Dissecting the Threshold Effects of Financial Deepening on Industrial Sector Performance in Nigeria

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Abstract

This study seeks to examine the relationship between financial deepening and industrial sector performance in Nigeria. It relied on the autoregressive distributed lagged (ARDL) technique, utilizing data obtained from the World Bank Development Indicators (WDI) between 1980 and 2018. The specific objectives of the study are to examine the impact of financial deepening on industrial growth, and compute the threshold of financial deepening index required to spur industrial growth to its optimum level. To achieve the above, the study built its theoretical framework on the supply-leading hypothesis. The results reveal that financial deepening index exerts a positive impact on industrial sector growth. Also, financial deepening threshold of 36.8% is required to spur industrial sector output to its equilibrium steady-state, beyond which industrial growth declines. Furthermore, the Granger causality test supports the bi-directional hypothesis, hence, the study concludes that government policies and programs should be focused at persuading financial institutions to grant more credit facilities to private investors in the industrial sector.

Keywords: financial deepening, industrial sector, threshold effects, ARDL, Nigeria

JEL Classification: C5 G2 I6

1. Introduction

Financial deepening connotes an increase in the supply of financial assets as well as the development of the financial sector, which in turn spurs economic development through the real sector (Ngerebo & Lucky, 2016). Likewise, industrialization is perceived as a major driver of the economy, hence, facilitates the production of goods, generates employment, and enhances household income (Adeyefa & Obamuyi, 2018). In advanced and emerging economies, the industrial sector plays a vital role in creating employment, generating wealth, promoting sustainable and inclusive growth: all of which are important issues discussed in goal eight (8) of the Sustainable Development Goals (SDGs). More specifically, the Nigerian manufacturing sector do not only account for a substantial proportion of economic activities, it generates employment and create income by engaging 12 percent of the workforce in the nation's formal sector (NBS, 2019). Activities in the manufacturing sector covers a broad spectrum, including light agro-based and heavy-iron and steel industries. This is why relevant agencies perceive the

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manufacturing sector as a veritable tool in charting a pathway out of economic recession, as well as planning for Nigeria's economic recovery during the post-Covid 19 era (Nwokolo, et al., 2020). Similarly, the role of financial institutions that functions as key players in the mobilization and allocation of savings for productive activities, building of structures for monetary prudence, and creating a template for managing liquidity within the system cannot be overemphasized.

Although the emphasis on the role of finance continues to soar, industries within Africa and its sub-regions have been unyielding and inactive. In light of the foregoing, there has been a wide variation among financial and development economists in terms of the role of finance on industrial growth. This variation is quite depicted by the arguments arising from the demand-following and the supply-leading hypothesis (McKinnon, 1973; Cole and Shaw, 1974). More recently, Adeyefa and Obamuyi (2018) describe the four main trajectories through which finance can motivate industrial sector development, pool savings, stimulate exchange, and advance capital allocation. These trajectories towards the provision of cheap funds cause interest rate to plummet, which in turn increase productivity and growth. On the contrary, Azu-Nwangolo and Ogechi (2018) argue that financial deepening is complex, may cause macroeconomic instability, and as such amplifies 'financial manias'. Here, financial markets can become victims of their own success because the longer a financial system proves to be reliable, the higher the demand that would be placed on them. Thus, it becomes clear that the process of financial deepening may stimulate a turbulent financial system that permits shocks and financial meltdown.

Basically, most economies in the world face the challenges of macroeconomic instability as a result of a weak and porous financial system, which in turn contributes negatively to the growth of the industrial sector (Brychko et al., 2020). The case of some South American economies is pathetic. For instance, between 1960 and 1995, Bolivia's financial sector share to GDP was five times smaller than the share of the US (Ali et al., 2014). The major factor responsible for the shrink in finance is macroeconomic instability. Interestingly, the expositions above trigger off an attempt to provide answers to questions that have been in existence since the emergence of the growth theory; which include why countries grow, as well as how to achieve steady and long-run growth rate.

The Nigerian case is not any different since the contribution of the secondary sector to total the gross domestic product (GDP) has been comparatively frail compared to other sectoral contributions in the economy (Kayode et al., 2020). For instance, between 2010 and 2019, the average sectoral contributions to GDP were distributed as: agriculture (16,985.48B'#), industry (15,728.29B'#), and service (29,599B'#) (CBN, 2019). Deductively, it can be argued that the industry sector ranked third, with the contributions of the service sector almost the double of the industry sector. Here, the agriculture sector was comfortable at second position. The sectoral contributions to GDP in percentage are distributed as: agriculture (21.91%), industry (24.19%), and service (53.02%). It is even worse when the industry-GDP ratio is compared with other middle-income countries in Africa.

