ANALYSIS OF TRADE OPENNESS AND INDUSTRIAL OUTPUT GROWTH IN AN OIL-RICH ECONOMY: FURTHER EVIDENCE FROM NIGERIA

Peter N. Mba[1], Anthony Orji[2] and Donald Chukwumaeze[3]

[1]Department of Economics, University of Calabar

[2]Department of Economics, University of Nigeria, Nsukka

(Corresponding Author)

[3]Department of Economics, University of Calabar

Abstract

The performance of the manufacturing sector in an oil-rich country like Nigeria has been a subject of debate among scholars. Some believe that it has not been impressive due to the preference and reliance on imported goods while others share different opinions. This study therefore investigates the relationship between trade openness and industrial output growth in Nigeria using time series data, endogenous growth framework as well as export-led growth model. The paper also examines the direction of causality between trade openness and manufacturing output using Toda-Yamamoto Causality Approach. The adopted framework contends that domestic policies on trade liberalization cannot be avoided but harnessed for optimal benefit of the economy. The empirical results shows that trade openness contribute positively to industrial output growth. In the short-run, the dynamic impact of trade openness on industrial output growth is insignificant while its long-run impact is significant. The paper also reveals a bidirectional causality between the two core variables. As the paper suggests, this could be a pointer to the government that there is need to diversify the economy and stop depending on a mono product. Again, the government should be careful while implementing trade openness policies to avoid making the country a dumping ground for unwanted developed countries' goods and service. This is particularly important when signing bilateral trade agreements and other treaties.

Key Words: Trade, Openness, Industrial Output, Growth, Nigeria

JEL Classification: F13, F14, L50, L60, O24

1. Introduction

Many economists and policy commentators see industrialization or modernization as a sine qua non for economic development (Akintunde, et al, 2021). It is also widely accepted that the speed of industrial development is dependent on domestic policies and organization of international trade; hence the importance of studying how economy grows is also linked to trade openness, industrial output and diversifying away from traditional commodities. Essentially, in many developing economies, discussions on trade openness and industrial output determinants have received some serious attention (Khobar and Moyo, 2021). This is largely due to various contenting arguments in the literature and the relatively declining performance of the industrial sector in these economies (Bateer et al, 2020). Having realized the backwardness associated with protected trade policies to earn economic success; developing countries in Africa including Nigeria are implementing trade liberalization policies. However, to achieve some sustainable levels of growth and greater diversification in any economy through the expansion of the industrial sector, domestic policies on trade openness and liberalization have critical roles to play.

Nigeria is a monoculture economy which depend majorly on crude oil production with neglect in other areas of investments resulting to fall in foreign exchange earnings, high rate of unemployment and inflation due to lack of investment in other key areas. Indeed, industrialization has been a top priority of government to move population out of poverty. Thus, focus has been on identifying factors capable of boosting industrial performance in Nigeria, among the key issues are openness of trade and industrial output growth leading to diversification.

The manufacturing sectors performances in Nigeria have not been impressive due to the preference and reliance on imported goods. The poor performance may be for other reasons such as policy instability, poor macroeconomic environment, bureaucratic bottlenecks, legal environment which does not guarantee property rights and safety, poor governance, corruption and low commitment of governments to industrial development (Albaladejo, 2003). It could be the case of high rise of importation of production input that may hinder industrial performance in Nigeria. Ajakaiye, Jerome and Alaba (2016) argued that the sharp depreciation of the naira adversely affected the manufacturing firms because of the increasing cost of importation of spare parts and infrastructural deficit, weak demand resulting from declining domestic purchasing power, high interest rate and gross under-utilization of capacity.

It is pertinent to note that the adoption of the structural adjustment programme (SAP) in 1986 initiated the process of termination of the hostile policies towards trade. A new industrial policy was introduced in 1989 with the debt to equity conversion scheme as a component of portfolio investment. In summary, the polices embarked on by the Nigerian government to attract foreign investors as a result of the introduction of the SAP could be categorized into five: the establishment of the Industrial Development Coordinating Committee (IDCC), investment incentive strategy, non-oil export stimulation and expansion, the privatization and commercialization programme, and the shift in macroeconomic management in favour of industrialization, deregulation and market-based arrangements (Mba, 2010 and Orji&Mba, 2011).

