. However, if the F-statistic lies between the upper-bound critical value (limit) and the lower-bound critical value (limit), the result is inconclusive

The general form of the bound testing approach is adopted to test the null hypothesis in order to ascertain the existence of long run (H_0) relationship against the alternate hypothesis (H_1) is based on eq. 10 above and is presented below:

H_0: πmfg =πmfdi =πcmf = πdin = πegy = πopn = πgns = πgns = 0. This indicates that, a priori there is no long run relationship.

H_1: πmfg ≠πmfdi ≠πcmf ≠ πdin ≠ πegy ≠ πopn ≠ πgns ≠ πgns ≠ 0. A priori, it is expected that there is existence of long run relationship.

If it is established that there is an existence of cointegrating relationship, the conditional ARDL (p, q_1, q_2, q_3, q_4, q_5, q_6, q_7) long run representation for manufacturing sector growth is specified as:

$$mfg_t = \alpha_0 + \sum_{i=1}^{P} \alpha_i mfg_{t-i} + \sum_{j=1}^{q1} \delta_j mfdi_{t-j} + \sum_{k=1}^{q2} \varphi_k cmf_{t-k} + \sum_{\ell=1}^{q3} \partial_\ell din_{t-\ell} + \sum_{m=1}^{q4} \lambda_m egy_{t-m} + \sum_{n=1}^{q5} \Omega_n opn_{t-n} + \sum_{p=1}^{q6} \sigma_p gns_{t-p} + \sum_{r=1}^{q7} \psi_r exr_{t-r} + \mu_t \quad (11)$$

Furthermore, the short run dynamics are estimated by specifying error correction model related with the long run estimates and represented as:

$$\Delta mfg_t = \alpha_0 + \sum_{i=1}^{P} \alpha_i \Delta mfg_{t-i} + \sum_{j=1}^{q1} \delta_j \Delta mfdi_{t-j} + \sum_{k=1}^{q2} \varphi_k \Delta cmf_{t-k} + \sum_{\ell=1}^{q3} \partial_\ell \Delta din_{t-\ell} + \sum_{m=1}^{q4} \lambda_m \Delta egy_{t-m} + \sum_{n=1}^{q5} \Omega_n \Delta opn_{t-n} + \sum_{p=1}^{q6} \sigma_p \Delta gns_{t-p} + \sum_{r=1}^{q7} \psi_r \Delta exr_{t-r} + \xi ecm + \mu_t \quad (12)$$

where ξ is the speed of adjustment process and ECM is the residuals generated and transformed from OLS regression [equation (3)]. Other variables remain as earlier defined. The coefficient of error correction term, a priori should be negative and significant (based on the calculated t-value) to give credence to the existence of long run relationship.

4. Empirical Results and Discussion

As a pre-condition for estimation of time series models and prior to ARDL bound test, time series properties of the variables needed to be examined to ascertain the existence or non-existence of unit root, for the avoidance of spurious results.

The results of unit root test based on Augmented Dickey Fuller procedure are presented below in Table 1. The null hypothesis of the existence of unit root or no stationarity cannot be rejected at 5 percent for the variables at the level, except for MFG. While MFDI, DIN, EGY, CMF, OPN, and EXR are stationary after first differencing, GNS attained stationarity after second differencing.

Table 1. Results of unit root test at 5 percent level of significance

	Levels		First difference		Second diff		Order of	Lag
VARIABLES	ADF Statistic	critical values	ADF statistic Critical values	Critical values	ADF Statistic	Critical values	Integration	Length
MFG	-5.56988	-1.95100					1(0)	1
MFDI	-1.70898	-1.95133	-3.712054	-1.95168			1(1)	1
DIN	2.26733	-1.95133	-0.409543	-1.95133			1(1)	1
EGY	0.613591	-1.95100	-4.480922	-1.95133			1(1)	1
GNS	0.809303	-1.95133	-0.136453	-1.95168	-13.08449	-1.95168	1(2)	1
CMF	-1.53329	-1.95100	-5.813673	-1.95133			1(1)	1
OPN	1.094557	-1.95100	-4.06196	-1.95133			1(1)	1
EXR	-1.89579	-1.95100	-4.491108	-1.95133			1(1)	1

Source: Authors' computation.

