“Financial sector and manufacturing sector performance: evidence from Nigeria”

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FINANCIAL SECTOR AND MANUFACTURING SECTOR PERFORMANCE: EVIDENCE FROM NIGERIA

Abstract

Nigerian economy depends on oil as the major source of revenue, failure to diversify the revenue base has raised questions about its sustainability and implication on the economy. This study uses market capitalization, broad money stock, credit to private sector, prime interest rate and deposit liability as proxies for the financial sector, while output in the manufacturing sector and manufacturing employment are used as proxies for manufacturing performance. The study examines the causal effects, shock effect and long-run impact using Granger Non-Causality, Vector Error Correction Model, and Dynamic Ordinary Least Square method, respectively. The results showed unidirectional causality, confirming the hypothesis of the ‘supply-leading view’ and ‘demand-following view’ except for market capitalization and output in the manufacturing sector, where independence was observed. The variance decomposition shows that the forecast error shock of credit to private sector and prime interest rate show more variations in manufacturing sector performance than other financial indicators. The long-run result using output in manufacturing sector as dependent variable shows a positive significant relationship with other financial sector indicators, except for broad money stock and deposit liability. This study recommended credit channel for transmission of monetary policy using interest rate to improve the performance of manufacturing sector, among others.

Keywords
financial, manufacturing sector, Vector Error Correction Model, Least Square

JEL Classification G20, O14, C32, C22

INTRODUCTION

Nigerian economy depends on the oil sector, and failure to diversify the revenue base and foreign exchange in the economy led the country to the recent recession in the second quarter of 2016 (The Economic Recovery and Growth Plan ERGP, 2017). The country has witnessed growth in the economy for more than a decade, but due to the reduction in crude oil prices since the year 2014, there were raised questions about its sustainability and the implication on the economy. In recent times, the Nigerian government has placed more emphasis on the development of manufacturing and agricultural sectors in order to promote sustainable growth and development. It is believed that an improved manufacturing sector is a prerequisite for economic development. Though, availability of capital has hindered the prospect of achieving this goal. The financial sector can promote growth through its efficient allocation of resources from the surplus sector to the productive sector (Ali & Hassan, 2008; Arizala, Cavallo, & Galindo, 2009; Campbell & Asaley, 2016; Eichengreen, Gullapalli, & Panizza, 2009; Hill & Perez-Reyna, 2017).
In order to maximize benefit of the financial sector on the economy, most African economies liberalized the sector in the late 1980s and 1990s, this was due to the structural adjustment programmes (SAPs) encouraged by the International Monetary Fund (IMF) and the World Bank. Studies have shown that the financial sector has promoted economic performance across African countries (Allen et al., 2016; Green, 2013; Levine, 1997; Park & Mercado, 2015; Senbet & Otchere, 2010). Despite the dynamics and improvement in financial sector due to the reforms, the manufacturing sector is considerably less developed compared to other developed countries. Critically examining the nature of Nigeria’s financial sector challenges, arguments have been raised on the contribution of the financial sector to the manufacturing sector, and its role in creating employment opportunities (Campbell & Asaleye, 2016). Scholars have stressed that Nigeria witnessed an increase in economic growth for a period of time before the recession, but all along the unemployment rate, low income, increase in poverty remained unsolved issues (Asaleye, Olurinola, Oloni, & Ogunjobi, 2017; Asaleye, Okodua, Oloni, & Ogunjobi, 2017). The manufacturing process is resource intensive by its nature with the majority of the inputs from agricultural products. Given this scenario, manufacturing sector can improve the sustainability of output sector to drive profitability and growth.

Financial sector development is central to economic growth and development (Levine, 1997; Park & Mercado, 2015). It is believed that financial development can have a positive impact on employment if there are clear channels or linkages to output sector. Okun (1969) posits that positive relationship exists between output and employment. The relationships between financial development and economic growth have been discussed extensively in the literature (Ductor & Grechyna, 2015); the need to contribute to the scanty literature on financial sector and manufacturing sector performance motivated this work. Theoretically, studies have shown that there is a positive relationship between financial sector and output (Bencivenga & Bruce, 1991; Diamond & Dybvig, 1983; Levine, 2005). In light of the importance of the financial sector to the manufacturing sector, the sensitive question that could be raised from the foregoing is what impact does the financial sector have in improving the manufacturing sector performance in Nigeria? Three channels are identified in literature, in which financial development affects the economy, through the causal effects, shock effect and long-run impact (Desbordes & Wei, 2017; Shaikh, Glavee-Geo, & Karjaluoto, 2017; Huang & Yeh, 2017; Ibrahim & Alagidele, 2017). Therefore, this study examines shock effects, causal relationship and long-run impact between financial development indicators and manufacturing performance in Nigeria using Vector Error Correction Model (VECM), Granger Non-Causality and Dynamic Ordinary least Square method (DOLS), respectively.

