Financial Sector Development and Industrial Production in Nigeria (1970-2009):

An ARDL Cointegration Approach

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Abstract

Literature abound justifying that industrialization is a pathway to economic development and growth. Whereas linkage between financial development and economic growth has long been a subject of intense scrutiny, not much has been done to examine the link between financial development and industrial growth. Using an aggregate production framework and autoregressive distributed lag (ARDL) cointegration technique for Nigerian time series data covering the period 1970 to 2009, the paper finds a cointegration relationship between financial sector development and industrial production. Both the long run and short run dynamic coefficients of financial sector development variables have negative and statistically significant impact on industrial production. Based on these research outcomes the following policy implications can be drawn: the most important task for government of Nigeria is to introduce further financial sector reforms to improve the efficiency of the domestic financial sector which is a pre-requisite for the achievement of industrial development. The inefficiency of the financial sector is responsible for the adverse impact on industrial production. Appropriate measures should be taken to eliminate the constraints and challenges facing small and medium scale enterprise (SME) funding schemes, as these enterprises form the bedrock of the Nigerian industrial sector. Furthermore, industrialization

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requires a lot of innovations and entrepreneurship. To achieve these, appropriate policy should be undertaken. Given the strong positive impact of labour stock on industrial production, policies should be geared towards diverting resources to develop more human capital.

1 Introduction

Literature abound justifying that industrialization is a pathway to economic development and growth. Whereas linkage between financial development and economic growth has long been a subject of intense scrutiny, not much has been done to examine the link between financial development and industrial growth. While the volumes of previous studies are attempting to reach a theoretical consensus on financial development and economic growth, it will be of interest to examine in the same vein the pathway of industrialization in the wake of financial development. The foundation for this work will anchor on Schumpeter (1912) and the subsequent enormous scholarly works stemming out from the debate of Mckinnon (1973) and Shaw (1973) on financial intermediation and economic growth. They contend that financial deepening and savings, increase investment and therefore impact positively on economic growth. Our thesis is that this impact is through investments in industrial sector. The views of Robinson (1962) and Stiglitz (1994) questioning the role of the financial system in promoting economic development remain valid as industrial growth also create demand for additional financial services, which in turn will lead to more developed financial sectors. Demetriades and Hussein (1996), Neusser and Kugler (1996)) representing a third group with the hypothesis of a bidirectional causation between financial development and economic growth might as well argue that it is true with industrial growth.

The forgoing notwithstanding, the financial sector is made relevant by its role through the interest rate. McKinnon (1973) and Shaw (1973) hypothesized that liberal interest rate regime motivates savers to convert some of their savings from unproductive real assets to financial assets and by so doing increase the supply of credit in the economy. This increased credit is what helps the investors to expand industrial output so that the economy can grow. Feyzioğlu, Porter, and Takáts(2009) confirmed that interest rate liberalization raises the cost of capital, increases the return on savings, and allows smaller, more efficient banks to increase their role in intermediation. Thus efficiency of investment is increased.

However, most developing countries in Africa have operated under quite repressive regimes. Most of these countries have embarked on various measures under the canopy of financial sector reforms to reposition the financial sector for economic growth. For some countries, there is evidence that the financial sector reforms have yielded fruits. For instance, empirical study for Zambia by Odhiambo (2009) reveals that interest rate liberalization enhances financial deepening and hence economic growth. There is no a priori reason, however, to believe that this is the case with Nigeria.

This paper sets off with the aim of providing robust empirical evidence on the relationship between the financial sector and industrial production growth in Nigeria. The paper is organized as follows. Section 2 reviews the existing literature on the link between financial intermediation, economic growth and industrial production. Section 3 presents background information and stylized facts on financial depth, economic growth and deposit rate of interest in Nigeria. Section 4 sheds light on the methodology and data used for the empirical analysis. Section 5 reports the estimation results while section 6 concludes.

2 Literature Survey

McKinnon (1973) and Shaw (1973) revisited the financial liberalization hypothesis and triggered off the debate on financial liberalization, interest rate and economic growth relationship. Since then, the potency of interest rate liberalization has been on debate from the theoretical and empirical frontiers. McKinnon (1973) and Shaw (1973) hypothesized that liberal interest rate regime motivates savers to convert some of their savings from unproductive real assets to financial assets and by so doing increase the supply of credit in the economy. The contention is that this will affect financial deepening and savings, increase investment and thereby impact positively on economic growth. Ndebbio (2004) and Abiad, Oomes and Ueda (2004) in their work support this view. Also, Feyzioğlu, Porter, and Takáts(2009) confirm that interest rate liberalization raises the cost of capital, increases the return on savings, and allow smaller, more efficient banks to increase their role in intermediation. Thus, efficiency of investment is increased. Ngugi and Kabubo (1998) explore the sequencing and actions taken in the liberalization process in Kenya. They focus on interest rate levels, spreads and determining factors, as an indicator of financial sector response to the reform process and found that the financial system was characterized by repression factors including negative real interest rates, inefficiency in financial intermediation and underdeveloped financial markets. They conclude that the economy is facing secondary financial repression and therefore needs to introduce policy measures that will lead to significant positive effects of financial liberalization.