According to the Department of Statistics (2019), the South African industry sector ranked second behind the service sector; and they contributed 29.7% and 67.5% within the period, respectively. Worse still, the Nigerian financial sector is developing; and as such the above impasse leads to a crucial question: Can financial deepening promote industrial sector growth through its ability to mobilize funds?

Based on the foregoing, first, this study seeks to examine the relationship between financial deepening and industrial sector growth using the autoregressive distributed lag (ARDL) model. Secondly, it computes an index for financial deepening and the threshold for financial deepening necessary to enhance industrial sector performance using the principal component analysis (PCA) (Iheanacho, 2016), and the ARDL threshold regression (Pesaran et al., 2001). These are the major contributions to knowledge.

The remainder of the study is as follows. Section 2 is on literature review; section 3 deals with the theoretical framework and methodology. The analysis and discussion is in section 4; and lastly section 5 gives the conclusion and policy formulation.

2. Literature Review
2.1 Brief Overview of Programs, Trends and Measurements
Hitherto, Nigeria have implemented several policies aimed not only at improving the productivity of the industrial sector, but that of the economy as a whole. These policies include development plans, the Structural Adjustment Program (SAP), and the adoption of financial sector reforms in 1986 as part of the economic reform programs. Other economic programs include: National Economic Empowerment Development Strategy (NEEDS), coined from the Millennium Development Goals (MDGs), which ended in 2010; Bank Recapitalization and Consolidation that came into operation in 2005; the Sustainable Development Goals (SDGs), and the African Union Development Agenda, nick-named the 'African Vision 2020 Agenda' (Echekoba & Ubesie, 2018). These economic and financial reforms were targeted at deepening the Nigerian financial system as a strategy towards attaining speedy industrialization and economic growth. However, despite concerted efforts to improve the financial and industrial sectors through more robust economic programs and policies, such as the economic recovery and growth plan (ERGP), very little progress has been recorded.

Further, the average contribution of the industrial sector to the GDP from 1970 to 1980 was 8.2%. It increased slightly to 9.3% from 1981 to 1990; and from 1991 to 2000 it reduced to 7.4%, and further reduced to 6.4% from 2001 to 2010, before it increased to 8.7% and between 2011 and 2016 (CBN, 2017). This is very tiny and infinitesimal when compared to the oil and gas sector, which is the mainstay of the economy. Similarly, the average value of broad money and credit to the private sector as a ratio to the GDP were approximately 15% and 13%, respectively. Comparing the statistics above with the contribution of the financial sector to GDP in the UK and the US, which are above an average value of 50% (WDI, 2019); it can be deduced that the financial system in Nigeria is weak and might not be able to substantially boost the industrial sector.

More so, it cannot be overemphasized that the proxies for financial deepening are numerous; including the ratio of broad money (M2) to gross domestic product, total deposit bank assets to GDP, ratio of credit to private sector as a ratio of GDP, insurance industrial premium as a ratio of GDP, and saving accumulation as a ratio of GDP (John & Ibenta, 2017). This is the trend in measuring financial deepening in most literature since the deeper the financial system, the more expanded the level and growth of output in the industrial sector. On the other hand, industrial sector output and performance is measured in terms of the ratio of manufacturing, construction, building, and industrial value-added to GDP.

Contrary to the above measures of financial deepening and industrial sector performance in existing literature, this study aims to compute an index for measuring financial deepening using the principal components analysis (PCA). Here, the study plans to compute a more robust index for financial deepening using money supply as a ratio of GDP, credit to private sector as ratio to GDP, insurance industry premium as a ratio to GDP, savings accumulation as a ratio to GDP, while the industrial output growth adopts the growth rate of industrial value-added as its proxy.

2.2 Review of Theories
The supply-leading hypothesis was authored by scholars such as McKinnon (1973) and Cole and Shaw (1974). This theory postulates that financial deepening in any economy causes industrial output and productivity to upshot. Contrary to the above, the demand-following hypothesis focuses on the pathway through which response of demand from the industrial sector growth triggers the development of modern financial institutions, their financial assets and liabilities, related financial services, and the overall financial deepening index (Patrick, 1966). Drawing from the above, this model postulates that the development of the industrial sector will in itself induce an increase in the demand for financial services.

Further, the bi-directional causality hypothesis opines that financial deepening and industrial sector growth are mutual, or bi-causal in nature. Here, financial deepening gradually induces industrial output growth as well as causes feedback and induces further robustness in the financial system deepening (Al-Naif, 2012). On the other hand, the neoclassical model has been the backbone of growth theories in the recent past. Here, this theory predicts that in a steady-state equilibrium, the level of per capita income is a function of prevailing technology, the rates of saving, population growth, and technical progress: all assumed to be exogenous (Barro and Sala-i-Martins, 1995). Since these rates differ across countries, the Solow-Swan model yields different predictions about how differing saving rates and population growth rates might affect different countries per capita income. Others held constant, countries with higher saving rates tend to have higher levels of per capita income and vice versa.