4.1 Analysis of Cointegration Results: Bound Tests

Analysis of the results of the ARDL bound test for cointegration between manufacturing sector performance and the selected explanatory variables are shown in Table 2.

Table 2.ARDL bounds test

Test Statistic	Value	k
F-statistic	4.714916	8
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	1.95	3.06
5%	2.22	3.39
2.5%	2.48	3.7
1%	2.79	4.1

Source: Authors' computation.

The ARDL bound test results indicate that the calculated F-statistic is 4.714916. This is greater than the upper and the lower limits of 3.39 and 2.22 respectively at 5% level. Thus, the results of the bound tests are valid which implies that the null hypothesis of no long run equilibrium relationship is rejected. Moreover, it could be inferred that there is a long run relationship between manufacturing sector growth and its selected determinants.

From the results presented in table 3, the coefficient of manufacturing foreign direct investment is statistically not significant in promoting manufacturing sector growth in the long run at 5% level. This lethargy is also corroborated by a computed low and insignificant t-statisticof 0.066. Foreign direct investment by multinational corporations in the country is typically skewed towards oil and gas, construction and extractive industries. This lassitude could be explained by irrepressible high degree of insecurity in the country. The fact that investment in manufacturing activities has a long term gestation period, foreign investment in this sector remains unattractive and insufficient to support long run and sustainable growth. The computed coefficient of credit to manufacturing sector indicates a long run positive response of manufacturing sector growth to changes in credit to the sector at 5% level. The result further demonstrates that a 1% increase in the amount of credit from the banking sub-sector to manufacturing sector would lead to approximately 0.35% increase in output in the long run, ceteris paribus. In spite of the result, CMF is not statistically significant in the long run.

Table 3. Estimated long run coefficients of the ARDL model

ARDL (1, 0, 1, 0, 0, 0, 0, 0). Dependent Variable: ℓnMFG based on Akaike Information Criterion (AIC)

Regressor	Coefficient	Std. Error	t-Statistic	Prob.
ℓnMFDI	0.023553	0.352187	0.066877	0.9472
ℓnCMF	0.357688	0.193567	1.847874	0.0770
ℓnDIN	-0.343473	0.262826	-1.306848	0.2036
ℓnEGY	-0.012353	0.578870	-0.021340	0.9832
ℓnOPN	0.735209	0.291244	2.524375	0.0186
ℓnGNS	-0.001107	0.329823	-0.003357	0.9973
EXR	-0.007169	0.006889	-1.040573	0.3084
C	7.456793	2.263218	3.294774	0.0031

Source: Authors' computation.

However, contrary to theoretical proposition, domestic investment negatively influenced manufacturing value added in the long run. The coefficient of approximately -0.34 of ℓnDIN shows that a 1% growth in domestic investment resulted in 0.3% decline in output growth in the long run. The negative coefficient may be accounted for by low investment in infrastructure and other capital goods, hence placing additional financial pressure on the investors who have to provide some of the infrastructures at huge cost. Since most foreign investors are rent seekers, additional financial burden could constrain the long run profitability expectation of the investors.

Similarly, the coefficient of approximately -0.012353 recorded for public energy consumption signifies a negative relationship with manufacturing output growth. This implies that a 1% increase in energy consumption reduces manufacturing value added in output growth in the long run by 0. 012353%. Insufficient energy supply and exorbitant tariff remained another channel of huge financial burden on investors, hence the negative relationship. ℓnOPN enters the model with a positive sign. In terms of the openness of the economy, the contribution to manufacturing output growth implies that the manufacturing sector output growth responds positively in the long run by about 0.73% to 1% variation in domestic economic liberalization. Economic liberalization is significant at 5% level in the long run. This implies that the economy still has the capacity of increasing marginal productivity in the manufacturing sector, and that maximum output of the sector has not yet been attained.