More than before, arguments against the influence of interest rate liberalization through savings and investment have increased. There is the strong

argument that it may not affect the level of savings and where it does, its effect will be negative as it may reduce the volume of savings. The reason found in the literature is primarily that the income effect of increased interest rate may well counter the positive substitution effect found between savings and consumption. If this happens, then, investment will be low and industrial output will fall and economic growth will decline. Giovannini (1983); Arrieta (1988); Cho and Khatkhate (1990); Warman and Thirwall(1994) and Bandiera et al. (1999) are among the critics of the interest rate liberalization hypothesis. They maintain that high interest rate leads to increase in opportunity cost of consumption; household will substitute part of their consumption for savings, hence savings will increase. In the same vein, increase in wealth due to increase in interest rate will increase consumption. The ambiguous situation so created by the rise in interest rate will produce counter effects and eventually lead to a negative overall effect on savings. Similarly, Omole and Falokun (1999) believe that interest rate liberalization will adversely affect industrial operations and therefore economic development, hence, they call for complementary policies that will accommodate industrial incentives such as tax reliefs, reduction in tariffs and provision of basic infrastructural facilities.

Another argument against interest rate liberalization is based on the interest rate elasticity of savings. It is expected that increase in real interest rate will reallocate only the available volume of savings to financial savings but total savings will remain unchanged. This is because high rate of interest attracts financial savings; in the sense that it becomes more rewarding to switch savings from other types to financial savings. However, it is known that investment in other assets like pension funds, mutual funds, shares and postal savings will produce same effect if they are made more attractive. But Gupta (1984) and Mahambare and Balasubramanyam (2000) have argued that such reallocation will not affect the volume of total savings.

There is yet a third point against the interest rate liberalization hypothesis stemming from the position that at low levels of income, interest rate may not induce savings. This, they argue, is because economic agents tend to consume all income and may not save. This tends to persist even at a sustained high deposit rate until income rises above consumption level. The works of Japelli and Pagano (1989, 1994) and that of Hall (1978) clearly specify that even at relatively high levels of income financial reforms aimed at easing borrowing tend to induce consumption more than savings.

Experiences from empirical results left us with conflicting results in the investigation of effect of interest rate liberalization on Economic growth. World Bank (1989) working with data from 33 developing countries for the period 1965 – 1985 and Fry (1980) in his work with 7 Asian countries concluded that there is positive effect of real interest rate on economic growth. Other works that found positive relationship between interest rate or financial liberalization with growth include Roubini and Sala-i-Martin (1992). Gibsonal Tsakalotos (1994) had argued however, that the Roubini and Sala-i-Martin work suffered from omitted variable

bias. On the contrary, Khatkhate (1988) and Gupta (1984) found that the relationship is negative.

Similar to the relationship between interest rate liberalization and growth is that of financial deepening and economic growth. The results here have also been as ambiguous. Four possible relationships stand out in the literature concerning financial depth and economic growth. One of them is as observed by Graff (1999) that the two are not causally related at all; each of them charts its course and any empirical relationship observed is purely historical. The other is that financial depth follow growth in response to the demand follow hypothesis. The converse of this has been considered a possibility (FitzGerald, 2006). That is that, growth follows financial development in response to supply follow hypothesis. The fourth obvious case is that financial development and economic growth Granger cause one another.

Nonetheless, the studies of Odhiambo (2007, 2008) show that the relationship between financial development and growth may be country specific and time bound as well as dependent on the measure of financial development used. Guryay, Safakli and Tuzel (2007) examined the relationship between financial development and economic growth in Northern Cyprus using Ordinary least Squares Estimation Method (OLS) and found that there is a negligible positive effect of financial development on economic growth. However, the Granger causality test showed that financial development does not cause economic growth, rather, the evidence supports causality from economic growth to the development of financial intermediaries.

Abdul and Ying (2008) used bound test method (ARDL) to cointegration with deposit liability ration (DLR) and credit to private sector (CPS) as proxies to financial development. They found that DLR and CPS have significant influence on economic development in Pakistan but in China DLR is positive and significant while CPS is positive but insignificant.