2.3 Empirical Review
In an attempt to review the empirical literature, it is evident that most authors focused on economic growth-financial deepening relations using the ordinary least squares (OLS), vector autoregression (VAR), autoregressive distributive lag (ARDL) and vector error correction model (VECM) to examine issues such as causality, impacts and cointegration via panel and time series data (Karimo &

Ogbonna, 2017; Echekoba & Ubesie, 2018). Imoughele and Ismaila (2014) focused on the monetary policy-manufacturing sector performance in Nigeria spanning over a 27-year period. Here, the Granger causality test, cointegration and VAR techniques were employed to analyse the obtained data. The results showed that the previous and current year of broad money supply and interest rate exert insignificant impact on manufacturing output; while the rate of inflation, external reserve and exchange rate influence manufacturing sector output positively and significantly. The above notwithstanding, rate of interest, external reserve, and exchange rate have negative impact on manufacturing sector output; while broad money supply and inflation rate affect the sector positively. The variables possess unidirectional relationship.

In addition, Aiyetan and Aremo (2015) examined the effect of financial sector development on output growth of manufacturing firms in Nigeria using data from 1986 to 2012. Relying on the VAR, the study discovered that the manufacturing output growth in Nigeria is spurred by robust financial development and deepening of the financial sector. Werigbelegha and Ogiriki (2015) examined the performance of the stock market and growth in the Nigerian manufacturing sector from 1988 to 2014. Adopting the OLS econometric techniques, the study found direct and significant relationship between stock market performance and the manufacturing sector. Also, the study revealed a direct and significant relationship between stock market new issues and manufacturing sector performance in Nigeria.

More importantly, Obafemi et al. (2016) assessed the relationship between financial deepening and investment in Nigeria using time series data spanning from 1970 to 2013. Using the Gregor-Hansen endogenous structural break methodology and the supply-leading hypothesis, the study discovered that financial deepening has a positive impact on domestic investment. Drawing on this established premise, the study recommended that increased integration of the financial system mobilizes savings for investment. Thus, subsidizing the operational cost of financial intermediation would promote financial deepening by easing the rigidities involved in mobilizing and accessing of credit for investment purposes.

Furthermore, Ojong et al. (2017) examined the relationship between financial deepening and manufacturing sector growth in Nigeria from 1985 to 2014 using the OLS multiple regression technique. Findings from the study reveals that an indirect and insignificant relationship exists between financial development and the contributions of manufacturing sector to GDP. More so, Olawumi et al., (2017) examined the effect of financial deepening on the profitability of selected commercial banks in Nigeria using secondary data. Findings revealed that each component of the financial deepening indicators has positive and significant impacts with the level of profitability of the selected commercial banks in Nigeria. This paper concluded that policies to spur financial deepening are key towards enhancing the performance of commercial banks.

Re-examining the above, John and Ibenta (2017) dissect the relationship between financial deepening and entrepreneurial growth in Nigeria using time series data

spanning 1986 to 2016. The Pearson correlation test was adopted to establish the relationships between the variables. The results revealed that financial deepening has a positive but insignificant relationship with entrepreneurial growth. Also, financial development exerts a positive impact on entrepreneurial growth; while the ratio of deposit money influences entrepreneurial growth negatively. Hence, the research recommends that an effective manipulation of money supply to increase capital flows would trigger entrepreneurial growth.

On the flipside, Adeyefa and Obamuyi (2018) investigated the effect of financial deepening on manufacturing firms' performance in Nigeria using ARDL technique. The results obtained revealed that broad money supply has direct impact on manufacturing output; while credit to private sector has negative impact on manufacturing performance. Also, market capitalization exerted negative and positive effects in the short- and long-run periods, respectively. The study recommended that the government should focus on expanding financial reforms targeted at enhancing credit accessibility to the manufacturing sector, as well as ensuring adequate implementation and monitoring of existing policies on financial reforms in Nigeria.

More recently, Kayode et al. (2020) employed the ARDL and the Toda-Yamamoto causality to examine the relationship between financial deepening and manufacturing sector performance in Nigeria using time series data covering 32-year periods. The results revealed that financial deepening has a significant positive effect on manufacturing performance; while the Toda-Yamamoto test confirms a unidirectional causality running from financial deepening to manufacturing performance. Thus, the study concluded that the government should improve financial deepening strategies aimed at increasing capital spending. Given this brief review of literature, it is evident that most authors did not compute the index for financial deepening using PCA. More so, most of the existing literature in financial deepening-industrial growth trajectory failed to compute the threshold for financial deepening required to spur industrial sector performance to the optimum level.