The second trade policy created the National Economic Empowerment and Development Strategy (NEEDS) in 2003 which was a medium-term economic strategist covering 2003-2007. According to African Trade Policy Centre (2007) NEEDS was described as Nigeria's plan for prosperity and vision for greater tomorrow with focus on: re-orienting values, reducing poverty, creating wealth and generating employment. In the trade policy area, it deepens Nigeria's integration with the rest of the world and maximizes the benefits of strategic integration with regional integration and trade as the two instruments. However, the impact of these policy thrusts on our economic performance still remains ambiguous.

Against this background, this article examines the impact of trade openness on industrial output performance, and equally looks at the direction of causality between them in order to make useful policy recommendations for the diversification of the economy.

2. Literature Review

Smith and Ricardo's theory commonly known as the orthodox or traditional theory of international trade by the classical economists argues that trade will promote growth and development in the form of higher production and consumption. But the theory attracted lots of criticisms from the modern trade theory due to its bases on unrealistic assumptions such as the assumption of labour cost; since it neglected other cost like capital. The Heckscher-Ohlin-Samuelson (HOS) model postulates that trade will help in reducing the income gap between poor and rich countries. Therefore, countries that have abundance labour (L) should use more of labour in production while the ones that have capital abundance should use more capital (K) in production so that at the long run, the gap of inequality will be wiped out.

In other words, HOS implies that poor countries with abundant labour should specialize in producing and trading in labour intensive goods while the richer countries with relatively scarce labour but abundant capital should specialize in capital intensive commodity. It also implies that free trade specializing in production will tend to bring about factor price equalization and thus increase the return to labour in poor countries that will be equivalent to the rich countries. This is based "on the assumption that some factors of production" are perfectly immobile internationally. The HOS model is found by utilizing Heckscher's observations such as: (i) countries differ in their relative endowments of the factors, (ii) production processes for different goods employ different relative intensities of the factors. Thus, the HOS has a growth dimension with implications for future outputs and trade patterns (Verick, 2006).

Dunning (1981) put forward his eclectic integrated approach to international trade. He observed that technology is not the main determinants that give a country advantage over another country through internationalizing. Internationalization could occur through transfer, price manipulation, security of supplies and markets and control over use of intermediate goods. While Caves (1971) opined that avoidance of oligopolistic uncertainty and erection of barriers to the entry of new rivals are the factors underpinning the investment decision in LDCs. This observation was further enhanced by the deficiencies of capital, technology and expertise to exploit and enhance the natural resources that abound in the less developed countries.

Empirical studies on trade openness and industrial output varies in their findings and conclusions. Some studies have focused on developing country specifics and some on cross country studies of developed or developing countries. Spiezia (2004) examines the impact of trade on the manufacturing sector using a set of panel data for a sample of 39 countries over different periods within the mid 1980s to 1990s. The study found no significant employment impact of Foreign Direct Investment (FDI) and domestic investment. But when disaggregated by income level, it showed a positive and significant impact of foreign direct investment on middle and high income countries with the low income countries not showing any impact on FDI on employment. He

observed that in 21 out of the 39 developing countries under study, an increase in the volume of trade resulted in an increase in employment, increased integration produced reduction in employment in the remaining 18 countries.
Njikam (2009) examined the effect of trade openness and growth of industrial performance in Cameroon, and explored whether relationship exists between infrastructure and industrial performance during the two time periods, before and after trade openness. The study utilized the annual values throughout the import-substitution era (1986-94) and proximately after trade restructuring (1995-2003) for a sample of 29 industrial sectors. By means of panel data techniques, it established that advancement in infrastructure tends to boost the efficiency of industrial sector and in trade openness agenda.

On impact of trade related reforms and openness on technical efficiency with reference to agro based industries in Pakistan, study by Sheikh and Ahmed (2011) showed their effect which is closely linked with the overall development of the country with a contribution of 25% share in Gross Domestic Product (GDP). Another study in Pakistan by Ahmed, Arshad and Afzal (2015) utilizing a panel of twenty seven 3-digit manufacturing industries over the period of 1980-2006 with a variant of Cob-Douglas function and estimating output elasticity and Total Factor Productivity (TFP). Result showed trade liberalization has positive but negligible impact on TFP and effective rate of protection exerts negative impact on TFP in the post liberalization than the pre-liberalization period.