3 Trends in Interest rate, Financial Development and Industrial Production in Nigeria

In the last four decades, Nigeria has adopted various interest rate regimes. Figure 1 graphically highlights the trend of deposit rate in Nigeria between 1970 and 2009. Deposit rate fell very slowly between 1970 and 1977 when it began a steady upward increase until 1987 when it reached an unprecedented height of 15.6%. There was a sharp fall in 1988 to 13.7% followed by a sharp rise in 1989 to 20.3%. In 1991 it fell to 16.1% and began another upward rise to 23.3% in 1993. It again erratically fell to 13.8 in the next year and gradually sustained a decline to 10.5% in 2001. However, it rose sharply in the next year to about 17% and thereafter declined to 9.47% in 2007. The year 2008 witnessed another rise in interest rate to 12.86. These periods can be classified into pre-SAP, SAP and post-

SAP or privatization regimes that are characterized by different interest rate repression and liberalization regimes.
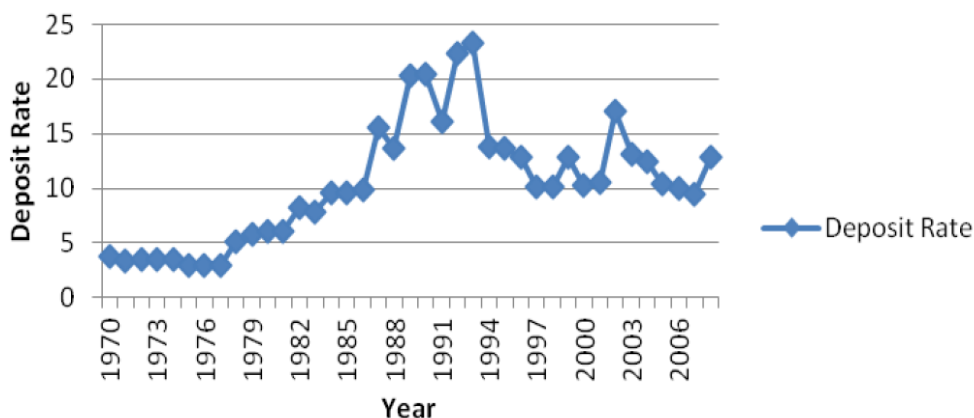

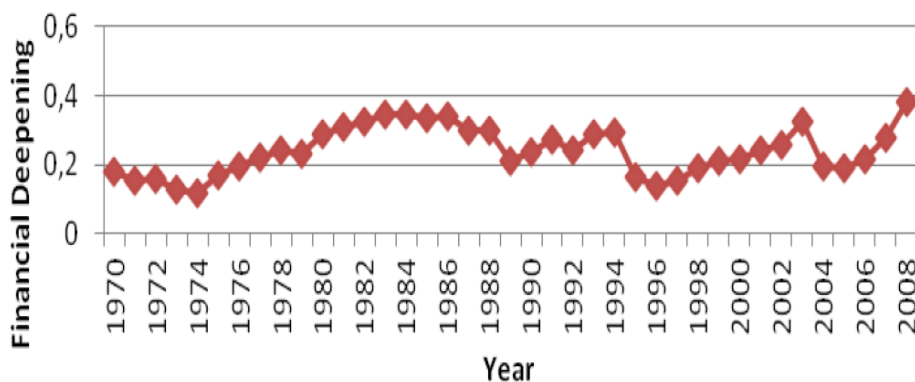Figure 1: Trends of Deposit Rate in Nigeria (1970-2008)

Figure 2: Trends of Financial Deepening in Nigeria (1970-2008)

The trend of financial deepening is depicted in Figure 2. As can be observed from the figure financial depth exhibited the same pattern as deposit rate of interest. We witness again a gradual decent in financial deepening (measured herein by M2/GDP) between 1970 and 1974 and a steady rise from 1975 to 1988. The troughs after 1974 are experienced in 1989, 1996 and 2005 while the peaks occurred in 1984, 1993, 2003 and 2008. Accordingly, these are pointers to some form of close association between interest rate and financial deepening.

Structurally, the Nigerian economy can be classified into three major sectors namely: primary/agriculture and natural resources; secondary- processing and manufacturing; and tertiary – services sectors. The economy is characterized by structural dualism. The agricultural sector is an admixture of subsistence and modern farming, while the industrial sector comprises modern business enterprises which co-exist with a large number of microenterprises employing less than 10 persons mainly located in the informal sector.

The agricultural sector has not been able to fulfil its traditional role of feeding the population, meeting the raw materials needs of industries, and providing substantial surplus for export. Indeed, the contribution of the sector to total GDP has fallen over the decades from a very dominant position of 55-8 percent of the GDP in 1960-70 to 28.4 percent in 1971-80, before rising to 32.3, 34.2 and 40.3 percent during the decades 1981-1990, 1991-2000 and 2001-2009, respectively (Table 1).the fall is not because a strong industrial sector is displacing agriculture but largely as a result of low productivity, owing to the dominance of peasant farmers and their reliance on rudimentary farm equipment and low technology. Another feature of the sector is under-capitalization which results in low yield and declining output among others.