3. Theoretical Framework and Methodology
To examine the impact of financial deepening on the growth of the industrial sector, the study adopted the supply-leading theory by Schumpeter (1934), which was later modified by McKinnon (1973) and Cole and Shaw (1974). This theory postulates that although industrial growth is a function of physical inputs such as labour and physical capital, financial deepening enhances industrial output growth within an economy. Interestingly, studies such as Chow et al. (2018) have adopted the supply-leading theory to examine the financial deepening-growth relation. Thus, it is upon this premise that the research built its framework on the supply-leading theory of financial deepening and industrial output growth.

Owing from the above propositions, the functional model of the supply-leading theory is specified as:

$$INOGR_t = f(INFD_t, A_t) \tag{1}$$

where $INOGR_t$ is the industrial output growth, $INFD_t$ is the index of financial deepening, and A_t includes other control variables such as inflation rate, exchange rate, and trade openness.

This is re-specified as a linear functional model below:

$$INOGR_t = f(MS_t, CPS_t, INSP_t, SAO_t, EXCH_t, INF_t, TOT_t) \tag{2}$$

Re-specifying the above into the mathematical form of the model, we have

$$INOGR_t = \delta_0 + \delta_1 MS_t + \delta_2 CPS_t + \delta_3 INSP_t + \delta_4 SAO_t + \delta_5 EXCH_t$$
$$+ \delta_6 INF_t + \delta_7 TOT_t \tag{3}$$

Notice that *MS, CPS, INSP* and *SAO* are indicators of financial deepening which are utilized to compute a financial deepening index ($\triangle FD$) using the principal component analysis (PCA). The factors are defined below.

3.1 Estimation Procedure

This study employs the ARDL model as the estimation technique to determine the short and long-run impacts of financial deepening on industrial sector growth in Nigeria. Furthermore, unit root test is employed to test for stationarity of the data, and the Granger causality test to examine the causal relationship amongst the variables employed. In addition, the ARDL model permits the regression of variables stationary at level (I (0)) and at first difference (I (1)). Thus, following Pesaran et al., (2001), an expression of the relationship between financial deepening and industrial sector output growth from equation (III) is expressed in the ARDL form as:

$$\Delta INOGR_t = \alpha_0 + \sum_{i=1}^{p} \alpha^1 \Delta INOGR_{t-1} + \sum_{i=0}^{p} \alpha^2 \Delta MS_{t-1} + \sum_{i=0}^{p} \propto^3 \Delta CPS_{t-1}$$

$$+ \sum_{i=0}^{p} \alpha^4 \Delta INSP_{t-1} + \sum_{i=1}^{p} \alpha_5 \Delta SAO_{t-1} + \sum_{i-0}^{p} \alpha_6 \Delta EXCH_{t-1}$$

$$+ \sum_{i=0}^{p} \alpha_7 \Delta INF_{t-1} + \sum_{i=0}^{p} \alpha_8 \Delta TOT_{t-1} + \beta_1 lnINOGR_{t-1} + \beta_2 lnMS_{t-1}$$

$$+ \beta_3 lnCPS_{t-1} + \beta_4 lnINSP_{t-1} + \beta_5 lnSAO_{t-1} + \beta_6 lnEXCH_{t-1}$$

$$+ \beta_7 lnINF_{t-1} + \beta_8 lnTOT_{t-1} + \varepsilon_t \tag{4}$$

Where Δ is the first difference operator, *INOGR* is industrial sector output growth rate, *MS* is money supply as a ratio of GDP, *CPS* represents credit to private sector as a ratio of GDP, *INSP* is insurance industry premium to GDP, *SAO* is savings accumulated to GDP, *EXCH* is exchange rate, *INF* is inflation rate, *TOT* is trade openness, *P* is the lag length, α & β are the parameter to be estimated, and ε_t is the white noise error terms.

Since the study will compute an index for financial deepening using principle component analysis (PCA) (see Iheanacho, 2016), then the ARDL equation becomes:

$$\Delta INOGR_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta INOGR_{t-1} + \sum_{i-0}^{p} \alpha_2 \Delta FD_{t-1} + \sum_{i-0}^{p} \alpha_3 \Delta EXCH_{t-1} + \sum_{i=0}^{p} \alpha_4 \Delta INF_{t-1}$$
$$+ \sum_{i=0}^{p} \alpha_5 \Delta TOT_{t-1} + \beta_1 lnINOGR_{t-1} + \beta_2 lnFD_{t-1} + \beta_2 lnEXCH_{t-1}$$
$$+ \beta_3 lnINF_{t-1} + \beta_4 lnTOT_{t-1} + \varepsilon_t \qquad (5)$$