There are some studies whose findings were divergent. The study by Ulaşan (2015) introduced four categories of openness indicators: trade volumes; direct trade policy measures, such as tariff rates and parallel premium for exchange rate; measures that indicate the difference between predicted and actual trade; and subjective measures, such as real exchange rate distortion index. Relationship between trade openness and growth in a panel of 119 countries was conducted by using dynamic panel data methods for the period from 1960 to 2000. The study outcome is in the opposite that openness has a direct robust relationship with economic growth in the long-run". Kim (2011) introduced the differential effect of openness on economic growth using fixed effect model with data from 61 countries from 1960 – 2000. Findings showed that trade openness has a positive effect on economic growth in high income countries, but the opposite effect is the case of low economies.

Studies focusing on crowding out or crowding in and their effect are few. Silajdzic and Mehic (2017) focused on less technologically advanced economies given their limited ability to reap off the benefits of free trade including limited absorptive capabilities, pervasive market and coordination failures inhibiting development of strategic, infant or new industries, and potential 'crowding out' effect of trade covering Central and Eastern European transition economies in the period from 1992-2014. The results point to the specification of trade, proper treatment of the possible simultaneity bias in the relationship, and the differences in the levels of industrial and technological development across countries and positive significant impact of trade intensity indices on economic growth in CEE countries robust to different methods of investigation. However, the results of their empirical studies do not render support to the hypothesis that trade liberalization policy is beneficial to growth performance in the specific context of selected transition economies.

Joining the contentious debate on capacity utilization and its role on economic performance of the manufacturing firms, Gu and Wang (2013) examined the Canadian manufacturing industries and findings showed that industrial productivity slowdown was associated with decline in capacity utilization. While Okunade (2018) also finds a positive but insignificant relationship between capacity utilization and manufacturing firms' output in Nigeria using data from 1981 to 2016 and Autoregressive Distributed Lag (ARDL) model approach.

In Nigeria, results of some studies such as Onakoya, Fasanya and Babalola (2012), Umoru and Eborieme (2013), Okoye, Nwakobi and Okorie (2016) and Adamu and Dogan (2017) are not unanimous with regards to output growth. Hence there is no consensus on the impact of trade openness on industrial output in the short and long run. Studies on Nigeria did not take into account the period of economic recession and subsequent devaluation/depreciation of Nigerian naira (2015-2017) which significantly reduced export than import. This research therefore empirically studied the relationship between openness and industrial output growth by augmenting other works done and adding core variables like gross domestic investment and their lessons for diversification.

3. Methodology

3.1 The Models

The theoretical foundation of the model is the endogenous growth as well as the export led model. This suggest among others that export led outward orienting trade policy stimulates growth (Wilbur and Haque 1992). Export stimulates growth by contributing to output with the efficient use of resources and foreign exchange that increases imports of capital goods and stimulates economic growth. The model is specified as follows:

$$\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \varphi(x_{t-1} - y_{t-1}) + \varepsilon_t \quad (3.1)$$

Where:

Δ = Difference operator

y_t = Endogenous variable

x_t = Exogenous variable

$(x - y)_{t-1}$ = Error correction term

φ = Coefficient of the error correction term which measures the degree of adjustment

β_0, β_1= Parameters of the model

ε_t= Error term

t = Time

The functional form of our model is specified as follows:

IND = f(OPN, GDI, EXR, FDI, INF) (3.2)

Where:

IND = Industrial output

OPN = Trade openness measured as exports + imports / GDP

GDI = Gross domestic investment

EXR= Exchange rate

FDI = Foreign direct investment

INF=Inflation rate

From equation (3.2), the empirical model is presented as follows:

$$\Delta IND_t = \lambda_0 + \sum_{i=1}^{i} \lambda_{1i} \Delta OPN_{t-i} + \sum_{i=1}^{i} \lambda_{2i} \Delta GDI_{t-i} + \sum_{i=1}^{i} \lambda_{3i} \Delta EXR_{t-i} + \sum_{i=1}^{i} \lambda_{4i} \Delta FDI_{t-i} + \sum_{i=1}^{i} \lambda_{5i} \Delta INF_{t-i} + \phi ECM_{t-i} + \mu_t. \quad (3.3)$$