Table 1: Sectoral Contributions to GDP

Activity by sector	1960-1970	1971-1980	1981-1990	1991-2000	2001-2009
Agriculture	55.8	28.4	32.3	34.2	40.3
Industry	11.3	29.1	41.0	38.6	28.4
Manufacturing	6.6	7.3	6.1	4.9	3.9
Building and Construction	4.8	8.3	2.3	1.8	1.8
Wholesale and Retail trade	12.8	17.6	14.5	13.8	14.0
Services	15.3	16.5	9.8	11.5	15.5
Total value-added	100.0	100.0	100.0	100.0	100.0
Diversification	0.2	0.4	0.4	0.4	0.3

Source: National Bureau of Statistics

The industrial sector comprises the manufacturing, mining (including crude petroleum and gas) and electricity generation. Prior to independence in

1960, the Nigerian economy was mainly agrarian. On attainment of independence, the government embarked on the programme of transforming the country into an industrial economy via the ISI. The Nigerian manufacturing subsector is made up of large, medium and small enterprises as well as cottage and handicrafts units. In spite of spirited efforts made to boost manufacturing output and various policy regimes, manufacturing has not made any significant contribution to the growth of the economy. Industry as a whole contributed only 11.3 percent of the GDP in 1960-70, growing significantly in the next two decades to a high rate of 41 percent in 1981-1990. This rapid growth is attributed largely to the crude petroleum and gas production during the two decades.

The contribution contracted to 38.6 percent during 2001-2009. These numbers, in fact, belie the poor contribution of the manufacturing subsector to aggregate output in Nigeria compared with its peers in Asia and Latin America. Indeed, the contribution of the manufacturing component has on average been below 5.0 percent in the last two decades. Even the relatively high contribution of the petroleum oil sector to the industrial sector is being driven largely by crude petroleum extraction and not by the associated 'core industrial' components like refining and petrochemicals. The contribution of wholesale and retail trade and services has more or less remained stable while that of building and construction rose sharply from 5.3 percent in the 1960s to 8.3 percent in the 1970s, but fell consistently, thereafter, to 1.8 percent during 2001-2009.

During and some few years after SAP, the manufacturing exports was dominated by textile, beer and stout, plastic products, cocoa butter, processed timber, tyres, bottled water, soap and detergents as well as iron rods. However, some of these products have disappeared from the export list owing to poor enabling environment. As shown in Table 2, non-oil exports as a component of total exports declined from 2.5 percent in 2004 to 1.0 percent in 2008. The rise in the share of non-oil export (4.2 percent) reported in 2009 is yet to be confirmed as a recovery bearing in mind the fact that the infrastructural decay is yet to be fixed. Primary products, mainly agricultural products, still dominate the Nigerian non-oil exports list. This is unfortunate given the thesis that 'no country develops by exporting unprocessed commodities'.

The Nigerian economy is import dependent with very little non-oil exports. It relies heavily on crude oil and gas exports with other sectors trailing far behind. For example, crude oil accounts for about 90 percent of foreign exchange earned by the country while non-oil exports account for the balance. The economy is therefore susceptible to shocks in the oil industry. In recent times, these shocks have been caused by either development in the international oil market or the restiveness in the Niger Delta region of the country. Agriculture and other mining activities have been abandoned to the rural poor. Economic and social infrastructure, especially power is grossly dilapidated. The power sector is generally recognized as a binding constraint on the Nigerian economy.

Table 2: Composition of Nigerian Exports

Components	2004	2005	2006	2007	2008	2009
Oil export	97.5	98.3	97.9	97.9	99.0	95.8
Non-oil export	2.5	1.7	2.2	2.1	1.0	4.2
Composition of Non-oil exports						
Agriculture	33.0	41.9	37.8	39.7	58.3	46.9
Minerals	2.0	4.0	8.5	6.3	7.7	6.7
Semi-manufactured	48.9	40.6	37.9	39.4	17.0	29.2
Manufactured	5.0	9.8	11.1	10.3	8.7	9.1
Other exports	11.2	3.9	4.7	4.3	8.3	8.1

Source: CBN Annual Report and Statement of Accounts, various issues

4   Methodology and Data Sources

4.1 Theoretical Models

The focus of our study is on the impact of financial sector development on the growth of the industrial sector. Our analysis utilizes the aggregate production framework proposed by Fosu and Magnus (2006) and Constant and Yaoxing (2010). The aggregate production framework is an extension of the conventional production function, which emphasizes labour and capital as the main factors of production, to examine the impacts of other variables such as public expenditure, terms of trade, exchange rate, foreign direct investment and so on. The general form of the function linking aggregate output in t period with inputs or factors of production is specified thus

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} \tag{1}$$

where Y_t denotes the aggregate production of the industrial sector at time t, and A_t, K_t, and L_t also denote the total factor productivity (TFP), the capital stock and the stock of labour at time t, respectively. Enormous scholarly works stemming out from the debate of Mckinnon (1973) and Shaw (1973) on financial intermediation and economic growth, contend that financial deepening and savings, increase investment and therefore impact positively on economic growth.