Furthermore, to determine the threshold effect (see Sum, 2012) of financial deepening on industrial sector output growth, we present a second ARDL model capturing the quadratic term of financial deepening in equation (5). This stems from economic intuition that over a certain level of financial deepening, growth of output in the industrial sector could be hampered as fast-growing financial systems has the potency of causing a heating-up of the economy. This means that threshold measures the amount of financial deepening index that is required to bring the weak industrial sector output growth to the required equilibrium level.

$$\Delta INDOL_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta INOGR_{t-1} + \sum_{i-0}^{p} \alpha_2 \Delta FD_{t-1} + \sum_{i-0}^{p} \alpha_3 \Delta FD^2_{t-1} + \sum_{i-0}^{p} \alpha_4 \Delta EXCH_{t-1}$$
$$+ \sum_{i=0}^{p} \alpha_5 \Delta INF_{t-1} + \sum_{i=0}^{p} \alpha_6 \Delta TOT_{t-1} + \beta_1 lnINOGR_{t-1} + \beta_2 lnFD_{t-1}$$
$$+ \beta_3 lnFD^2_{t-1} + \beta_4 lnEXCH_{t-1} + \beta_5 lnINF_{t-1} + \beta_6 lnTOT_{t-1} + \varepsilon_t \qquad (6)$$

4. Data Analysis and Discussions
4.1 Trend Analysis
The trends for financial deepening and industrial output growth shows the graphical presentation of the relationship between these key variables in the study (Figure 1).
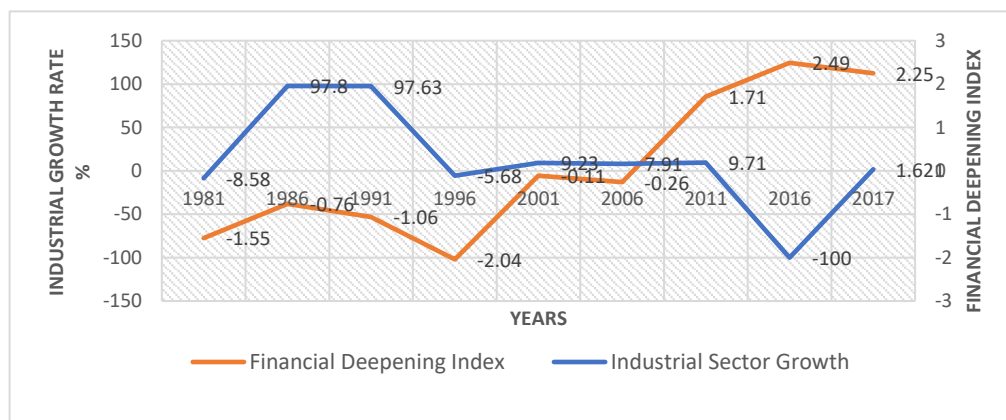

Figure I: *Industrial Sector Growth and Financial Deepening Index in Nigeria*
Source: Authors' compilation 2020 from WDI 2018

Figure I reveals that between 1981 and 1986, the industrial sector grew from -8.58% to 97.8%. In the same manner, financial deepening grew negatively from -1.55% to -0.76. Furthermore, the period 1991 and 1996 saw both the industrial sector and financial deepening index declining by 0.17% and 0.3%, respectively. Between 2011 and 2016 the industrial sector growth drastically fell from 9.71% to -100%, although the index of financial deepening grew from 1.71 to 2.49%. The 2017 period recorded a massive increase in industrial sector growth; with a marginal decline in the index of financial deepening.

4.2 Descriptive Statistic Result
This shows the average mean of the estimated variables in the model in Table I.

Table I: Descriptive Statistics of the Variables

	Mean	Median	Max.	Min.	Std. Dev.	Skew-ness	Kurtosis	Jarque-Bera	Prob.	Obs.
CPS	10.8913	8.2000	20.8000	5.9000	5.3646	0.9701	2.1420	6.9384	0.0311	37
EXCH	82.9283	92.3400	315.5400	0.6200	81.0997	0.7676	3.0672	3.6410	0.1619	37
INF	19.5416	12.8800	72.8400	5.3800	17.4474	1.6972	4.6728	22.0773	0.0000	37
INOGR	23.9440	9.7159	200.8573	-100	49.9973	1.1616	6.3660	25.7899	0.0000	37
INSP	0.3283	0.3067	0.6562	0.0954	0.1306	0.3912	2.5000	1.3292	0.5144	37
MS	14.1631	12.7000	21.3000	9.2000	3.9332	0.6985	1.9299	4.7746	0.0918	37
SAO	9.0048	8.5800	23.2500	3.3400	3.7967	1.5376	6.7648	36.4308	0.0000	37
TOT	32.2379	34.1826	53.2779	9.1358	12.7373	-0.3441	2.1321	1.8915	0.3883	37

Source: Authors' computation 2020 from WDI (2019)

The mean value for the credit to private sector stood at 10.8%, which is higher than the median value of 8.2%. In addition, the average value for the inflation rate is 19.5%, which is higher than the median value of 12.8%. This suggests that the rate of inflation in Nigeria for the examined period grew by 6.7%. In the same vein, the mean for industrial sector growth in Nigeria stood at 23.9% compared to 9.7% median value of the sector growth. This could be explained by the facts that inflation has a direct and positive influence on industrial sector growth, which means that the relative increase in the prices of finished goods will attract more investors to invest and produce more. Looking at the standard deviation, the values for all variables is above 1.0, with the exception of insurance premium which is below 1.0.