Where $\lambda_0, \lambda_{1i}, \lambda_{2i}, \lambda_{3i}, \lambda_{4i}, \lambda_{5i}$ are parameters of the model to be estimated; and μ_t is error term

Further, to address the objective of the study, we estimate a long-run relationship using static econometric model specified as follows:

$$Log(IND_t) = \alpha_0 + \alpha_1 Log(OPN_t) + \alpha_2 Log(GDI_t) + \alpha_3 EXR_t + \alpha_4 Log(FDI_t) + \alpha_5 INF_t + \mu_t. \quad (3.4)$$

Where $\lambda_0, \lambda_{1i}, \lambda_{2i}, \lambda_{3i}, \lambda_{4i}, \lambda_{5i}, \alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ are parameters of the models to be estimated; Log is natural logarithm.

3.2 Method of Data Analysis

The ordinary least squares (OLS) method is used to estimate the parameters of the specified models. The adoption of the OLS method is due to the fact that it is the best estimation technique for linear models. Also, the parameter estimates of the OLS method have some optimal (desirable) properties called best linear unbiased estimates (BLUE) properties. However, before model estimation is carried out, unit root test of the variables under consideration is first conducted. The unit root test is used to ascertain the stationarity property of the time series variables in the specified models. The importance of unit root test is that it enables us to avoid the problem of spurious regression outputs. In this study, the Augmented Dickey-Fuller (1981) unit root test method is utilized.

Next after unit root test is cointegration test. The cointegration test is used to confirm whether time series variables which might be individually non-stationary can be linearly combined to give a meaningful long-run equilibrium relationship. For this study, the bounds cointegration test procedure is used. The bounds cointegration test procedure follow autoregressive distributed lag (ARDL) modeling framework and is based on the F-test statistic. After model estimation, the validity and healthiness of the regression estimates are confirmed using various post-diagnostic test statistics (checks) such as coefficient of determinations (R^2), adjusted coefficient of determinations ($\bar{R}^2$), t-statistic, F-statistic, and Durbin-Watson (D-W) statistic.

4. Results and Discussion

This section presents the empirical results of the study, ranging from descriptive (summary) statistics, ADF unit root test results, bounds cointegration test results to the regression results (which consists of short-run regression results and long-run regression results).

4.1 Descriptive Analysis of Variables

Table 1: Summary Statistics

Statistics	Log(IND)	Log(OPN)	Log(FDI)	Log(GDI)	EXR	INF
Mean	275993.3	2567202	296477.3	2302.279	76.34289	18.54711
Std. Dev.	286585.5	1756860	359881.4	3487.667	70.82855	18.49105
Jarque-Bera	4.847835	3.191205	1.085788	1.948764	2.229035	1.025960
Probability	0.088574	0.202786	0.604388	0.706913	0.520692	0.690179
Observations	38	38	38	38	38	38

Source: Computed using E-Views 9 software.

The summary of descriptive statistics of variables of study is as reported in table 1. It provides the mean, standard deviation and Jarque-Bera statistic values of the variables under consideration. The mean measures the average value of the series. Standard deviation (std. dev.) measures the dispersion or spread in the series. The higher (lower) the value, the higher (lower) the deviation of the series from its mean. Jarque-Bera is a test statistic for normal distribution. The null hypothesis for the test is that the series is normally distributed at conventional level of statistical significance of 5% (0.05). Thus, if the computed probability value for the test is greater than 5% (0.05), we do not reject the null hypothesis otherwise, we reject it.

As can be observed from table 1, the mean values of Log(IND), Log(OPN), Log(FDI), Log(GDI), EXR and INF are 275993.3, 2567202, 296477.3, 2302.279, 76.34289 and 18.54711 respectively while their respective standard deviations are 286585.5, 1756860, 359881.4, 3487.667, 70.82855 and 18.49105. The results showed that EXR and INF had the lowest or least mean and variability (standard deviation) while Log(IND) and Log(FDI) had the highest or largest mean and variability (standard deviation). Lastly, the Jarque-Bera statistic values showed that Log(IND), Log(OPN), log(FDI), Log(GDI), EXR and INF are all normally distributed.