Our thesis is that this impact is through investments in industrial sector. Hence, we assume that TFP is a function of financial depth (FIN), interest rate (INT), and other exogenous factors (C). In respect of the agricultural sector productivity, we add environmental and natural factors such as weather condition. Thus, we modelled the total factor productivity as:

$$A_t = f(FIN_t, INT_t, C) \qquad (2)$$

Equation (2) can be expressed explicitly as:

$$A_t = FIN_t^{\phi} INT_t^{\lambda} C_t \qquad (3)$$

Combining equations (3) and (1), we obtain:

$$Y_t = C_t K_t^{\alpha} L_t^{\beta} FIN_t^{\phi} INT_t^{\lambda} \qquad (4)$$

Linearizing equation (4) and adding the error term, we obtain an explicit estimable econometric model as follows

$$\ln Y_t = c + \alpha \ln K_t + \beta \ln L_t + \phi \ln FIN_t + \lambda \ln INT_t + \varepsilon_t \qquad (5)$$

where all coefficients and variables are as defined earlier, c is a constant parameter and ε is the white noise error term.

4.2 Estimation Method

The study adopts the bounds testing cointegration procedure to estimate the long run and short run relationships and dynamic interaction among the variables of interest. Pesaran et al (2001) proposed an Autoregressive Distributed Lag (ARDL) bounds testing approach to investigating the existence of cointegration relationship among variables. There are three specific advantages associated with this approach:

(i) It circumvents the problem of the order of integration associated with the Johansen likelihood approach (Johansen and Juselius, 1990).

(ii) Unlike most of the conventional multivariate cointegration procedures, which are valid for large sample size, the bounds test approach is suitable for small sample size study (Pesaran et al, 2001).

(iii) It provides unbiased estimates of the long run model and valid t-statistics even when some of the regressors are endogenous (Harris and Sollis, 2003).

The following ARDL model will be estimated in order to test the cointegration relationship between the variables: Interest rate, financial depth, industrial output, labour and capital stocks.

$$\Delta \ln IND_t = c_0 + \delta_1 \ln IND_{t-1} + \delta_2 \ln INT_{t-1} + \delta_3 \ln FIN_{t-1} + \delta_4 \ln K_{t-1} + \delta_5 \ln L_{t-1}$$

$$+ \sum_{i=1}^{p} \phi_i \Delta \ln IND_{t-i} + \sum_{j=0}^{q} \varphi_j \Delta \ln INT_{t-j} + \sum_{l=0}^{q} \gamma_l \Delta \ln FIN_{t-l}$$

$$+ \sum_{m=0}^{q} \eta_m \Delta \ln K_{t-m} + \sum_{k=0}^{q} \varpi_k \Delta \ln L_{t-k} + \varepsilon_t \tag{6}$$

where δ_i are the long run multipliers, c_0 is the intercept and ε_t are white noise errors.

The first step in the ARDL bounds testing approach is to estimate equation (6) by Ordinary Least Squares (OLS) in order to test for the existence of a long run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables, that is:

H_N ; $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$ against the alternative
H_A ; $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$

We denote the test which normalize on IND by $F_{IND}(IND|INT, FIN, K, L)$]. Two asymptotic critical value bounds provide a test for cointegration when the independent variables are I(d) [where $0 \leq d \leq 1$]: a lower value assuming the regressors are I(0) and an upper value assuming purely I(1) regressors. If the F-statistic is above the upper critical value, the null hypothesis of no long run relationship can be rejected irrespective of the orders of integration for the time series. Conversely, if the test statistic falls below the lower critical value, the null hypothesis cannot be rejected. Finally, if the statistic falls between the lower and upper critical values, the result is inconclusive. The approximate critical values for the F-statistic test were obtained from Pesaran, Shin and Smith (2001).

Once cointegration is established the conditional ARDL (p, q_1, q_2, q_3, q_4,) long run model for HD_t can be estimated as:

$$\ln IND_t = c_0 + \sum_{i=1}^{p} \delta_1 \ln IND_{t-i} + \sum_{j=0}^{q1} \delta_2 \ln INT_{t-j} + \sum_{l=0}^{q2} \delta_3 \ln FIN_{t-l}$$

$$+ \sum_{m=0}^{q3} \delta_4 \Delta \ln K_{t-m} + \sum_{k=0}^{q4} \delta_5 \Delta \ln L_{t-k} + \varepsilon_t \tag{7}$$