4.3 Data Analysis
4.3.1 Test for Stationarity
This section presents the unit root test conducted on the variables. The first step is to diagnose the stationarity of the variables to determine the appropriate test and estimation model to employ.

The ADF test results (Table 2) show that credit to the private sector as a percentage of GDP, exchange rate, inflation rate, insurance premium, money supply as a percentage of GDP, savings accumulation and trade openness are all stationary at first difference, while only industrial output growth is stationary at level.

Table 2: Stationarity Test

Variables	Levels			First Difference			Order of Integration
	ADF Test Stat.	*1%*	*5%*	*ADF Test Stat.*	*1%*	*5%*	
CPS	-0.4855	-3.6267	-2.9458	-4.9684***	-3.6329	-2.9484	I(1)
EXCH	-2.4122	-3.6267	-2.9458	-2.9129**	-3.6329	-2.9484	I(1)
INF	-2.8614	-3.6267	-2.9458	-5.5110***	-3.6329	-2.9484	I(1)
INOGR	-5.6051***	-3.6267	-2.9458	-5.2677***	-3.6537	-2.9571	I(1)
INSP	-1.7888	-3.6329	-2.9484	-5.4655***	-3.6329	-2.9484	I(1)
MS	-0.9089	-3.6267	-2.9458	-.5.3842***	-3.6329	-2.9484	I(1)
SAO	-2.2347	-3.6267	-2.9458	-6.4666***	-3.6329	-2.9484	I(1)
TOT	-2.2018	-3.6267	-2.9458	-7.3764***	-3.6329	-2.9484	I(1)

Notes: ***, ** indicate 1% and 5% level of significant
Source: Authors' computation, 2020

4.3.2 ARDL Bound Test Result

Table 3 presents the bound testing results, which reveal that a long-run equilibrium relationship exists between financial deepening and industrial sector growth in Nigeria, since the F-Statistic is greater than the upper bound values of I (0) and I (1) at 5 percent levels of significance.

Table 3: ARDL Bounds Test
Null Hypothesis: No long-run relationship exists

Test Statistic	Value	K
F-statistic	5.0303	7
Significance	*I(0) Bound*	*I(1) Bound*
10%	2.03	3.13
5%	2.32	3.5
2.5%	2.6	3.84
1%	2.96	4.26

Source: Authors' computation 2020

The study then proceeded to estimate the short-run and long-run significance by employing ARDL technique. Table presents the results, which show that credit to the private sector, and the first period of credit to the private sector as a percentage of GDP has negative and insignificant impacts on industrial sector growth, implying that a percent change in current credit to the private sector and previous lag of credit to it will decrease industrial sector growth by 256.0% and 29.3%, in the short-run respectively. In addition, current insurance premium and previous insurance premium negatively and insignificantly impact industrial sector growth in the short-run. More so, savings accumulation both for current and previous, including current inflation, has a positive and insignificant impact on industrial sector growth. This indicates that a percent change in savings accumulation and inflation in the short-run will increase industrial sector growth by 1250%, 91.8%, and 104.8% respectively. The co-integrating equation has negative and significant impact on industrial sector growth, meaning that the impact of previous lag value of the industrial sector growth on its current value is negative.

Table 4: Autoregressive Distributive Lagged (ARDL) Model
Dependent Variable: INOGR