4.2 Trend Analysis of Variables

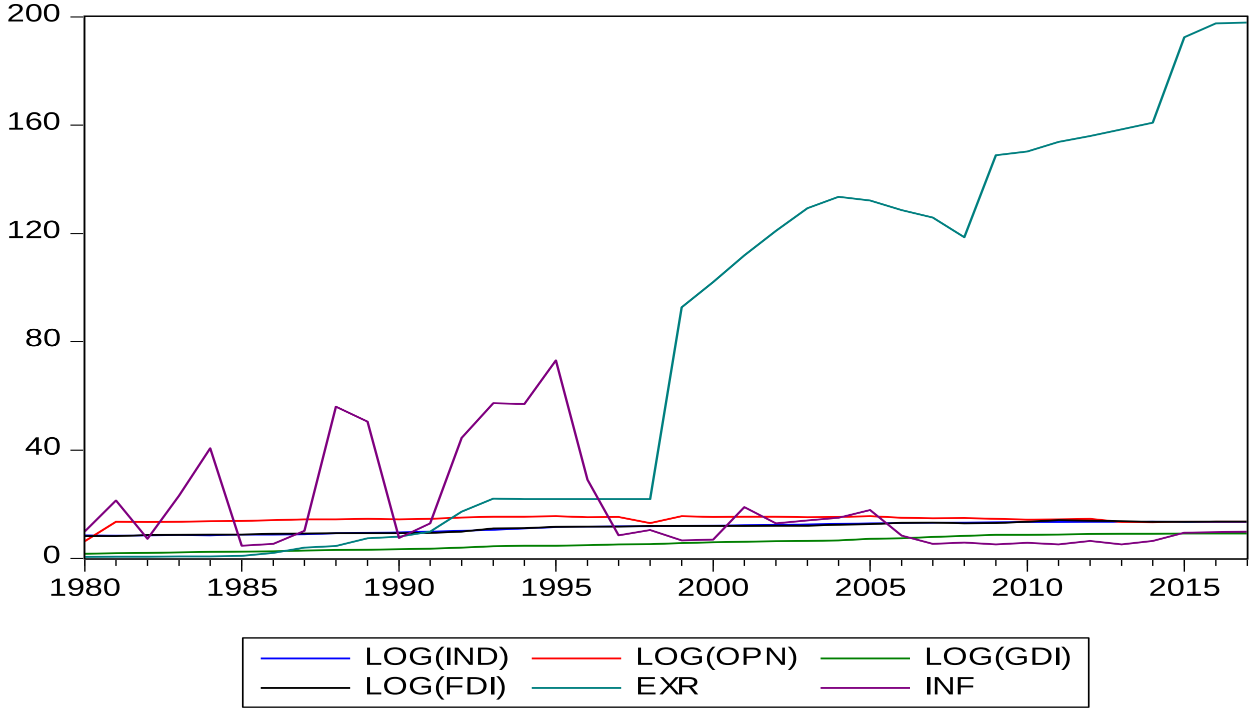

Fig. 1: Trends of Regression Data

Figure 1. shows the trend behaviour of the variables of study over the period 1980-2017. It can be observed that EXR and INF were more volatile than the rest of the variables (Log(IND), Log(OPN), Log(GDI) and Log(FDI)) in the entire period. This shows that there was relative stability in the trend behaviours of Log(IND), Log(OPN), Log(GDI) and Log(FDI) between 1980 and 2017. However, each of these variables exhibited some sorts of mild instability at different periods. The implication of the trend behaviour of each variable is that to a large extent it affects their stationarity status as can be observed in table 4.2 below.

4.3 Unit Root Test Results

Table 2: Augmented–Dickey Fuller (ADF) Test Results

Variables	ADF Statistics		Remark
	Level	First Difference	
Log(IND)	-0.068763	-3.179421**	I(1)
Log(OPN)	-1.560945	-10.39922**	I(1)
Log(FDI)	-0.549672	-5.654844**	I(1)
Log(GDI)	2.748521	-5.261166**	I(1)
EXR	0.251892	-5.785191**	I(1)
INF	-3.006429**	-	I(0)

Note: ** indicates the rejection of the null hypothesis of existence of unit root at 5% significance level. Lags are selected based on Schwarz Information Criteria (SIC).