This involves selecting the orders of the ARDL (P, q_1, q_2, q_3, q_4,) model in the five variables using Aikaike Information criteria (AIC). The next step is to obtain the short run dynamic parameters by estimating an error correction model associated with the long run estimates. This is specified as:

$$\Delta \ln IND_t = \mu + \sum_{i=1}^{p} \phi_i \Delta \ln IND_{t-i} + \sum_{j=0}^{q} \varphi_j \Delta \ln INT_{t-j} + \sum_{l=0}^{q} \gamma_l \Delta \ln FIN_{t-l}$$

$$+ \sum_{m=0}^{q} \eta_m \Delta \ln K_{t-m} + \sum_{k=0}^{q} \varpi_k \Delta \ln L_{t-k} + \vartheta \, ecm_{t-1} + \varepsilon_t \tag{8}$$

Here, $\phi, \varphi, \varpi, \eta$, and γ are the short run dynamic coefficients of the model's convergence to equilibrium and ϑ is the speed of adjustment.

4.3 Data Source and Definition of variables

4.3.1   Data Source

Annual time series data from 1970 to 2009 are used in this study. The data are obtained from different sources, including various issues of the Central Bank of Nigeria *Statistical Bulletins*, International Financial Statistics, (IFS) Yearbooks published by the International Monetary Fund and *National Bureau of Statistics Abstract of Statistics* published by the Nigerian National Bureau of Statistics.

4.3.2   Definition of variables

Financial depth variable is defined in this study as the broad money stock (M2) divided by the gross domestic product (GDP). Nominal deposit rate is taken to be interest rate on 6 months deposit in commercial banks. Labour stock is measured as the total worker employed and capital stock is measured as the gross fixed capital formation. Industrial output refers to the gross domestic product of the industrial sector.

5 Empirical Findings

A more efficient univariate DF-GLS test has been utilized to explore the order of integration of the variables. The test is a simple modification of the conventional augmented Dickey-Fuller (ADF) t-test as it applies Generalized Least Squares (GLS) detrending prior to running the ADF test regression. The DF-GLS test has the best overall performance in terms of sample size and power over the ADF tests. According to Elliot, Rothenberg and Stock (1996), it "has substantially improved power when an unknown mean or trend is present". The results are reported in Table 3.

Based on the DF-GLS test statistics, it is found that capital stock is integrated of I(0) at 10 percent significance level. Industrial output, financial depth, labour stock and interest rate have unit root problems at level while stationary at I(1). The empirical exercise provides dissimilar order of integration for variables, that is, I(0)/I(1). This dissimilarity is good rational for applying the ARDL bounds testing approach to cointegration developed by Pesaran et al. (2001).

Using Akaike Information Criterion (AIC) as a guide, a maximum lag order of 4 was chosen for the conditional ARDL VAR in (6). The F-statistic tests

for the joint null hypothesis that the coefficients of the lagged level variables are zero (that is, no long run relationship exists between them). Table 4 reports the results of the calculated F-statistics when each variable is considered as dependent variable in the ARDL OLS regressions.

Table 3: Dickey-Fuller GLS (Elliot-Rothenberg-Stock test) Unit root test

Variables	AIC lag	constant	Trend and constant
lnIND	0	-0.5747	-1.3633
ΔlnIND	0	-5.9953**	-6.7616**
lnFIN	0	0.6331	-1.4754
ΔlnFIN	0	-6.2249**	-6.8674**
lnINT	0	-0.9254	-1.6054
ΔlnINT	2	-2.3148*	-2.6625
lnK	1	-2.5348*	-3.6926*
ΔlnK	3	-5.4684**	-5.0036**
lnL	4	0.3209	-1.6396
ΔlnL	1	-5.8413**	-6.0704**
Asymptotic critical values: 1%		-2.6256	-3.7700
5%		-1.9496	-3.1900

Note: The variables are expressed in their natural logarithms.
       Δ denotes first difference.
       **(*) denotes the rejection of the null hypothesis at 1(5)% significance level.

Table 4: Results of Bounds Tests

	lag	F-statistic	Probability	Outcome
F_{IND}(IND|FIN, INT, K, L)	4	4.5812	0.0489	Cointegration
F_{FIN}(FIN|INDU, INT, K, L)	4	4.1434	0.0601	Inconclusive
F_{INT}(INT|IND, FIN, K, L)	4	2.1875	0.1871	No cointegration
F_{K}(K|FIN, INT, IND, L)	4	0.3424	0.8394	No cointegration
F_{L}(L|FIN, INT, K, IND)	4	0.6475	0.6490	No cointegration

Notes: Asymptotic critical bounds are obtained from Table C2, Case III unrestricted
       intercept and no trend for k=5 (Pesaran et al, 2001). Lower bound I(0) =2.87 and
       upper bound I(1) =4.19 at 5% significance level.