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
	D(MS)	3.2708	12.2806	0.2663	0.7945
	D(MS(-1))	-11.1214	14.1302	-0.7870	0.4465
	D(CPS)	-2.5607	10.3352	-2.4777	0.0291
	D(CPS(-1))	-0.2934	12.5229	-0.2342	0.0187
	D(INSP)	-15.5343	201.0380	-0.7727	0.4546
Short-run Equation	D(INSP(-1))	-65.1539	180.0797	-0.3618	0.7238
	D(SAO)	12.0505	8.7462	1.3778	0.1934
	D(SAO(-1))	0.9189	7.1834	0.1279	0.9003
	D(INF)	1.0485	0.9646	1.0869	0.2984
	D(INF)	-0.4216	0.8780	-0.4802	0.6397
	D(EXCH)	0.6639	0.6703	0.9905	0.0414
	D(EXCH(-1))	0.1649	0.9157	0.1800	0.8601
	D(TOT)	-1.3389	1.8159	-0.7373	0.4751
	D(TOT(-1))	-0.6625	2.1453	-0.3088	0.7628
	CointEq(-1)	-1.1335	0.3460	-3.2752	0.0066
	MS	0.7457	19.019716	0.0392	0.0194
	CPS	-7.2277	9.162238	-0.7888	0.0455
Long-run Equation	INSP	-25.7417	170.596579	-0.1508	0.8826
	SAO	15.4800	11.381950	1.3600	0.1088
	INF	0.8114	1.181593	0.6867	0.0053
	EXCH	-0.3712	0.395525	-0.9385	0.3665
	TOT	1.8121	2.080317	0.8710	0.0008
	C	-79.4287	154.879229	-0.5128	0.6174

Source: Author's computation 2020

Further, the long-run results show that money supply has positive and significant impact on industrial sector growth in Nigeria, while other indicators of financial deepening—that is, credit to private sector, insurance premium and savings accumulation—have a negative and insignificant impact on industrial sector growth. Based on the mixed results in the short- and long-run on financial deepening indicators, the study went ahead to compute an index for financial deepening to get the exact impact of financial deepening on industrial sector growth for the period considered 1981 to 2017. Table 5 presents the results.

Having computed an index for financial deepening using the PCA, the results affirm that financial deepening has a positive and significant impact on the industrial sector in Nigeria, both in the short- and long-run for the period under consideration. Although, this finding is in tandem with the works of John and Ibenta (2017) and Adeyefa and Obamuyi (2018), however, it contradicts the work of Karimo and Ogbonna (2017); maybe because of differences in measures of variables, scope, and methodology. Further, the finding is in tandem with a-priori expectation and economic theory. This is because the more available these financial deepening indicators (money supply), the higher the liquidity within a system; hence, the lower the lending rates are driven down.

Table 5: Autoregressive Distributive Lagged (ARDL) Model for Index of Financial Deepening

Dependent Variable: INOGR

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
	D(FDIN)	8.525858	16.879323	-1.097547	0.0048
	D(FDIN(-1))	2.084290	15.020741	0.804507	0.0301
	D(EXCH)	0.018366	0.570861	0.032172	0.9746
	D(EXCH(-1))	-0.489403	0.766754	-0.638280	0.5302
	D(INF)	0.924431	0.730466	1.265536	0.2195
	D(INF)	-0.074502	0.764846	-0.097408	0.9233
	D(TOT)	-0.268618	1.523025	-0.176371	0.8617
Short-run Equation	D(TOT(-1))	-1.001649	1.309846	-0.764707	0.4530
	CointEq(-1)	-1.330750	0.286375	-4.646884	0.0001
	FDIN	0.309270	8.381343	-0.036900	0.0209
	EXCH	-0.247197	0.228935	-1.079770	0.2925
	INF	0.476761	0.636773	0.748714	0.4623
Long-run Equation	TOT	0.724482	0.720457	1.005586	0.3261
	C	14.845329	25.819221	0.574972	0.5714

Source*:* Authors' computation 2020

Building on this premise, it can be deduced that lower interest rates encourage investors to establish new industries as well as expand old ones. This is the pathway to improved industrial performance in Nigeria. In the same vein, the co-integration equation for previous year still remains negative and significant.

Table 6 presents the short- and long-run coefficients for the analysis of the threshold effect of financial deepening on industrial sector growth in Nigeria.

Table 6: Threshold Effect of Financial Deepening Index on Industrial Sector Growth

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
	D(FDIN)	9.657606	26.962972	-1.099938	0.0159
	D(FDIN(-1))	1.150114	24.096214	0.047730	0.0025
	D(FDIN^2)	-3.847717	5.437496	-0.707627	0.4882
	D(FDIN^2 (-1))	6.173176	5.898575	1.046554	0.3092
Short-run Equation	D(INF)	0.319590	0.778584	0.410476	0.6863
	D(INF)	-0.381595	0.786551	-0.485150	0.6334
	D(EXCH)	0.275771	0.614607	0.448696	0.6590
	D(EXCH(-1))	-0.039248	0.802536	-0.048904	0.9615
	D(TOT)	1.943955	1.903135	1.021449	0.3206
	D(TOT(-1))	-0.853025	1.340553	-0.636324	0.5326
	CointEq(-1)	-1.693331	0.388837	-4.354862	0.0004
	FDIN	9.478292	15.562912	1.894137	0.0344
	FDIN^2	-12.086323	5.724873	-2.111195	0.0490
Long-run Equation	INF	0.063091	0.598686	0.105383	0.9172
	EXCH	-0.651929	0.256433	-2.542297	0.0204
	TOT	1.538018	0.661816	2.323935	0.0320
	C	57.552924	28.233852	2.038437	0.0565

Source: Author's computation 2020

The results indicate the existence of a nonlinear relationship between financial deepening and industrial sector growth as shown by the quadratic term of financial deepening. Here, the effect of the quadratic term of financial deepening on industrial sector growth indicates that the threshold above which growth is hampered is 0.36. This indicates that financial deepening is associated with higher levels of industrial sector growth in Nigeria up to the threshold of approximately 36.8%, beyond which it may cause a decline in industrial performance. The results further affirm that deepening of financial sector above 36.8% may hinder industrial growth.