Source: Computed using E-Views 9 software.

The ADF unit root test results as reported in table 4.2 showed that Log(IND), Log(OPN), Log(FDI), Log(GDI) and EXR were non-stationary at level except INF. This means that Log(IND), Log(OPN), Log(FDI), Log(GDI) and EXR have mean, variance and covariance that are not constant overtime. However, after first differencing, each of these time series variables became stationary. The implication of the unit root test results is that Log(IND), Log(OPN), Log(FDI), Log(GDI) and EXR are integrated of order one, i.e., I(1) while INF is integrated of order zero, i.e., I(0). Therefore, in testing for cointegration, the appropriate method to use is the bounds cointegration test method which is based on autoregressive distributed lag (ARDL) framework. The choice for bounds test approach is based on the assumption that it is best suitable for cointegration test involving mixture of I(0) and I(1) integrated time series.

4.4 Bounds Cointegration Test Results

Table 3: Results of Bounds Cointegration Relationship

Critical Bounds Value of the *F*-statistic						
K	*1% level*		*5% level*		*10% level*	
	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
5	3.93	5.23	3.12	4.25	2.75	3.79
Calculated F-statistic= 7.185877						

Note: The lag length was selected based on the Schwartz Information Criterion (SIC). K is the number of regressors.

Source: Computed using E-Views 9 software.

The results of the bounds test for the presence of long-run relationships between the variables are reported in table 4.3. Since this study employed annual data, we follow the tradition of Narayan and Smyth (2005) and set the maximum lags in the ARDL model to 2 ($i_{max} = 2$). The estimated model of the ARDL-bounds test is based on minimizing the Schwartz Information Criterion (SIC). The bounds F-test for cointegration test yields evidence of a long-run relationship between the concerned variables. The computed F statistic, $F_C = 4.396907$ is respectively greater than the lower and upper bounds at 1%, 5% and 10% critical value resulting in the rejection of the null hypothesis of no long-run relationship between the examined variables. This evidence implies that a long-run relationship exists between the variables which rules out the possibility of estimated relationship being spurious.

4.5 Regression Results

Table 4: The Short-run (Dynamic) Relationship and Error Correction Mechanism

Dependent Variable: IND

Variable	*Coefficient*	*Standard Error*	*t-Statistic*	*P-Value*
C	15761.61	6702.081	2.351749	0.0272
D(OPN)	0.005976	0.001437	0.363446	0.7195
D(OPN(-1))	0.003342	0.006233	0.536140	0.5968
D(GDI)	5.587820	1.244110	4.491419	0.0003
D(GDI(-1))	19.86873	5.693714	3.489590	0.0014
D(FDI)	0.020353	0.048362	0.420857	0.6776
D(FDI(-1))	0.027682	0.053452	0.517877	0.6093
D(EXR)	-752.1723	320.7247	-2.345227	0.0196
D(EXR(-1))	-41.88969	14.94348	-2.803208	0.0075
D(INF)	-108.0239	306.8214	-0.352074	0.7279
D(INF(-1))	-100.6335	307.3354	-0.327439	0.7462
ECM(-1)	-0.564320	0.116271	-4.853489	0.0000

Diagnostic Checks

R-Squared: 0.78

Adjusted R-Squared: 0.75

Durbin-Watson: 2.01

F-Statistic: 53.32014; PV: 0.000000

Note: PV= Probability Value

Source: Computed using EViews 9 Software.