When the regression is normalized on industrial output (IND), the calculated F-statistic 4.58 is higher than the upper bound critical value 4.19 at the 5 percent level. Thus, the null hypothesis of no cointegration is rejected, implying long run cointegration relationships amongst the variables when the regressions are normalized on IND. When the regression was normalized on financial depth (FIN), the calculated F-statistic 4.14 is higher than the lower bound critical value 2.87 but less than the upper bound critical value 4.19. Hence, a conclusive decision cannot be made on long run cointegration relationship amongst the variables when the regressions are normalized on FIN. With respect to the other three variables, the results from the table clearly show that the null of no cointegration could not be rejected as the calculated F-statistics lie below the lower bound critical value 2.87 at the 5 percent level.

Once a long run cointegration relationship has been established, equation (7) was estimated. The results obtained by normalizing on industrial production (IND) in the long run are reported in Table 5.

Table 5: Estimated Long run coefficients using the ARDL approach

Dependent Variable: LNIND				
Regressor	Coefficient	Standard Error	t-Statistic	t-Probability
C	1.366980	0.536308	2.548872	0.0160
LNFIN	-0.595968	0.047743	-12.48292	0.0000
LNR(-2)	0.410125	0.089718	4.571282	0.0001
LNK	0.123006	0.060950	2.018143	0.0523
LNL(-3)	0.987922	0.277703	3.557482	0.0012
LNL	1.742506	0.316790	5.500500	0.0000
R-squared	0.977685	Akaike info criterion		-0.272602
Adjusted R-squared	0.974086	Schwarz criterion		-0.011372
Durbin-Watson stat	1.361791	F-statistic		271.6430

**(*) denotes 1%(5%) significance level.

The estimated coefficients of the long run relationship show that industrial production is substantially explained by the variables included in the analysis. The adjusted R-squared reveals that 97.40 percent of the variation in industrial production is explained by the variables. The F-statistic also indicates that model is significant as a whole. However, the Durbin Watson statistic shows evidence of

serial correlation. The two indicators of financial sector development have contrasting impacts. While financial depth has a negative sign contrary to the financial intermediation thesis, interest rate has a positive and significant effect. Both Labour and capital stock positively impact on industrial production in the long run model.

The results of the short run dynamic coefficients associated with the long run relationships obtained from the ECM equation (8) are given in Table 6. The signs of the short run dynamic impacts are maintained to the long run, except for interest rate. The coefficient of financial depth remains negative even in the short run model. Despite a large deposit base, the Nigerian financial system is generally judged to be relatively underdeveloped and inefficient. The regulatory and institutional framework for accessing credit from the formal financial system by the private sector is cumbersome. Thus very few small and medium scale industrialists are able to obtain loans.[3]

In general, private sector credit in Nigeria is very low to support industrial production. As shown in Table 7, private sector credit as percentage of GDP in Nigeria is below the low income group average. The public sector still dominates in terms of the loans and advances from the banking system. This gives credence to the current financial sector reforms directed at transforming the financial sector to enable it have the desired positive effect on the real sector of the economy (agriculture and industry).

Though not significant at 5 percent level, Interest rate has a negative impact on industrial output. This adverse effect could be as a result of the negative relationship between investment and interest rate. Higher interest rate encourages savings, but at the same time acts as a disincentive to investors and consumers, hence, depletes aggregate demand. In the short run, the negative effect on aggregate demand may overwhelm the positive effects via savings mobilisation, as is the case in our research.

The ECM_{t-1} coefficient shows how slowly or quickly variables return to the equilibrium. It is expected that the sign of ECM_{t-1} should be negative with high level of significance. The ECM_{t-1} estimates the speed of adjustment to re-establish the stable equilibrium in the dynamic short run model. The appearance of ECM_{t-1} with a negative sign and significance ensures that an established long run relationship can be attained. The coefficient of ECM_{t-1} is (-0.5655) and significant at 1 percent level of significance for the short run model. This implies that long run deviation in industrial production is corrected by 56.55 percent over each year.

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[3] In fact, commercial banks loans to small scale enterprises as percentage of total credit fell from 48.8 percent in 1992 to 0.9 percent in 2007 (CBN Statistical Bulletin, **18**, December, 2007).

Table 6: Estimated Coefficients of the Short run Dynamic Error correction Model

Dependent Variable: ΔLNIND

Regressor	Coefficient	Standard Error	t-Statistic	t-Probability
Constant	0.149097	0.038856	3.837145	0.0006
ΔLNFIN	-0.786345	0.084667	-9.287479	0.0000
ΔLNK	0.109508	0.053613	2.042551	0.0500
ΔLNL	1.208620	0.382869	3.156750	0.0036
ΔLNR(-3)	-0.239404	0.130845	-1.829669	0.0773
ECM(-1)	-0.565577	0.165323	-3.421046	0.0018

R-squared	0.871824	Akaike info criterion	-0.712201
Adjusted R-squared	0.850461	Schwarz criterion	-0.448281
Durbin-Watson stat	1.838440	F-statistic	40.81068

Normality test: Jarque Bera 1.4423 (0.4862) Serial correlation Test: Breusch Godfrey
LM 0.2062(0.8148) ARCH test 0.1587 (0.8539)
White Heteroskedasticity test 1.3762 (0.2668).