4.4 Post Diagnostic Test Result

For the robustness of the study, we conducted a robustness analysis to check for heteroscedasticity and serial autocorrelation in the model. The corresponding p-values for F-statistic in the Breusch-Pagan-Godfrey heteroscedasticity test (0.1064), Breusch-Godfrey serial correlation LM test (0.5825) and Ramsey RESET test (0.1988) denote an acceptance of the null hypotheses, which states the absence of heteroscedasticity, serial correlation and stability among the variables within the regression models (Table 7).

Table 7: Heteroscedasticity, Serial Autocorrelation and Stability Tests

Breusch-Pagan-Godfrey Heteroscedasticity Test	F-statistic	1.824416	Prob. F (13,21)	0.1064
Breusch-Godfrey Serial Correlation LM Test	F-statistic	0.556104	Prob. F (2, 19)	0.5825
Ramsey RESET Test	F-statistic	9.598978	Prob. F (1, 1)	0.1988

Source: Authors' computation, 2020

4.5 Pairwise Granger Causality Tests

Lastly, the Granger causality results (Table 8) shows that there is a bi-directional causality running from industrial sector growth to financial deepening, which supports the work of Ghildiyal et al. (2015). More so, this finding upholds the bi-directional theory on financial deepening and industrial sector growth.

Table 8: Granger Causality Result

Null Hypothesis:	Obs.	F-Statistic	Prob.
FDIN does not Granger Cause INOGR	35	1.85555	0.0139
INOGR does not Granger Cause FDIN		6.02803	0.0063
INF does not Granger Cause INOGR	35	0.94778	0.3989
INOGR does not Granger Cause INF		1.69474	0.2008
INF does not Granger Cause FDIN	35	2.13583	0.1358
FDIN does not Granger Cause INF		0.78038	0.4673

Source: Authors' computation 2020

The implication is that more premium is paid to insurance companies, and more savings are accumulated as industrial output increases. On the other hand, as the industrial sector output expands, it increases savings accumulation, triggers increase in money supply and credit to the private investor, which can metamorphose to increment in industrial sector output growth in Nigeria.

5. Conclusion and Policy Formulation

Financial deepening in Nigeria is patterned to play a special role of financial intermediation to ensure that sufficient funds get to industrialists focused at enhancing industrial sector growth, as well as promote economic growth and development. Considering the findings, the study concludes that computed index of financial deepening is a better proxy for financial deepening compared to the individual components (money supply, credit to private sector, insurance premium and savings accumulation) whose impacts were not only mixed but insignificant within the model. In line with the above, an attempt to improve on these components of financial deepening would further strengthen the impact of the computed index, as well as its impact on industrial sector growth. Thus, since credit to private sector is not free but given at a cost, further studies in this area should capture the lending rates of banks and how it affects the growth of the industrial sector. Lastly, other researchers in financial economies can reinvestigate this phenomenon in the West Africa Monetary Zone (WAMZ), to determine the sensitivity of financial deepening index.

Owing from the research findings, the study recommends that regulators such as the CBN and commercial banks, should encourage banks to be efficient in their financial intermediation function by ensuring that funds from the surplus sector are efficiently channelled to the deficit sector of the economy. Also, through its intervention programs the government should ensure that more credit is made available to the private sector to promote entrepreneurial and industrial response in various sectors of the economy, which will in turn spur economic growth. Further, monetary authorities should implement policies geared towards increasing money supply to achieve increased capital flows to the real sector of the economy as this will trigger industrial sector growth.

The above notwithstanding, the CBN should further compel commercial banks to grant more credit facilities to the private sector, including young graduates and new entrants without collaterals to enable them invest and contribute effectively in the growth of the industrial sector. This can be achieved if more bank branches are established: not as a solution, but rather targeted at extending more credit to the private sector (entrepreneurs), and increasing the supply of money as a way-forward to growth of industrial sector. Lastly, the government should launch new financial reforms capable of enhancing the accessibility of the manufacturing sector to credit and ensure adequate monitoring and implementation of existing policies on financial reforms in Nigeria with a view to deepening the country's financial system, and thereby promoting the performance of manufacturing firms in Nigeria.

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