Contrary to conjecture in government circles that income is high, the result in respect of gross national savings proves otherwise. The result exemplifies that income in Nigeria is low, hence low aggregate savings, which adversely affect manufacturing sector growth, but not significant. In support of theoretical standpoint, exchange rate depreciation and instability deterred manufacturing sector growth.

The results of error correction representation (short run dynamics) of the ARDL model aimed at relating ECM and long run behaviour is presented in table 4. It is interesting to note that there is no remarkable directional difference between the results of the long run equation and the short run modeling. For example, the effect of one lagged value of the manufacturing output value added which has a coefficient of -0.0547 denotes that a one percent preceding year increase in manufacturing sector output resulted in 0.057 decreases in output. However, the t-statistic of -0.0319 shows that ΔℓnMFG(-1) is not significant in determining variation in ΔℓnMFG.

Nevertheless, in line with the long run impact of FDI on manufacturing output growth, the contemporaneous coefficient of foreign direct investment is positive but statistically insignificant at 5% level in the short run. Bank credit to the manufacturing sector generates a negative relationship with manufacturing output growth but statistically significant in the short run. It could be deduced that the amount of credit extended to the private sector, and indeed, the manufacturing sector may be inadequate to stimulate manufacturing output growth. Additionally, investors usually do not possess the requisite collateral to secure the needed loan in the short run couple with the high cost of capital. This impedes sectoral expansion.

The coefficients of current and one period lag of domestic investment are negative and statistically insignificant in the short run. Thus, they do not bear the expected sign. That is, the coefficient = -0.132150 of domestic investment in the contemporary period means that a 1% increase in domestic investment deters manufacturing output growth by 0.132% in the short run. Similarly, domestic investment lagged once has a negative coefficient of 0.24201 and a t-statistic of -0.9699 which signifies that the variable is not significant in stimulating growth in the short run. It could be inferred that the value of domestic investment in the country is inadequate to support manufacturing sector growth in the short run. Though there is a sharp discrepancy between the coefficients of energy consumption in the contemporaneous period and the immediate preceding year, both are insignificant in mobilizing output growth in the short run.

Table 4. Estimated short run coefficients of the ARDL model

ARDL (1, 0, 0, 1, 1, 1, 0, 0, 0). Dependent Variable: ΔℓnMFG based on Akaike Information Criterion				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ΔℓnMFG(-1)	-0.054700	0.171286	-0.319351	0.7528
ΔℓnMFDI	0.277494	0.170543	1.627116	0.1194
ΔℓnCMF	-0.194062	0.090374	-2.147311	0.0442
ΔℓnDIN	-0.132150	0.139547	-0.946993	0.3549
ΔℓnDIN(-1)	-0.242041	0.137282	-1.763087	0.0932
ΔℓnEGY	-0.046223	0.237967	-0.194240	0.8479
ΔℓnEGY(-1)	0.464132	0.232158	1.999208	0.0594
ΔℓnOPN	0.219133	0.138319	1.584255	0.1288
Δℓn(OPN(-1)	0.286807	0.124405	2.305428	0.0320
ΔGNS	0.106952	0.296074	0.361235	0.7217
ΔEXR	0.002453	0.003546	0.691742	0.4971
ECM(-1)	-2.16E-06	1.01E-06	-2.144745	0.0444
C	0.080195	0.096838	0.828140	0.4174
Model criteria				
R^2 = 0.35	Adjusted R^2 = 0.32			F-Statistic = 2.288029
Prob(F-statistic) = 0.04	D-W stat = 1.714575			AIC = -0.149405
SSR = 0.194525	MDV = 0.147615			S. D. D. V. = 0.236891

Source: Authors' computation.