Table 4.4 presents the parsimonious encompassing error correction model which shows the short-run evolution of the time series under consideration and their dynamics of adjustments overtime. At 5% level of significance, trade openness (OPN) and foreign direct investment (FDI) impacted positively and insignificantly on industrial output growth (IND) in the short-run while the short-run impact of gross domestic investment (GDI) on IND was positive and statistically significant. Both exchange rate (EXR) and inflation rate (INF) impacted negatively on IND in the short-run, however, while EXR impacted significantly on IND on one hand, the impact of INF on IND on the other hand, was statistically insignificant. The coefficient of the loading factor i.e., error correction term (ECM) is correctly signed and statistically significant at 5% level of significance. This implies that an error correction mechanism exists so that the deviation from long-run equilibrium has a significant impact on IND in Nigeria. The value of -0.56 implies that 56% of the disequilibria in IND of the previous years' shocks adjust back to the long-run equilibrium in the current period. It also implies that adjustment to long-run equilibrium is moderate.

The adjusted coefficient of determination value of 0.75 shows that the estimated error correction model has a good fit. The F-statistic of value of 53.32014 with probability value of 0.000000 suggests that the parameters of the model are jointly significant while the Durbin-Watson statistic of 2.01 indicates the absence of first-order autocorrelation; implying that the estimated model is free from the problem of spurious regression.

Table 5: The Long-run (Static) Relationship

Dependent Variable: Log(IND)				
Variable	*Coefficient*	*Standard Error*	*t-Statistic*	*P-Value*
C	1.128408	0.829815	1.359831	0.1834
LOG(OPN)	0.073641	0.011485	6.411929	0.0000
LOG(GDI)	0.083336	0.127951	0.651315	0.5195
LOG(FDI)	0.828123	0.124085	6.673822	0.0000

EXR	0.000916	0.002429	0.377057	0.7086
INF	-0.001662	0.003002	-0.553615	0.5837

Diagnostic Checks

R-Squared: 0.98

Adjusted R-Squared: 0.96

Durbin-Watson: 1.92

F-Statistic: 66.70032; PV: 0.000000

Note: PV=Probability value.

Source: Computed using EViews 9 Software.

From the long-run regression results as reported in table 5, it can be observed that in exception of inflation rate (INF), other factors such as trade openness (OPN), foreign direct investment (FDI), gross domestic investment (GDI) and exchange rate (EXR) had positive relationship with industrial output growth (IND) in the long-run. Thus, a percentage change in OPN, GDI, FDI and EXR, on average, increased IND by 7.36%, 8.33%, 0.0916% and 82.81% respectively. Since INF negatively relates with IND, a percentage change, on average, reduced the value of IND by 0.1662%. But while the long-run impacts of OPN and FDI on IND were statistically significant, those of GDI, EXR and INF were statistically insignificant.

In terms of the goodness of fit of the estimated long-run model, the adjusted coefficient of determination value of 0.96 indicates a good fit. The F-statistic of value of 66.70032 with probability value of 0.000000 suggests that the parameters of the model are jointly significant while the Durbin-Watson statistic of 1.92 indicates the absence of first-order autocorrelation; implying that the estimated model is free from the problem of spurious regression.

4.6 Toda-Yamamoto Causality Test Results

Based on the results of the ADF test, we proceed to test for the existence of causal relationships among the variables in the specified equation of study through the use of the Toda-Yamamoto causality test. The use of this test is informed by the order of integration of the study variables, which is a mixture of I(0) and I(1) series. Since the Toda-Yamamoto causality test is based on vector regression (VAR) modelling framework, the optimal lag length of the VAR model, which is 2, that is, k=2, was determined by the usual information criteria such as Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn information criterion (HQ). Also, since the variables of study had mixture of I(0) and I(1) orders of integration, it implies that the maximum order of integration (d) is 1, that is, $d_{\max}$ =1. The results of the Toda-Yamamoto test are presented in table 6. The results are interpreted at 5% level of significance.

Table 6: Results from Toda-Yamamoto Causality Test

Dependent variable: LOG(IND)			
Excluded	**Chi-sq**	**Df**	**Prob.**
LOG(OPN)	13.73156	3	0.0033
LOG(FDI)	4.983383	3	0.1730
LOG(GDI)	8.856042	3	0.0313
EXR	25.76271	3	0.0000
INF	1.862884	3	0.6013
All	**50.97700**	**15**	**0.0000**
Dependent variable: LOG(OPN)			
Excluded	**Chi-sq**	**Df**	**Prob.**
LOG(IND)	13.08430	3	0.0045
LOG(FDI)	3.180876	3	0.3646
LOG(GDI)	4.048912	3	0.2562
EXR	6.859127	3	0.0765
INF	1.854364	3	0.6032
All	**61.90128**	**15**	**0.0000**
Dependent variable: Log(FDI)			
Excluded	**Chi-sq**	**Df**	**Prob.**
LOG(IND)	2.222215	3	0.5276
LOG(OPN)	0.437177	3	0.9325
LOG(GDI)	2.236226	3	0.5248