Table 7: Private sector credit in Selected Countries and Country Groups,
1993-2000 (in percent)

Country	Private sector credit to GDP
China	40.0
India	24.1
Rep of Korea	112.5
Japan	65.1
United States	76.7
Nigeria	13.1
Country Income Group:	

High Income
    Middle Income
    Low Income
	121.8
	41.1
	59.6

Source: Tseng and Rodlauer (2003)

In addition, the short run dynamic model passes all short run diagnostic tests for no serial correlation, no conditional autoregressive serial correlation, no existence of white heteroskedasticity and error term is normally distributed. The *cusum squares* test for model stability is equally satisfactory and presented in Figure 3.
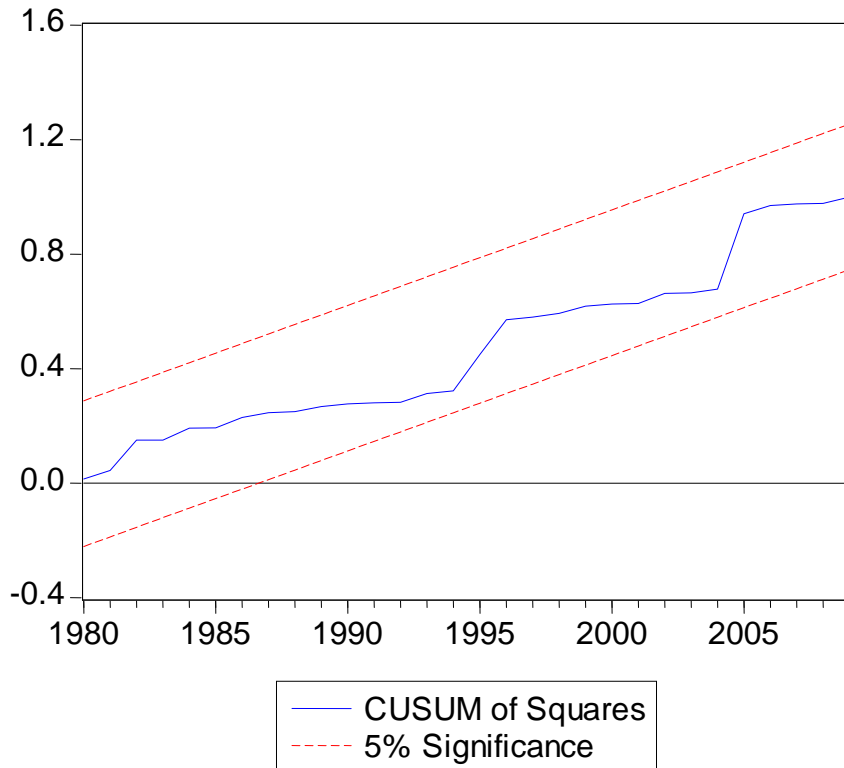

Figure 3: Plot of cumulative sum of squares of residuals

6 Conclusion and Policy Implications

This paper examined the relationship between financial sector development and growth of industrial production in Nigeria over the period 1970 to 2009 using the ARDL bounds testing cointegration approach. After many decades of repressive financial policy and inefficient financial institutions, it is not surprising that the impact of financial sector on industrialization has been nothing but adverse. Efforts to liberalise the economy as a whole during the Structural Adjustment Programme (SAP) era resulted in different types of distortions and further impoverishment of the masses. Since the sudden partial suspension of SAP in the 1990s, policymakers and experts have continued the search for appropriate

financial sector reforms to impact positively on the real sector of the economy, create jobs and alleviate poverty in the country. Though the reforms have succeeded in the stabilization of the financial sector and building strong financial institutions, the positive linkages or spillover effects on other sectors are yet to be experienced.

Based on these research outcomes the following policy implications can be drawn: the most important task for government of Nigeria is to introduce further financial sector reforms to improve the efficiency of the domestic financial sector which is a pre-requisite for the achievement of industrial development. The inefficiency of the financial sector is responsible for the adverse impact on industrial production. Efforts are already being directed at improving the provision of credit access to small and medium enterprises (SME) through the SME guarantee schemes and the micro-financial institutions. However, appropriate measures should be taken to eliminate the constraints and challenges facing this scheme. In addition, industrialization requires a lot of innovations and entrepreneurship. To achieve these, appropriate policy should be undertaken. Given the strong positive impact of labour stock on industrial production, policies should be geared towards diverting resources to develop more human capital.

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