A very interesting result is noted in the relationship between the proxy for economic liberalization (OPN) lagged once. The result indicates that OPN(-1) is statistically significant in promoting manufacturing sector growth in the short run. It is evidenced that a 1% increase in economic liberalization would always result in expanding growth in the manufacturing sector by 0.286% in the short run, all things being equal. Furthermore, the t-statistic which is equal to 2.3 is statistically significant and positively influenced variation in manufacturing sector. In the same way, the coefficient of economic openness in the contemporaneous year is about 0.219 though statistically insignificant. Therefore, it could be inferred that government policy on trade openness spawns positive short run effect in the manufacturing sector.

There is an intriguing result here concerning the relationship between gross national savings and manufacturing output growth. Gross national savings maintains a direct relationship with the manufacturing output (MFG) and the coefficient of gross national savings (GNS) valued at approximately 0.106 indicates that 1% increase in savings leads to 0.106% increase in manufacturing output growth, but there is no statistically significant relationship amongst them. This position could be attributed to low income in the country, hence low savings. This further cripples efforts directed towards rejuvenating sectoral short run growth. Exchange rate is not significant in supporting growth in the manufacturing sector because of unguided depreciation, and unending variability and uncertainty.

The ECM is statistically significant as the model reports the calculated t-statistic (value) of -2.144745 and a p-value of 0.0444 (which is less than the alpha value of 0.05). However, the coefficient of error correction mechanism (ECM) has the expected and the correct sign. Nonetheless, the coefficient is infinitesimally low. The low coefficient implies that the speed of adjustment after shock to equilibrium is low. Furthermore, it infers that the speed of adjustment from the preceding year's disequilibrium in the manufacturing output growth to current year's equilibrium can be achieved but at a lower speed.

The explanatory power of the ARDL ECM model is captured by the coefficient of determination (adjusted R-Square) which measures the variation of the MFG in the model that is being explained by the combination of all the explanatory variables. The R-square (coefficient of determination) is about 35%. This is a fair share bearing in mind that no single model can capture all the relevant variables that can influence the performance of any sector or an economy under consideration. With the Durbin-Watson statistic of 1.71, it signifies that the model is free from any form of serial correlation. The F-statistic of 2.28 denotes that the model is significant in explaining the problem under investigation. This further shows that all the variables in the model have jointly influenced changes in the performance of the manufacturing sector.

5. Conclusion and Policy Recommendations

The purpose of this study was to examine the relationship between foreign direct investment, credit to the manufacturing sector, domestic investment, energy consumption, trade liberalization, aggregate national savings, exchange rate and manufacturing sector growth in Nigeria between 1981 and 2015. On the basis of this study, it is established that FDI inflow to the manufacturing sector in Nigeria has no significant role in promoting growth both in the short run and the long run. It is important to note that policy inconsistency and distortions, poor investment climate, low income and poor savings attitude, abysmal provision of utility services, and foreign exchange rate misalignment may been responsible for the dismal flow, in quantum and quality, of FDI to the manufacturing sector.

Therefore, arising from the above highlighted challenges, the following policy implications are advanced for the reinvigorating of the sector:

- The financial institutions need to provide adequate and accessible credit facilities to domestic investors in the sector. The demand for collateral as a necessary condition for qualification for loan need to be properly addressed and relaxed, in some cases.
- Government concessionary policy on the inflow of FDI should be objectively reviewed in the light of its benefits to critical sectors and macroeconomic necessity and in consideration of the interest of infant firms, to avoid crowding out effect.
- Government should step up the tempo of domestic investment in infrastructural development, such as electricity, roads and water supply, amongst others. The provision of these would act as catalyst to investment in the manufacturing sector and other sectors of the economy. Similarly, it is suggested that adequate attention be given to insecurity to boost the morale of investors in the country.
- Policy makers need to craft policies aimed at encouraging increased and joint participation of both the private domestic investors and multinational corporations in investing in the manufacturing sector.

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