EXR	0.163418	3	0.9833
INF	0.585815	3	0.8997
All	**12.88049**	**15**	**0.6115**
Dependent variable: LOG(GDI)			
Excluded	**Chi-sq**	**Df**	**Prob.**
LOG(IND)	8.882036	3	0.0309
LOG(OPN)	7.002640	3	0.0718
LOG(FDI)	5.766587	3	0.1235
EXR	7.264753	3	0.0639
INF	8.280282	3	0.0406
All	**17.56547**	**15**	**0.2862**
Dependent variable: EXR			
Excluded	**Chi-sq**	**Df**	**Prob.**
LOG(IND)	2.790365	3	0.4251
LOG(OPN)	3.867621	3	0.2761
LOG(FDI)	3.467674	3	0.3250
LOG(GDI)	1.086566	3	0.7803
INF	3.732836	3	0.2918
All	**21.74070**	**15**	**0.1148**
Dependent variable: INF			
Excluded	**Chi-sq**	**Df**	**Prob.**
LOG(IND)	26.94502	3	0.0000
LOG(OPN)	10.43709	3	0.0152
LOG(FDI)	10.54386	3	0.0145
LOG(GDI)	2.798393	3	0.4238
EXR	8.205470	3	0.0420
All	**91.91858**	**15**	**0.0000**

Source: Computed using EViews 9 Software.

The results of the Toda-Yamamoto causality test revealed that bi-directional causality respectively exists between Log(IND) and Log(OPN), and Log(IND) and Log(GDI).

The results showed that unidirectional causality runs from EXR to Log(IND), Log(IND) to INF, Log(OPN) to INF, Log(FDI) to INF, INF to Log(GDI), and EXR to INF.

The results further revealed that no causality runs between Log(IND) and Log(FDI), Log(OPN) and Log(FDI), Log(OPN) and Log(GDI), Log(OPN) and EXR, Log(FDI) and Log(GDI), Log(FDI) and EXR, and Log(GDI) and EXR.

Lastly, at the Chi-square calculated value of 50.97700 and probability value of 0.0000, we can safely conclude that a bi-directional causality jointly runs between industrial output growth (Log(IND)) and trade openness indicators such as Log(OPN), Log(FDI), Log(GDI), EXR and INF.

4.7. Discussion and Policy Implication of Findings

The observed short-run and long-run positive relationship between trade openness and industrial output growth is in agreement with the findings of, for example, Spiezia (2004) for panel of 39 countries (out of which 21 are developing countries), Njikam (2009) for Cameroun, Sheikh and Ahmed (2011) for Pakistan, Arshad and Afzal (2015) for Pakistan, and Ulaşan (2015) for 119 countries (out of which 21 are developing countries). However, just like these studies observed, evidence from the present study shows that in the short-run, the dynamic impact of trade openness on industrial output growth is insignificant while its long-run impact is significant. Results from the Toda-Yamamoto causality test further showed that a bi-directional causality jointly runs between industrial output growth and trade openness indicators in Nigeria. The policy lesson that could be drawn from these findings is that Nigeria's trade liberalization policies targeting industrial growth should have a long-term outlook. It also implies that government should be willing to accommodate the short-run distortions and adverse effects that come with trade openness. Important lessons can also be drawn for diversification here. For example, since the impact of trade openness on industrial output is not significant in the short run, it could be a pointer to the government that there is need to diversify the economy and stop depending on a mono product. When the economy is diversified it will open up more frontiers of businesses with the international community which could be beneficial to the domestic economy both in the short run and in the long run. Finally, the government should be careful while implementing trade openness policies to avoid making the country a dumping ground for unwanted developed countries' goods and service. This is particularly important when signing bilateral trade agreements and other treaties.

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