The study is divided into five sections. The paper begins with the introductory section. Section one is the literature review. Section two presents the methodology; section three explains the presentation of results. Finally, last section presents the conclusion.

1. LITERATURE REVIEW

From on the theoretical perspective, one of the most common models used to explain the relationship between financial development and output is the endogenous growth model (Acemoglu, Philippe, & Fabrizio, 2006; Bencivenga & Bruce, 1991; Campbell & Asaleye, 2016; Grossman & Stiglitz, 1990; Lucas, 1988; Levine, 1997, 2005). The studies by Levine (1997, 2005) used the endogenous growth model to establish the relationship between financial indicators and growth. The scholars concluded that information and transaction cost are very important factors in developing the financial market and institution. Consequently, Bencivenga and Bruce (1991) developed a model with endogenous growth specifications. The study by Bencivenga and Bruce (1991) investigated the role of savings in generating capital and its implication on financial intermediaries in order to promote growth and development. It was shown that there is a positive relationship between resource allocation and growth rate. The findings by Bencivenga and Bruce (1991) were also in line with the study of Diamond and Dybvig (1983). In a similar study by Greenwood and Jovanovic (1990),
the endogenous growth model was used as well. In the model, the scholars assumed that the capital is relatively limited compared to other factors. The research of Greenwood and Jovanovic (1990) showed that efficient allocation of capital and effective information of firms are vital to promote growth. The findings of these research were also confirmed in the study of Levine (1997). From the theoretical perspective, evidence has shown that capital through financial sector can promote growth and development.

On the other hand, some scholars have argued that financial sector can hinder growth and development by intense government intervention in the sector. More so, the study by Ghali (1999) showed that government intervention through interest rate ceilings and direct credit programs on the banking system restricts financial sector development, which, in the long run, might have an adverse effect on economic growth. Most of the models ignore the effect of inflation rate on the theoretical perspectives. This was the motivation of the study by Hung (2003). In the theoretical framework by the scholar, a negative relationship between inflation rate and growth was established. Though, less impact was noted with countries that have low inflation rate. It was concluded by Hung (2003) that an improved financial sector will automatically reduce inflation rate. Growth and development can only be attained when the inflation rate is moderately low.

Hill and Perez-Reyna (2017) developed a model to analyze how financial development affects occupational choice. The emphasis of the scholars was on how financial sector affects misallocation and occupational choice. It was concluded by the scholars that improved enforcement leads to more relaxed credit constraints. Different schools of thought have explained the impact of money on the aggregate output. The Keynesians believed that money does not matter and irrelevant to the influence on output. This view contradicts the Monetarists who believed money can be used to promote growth. Consequently, the New-Keynesians pointed out that variability in money supply in an economy affects real variables like GDP and employment level.

The study by Campbell and Asaleye (2016) examined the impact of financial reforms on manufacturing output in Nigeria. Campbell and Asaleye (2016) used market capitalization to GDP ratio, broad money stock to GDP, credit to private sector ratio, prime interest rate and deposit liability to GDP ratio as financial indicators. The scholars concluded that financial sector performed better in the post-reform era compared to the pre-reform era. Unexpectedly, the growth of manufacturing output indicator was low in the post-reform era. Campbell and Asaleye (2016) suggested a review of the financial sector reforms with more focus on the manufacturing sector. Likewise, Akinlo and Ogun (2011) proxied financial sector indicators using broad money stock to GDP, credit to private sector, prime interest rate and deposit liability ratio to GDP. Ogun and Akinlo (2011) investigated the impact of financial sector reforms on the performance of Nigerian economy.

Different channels have been identified in the literature in which the financial sector affects the economy, but most of the studies focused on the nexus among financial development, economic growth, and foreign direct investment, while studies on the financial sector and manufacturing performance are still growing. For example, Desbordes and Wei (2017) investigated the relationship between financial development and foreign direct investment (FDI) in the United State of America (USA). Their findings showed a causal relationship between country-specific financial development and sector-specific financial vulnerability. Desbordes and Wei (2017) concluded that source and destination countries’ financial development have a positive impact on greenfield, expansion, and merger and acquisition FDI. Huang and Yeh (2017) examined the nexus among level, structure and volatility of financial development and inflation targeting (IT) using data on 74 countries. It was observed by the scholars that volatility of financial development affects the economy. It was also concluded by Huang and Yeh (2017) that IT promotes efficient market-oriented financial system in both developed and developing economies, and that adopting IT through monetary framework is beneficial to the economy.

Manganelli and Popov (2015) examined the impact of financial development on the volatility of GDP growth through sectoral reallocation in OECD countries. The study by Manganelli and Popov (2015) showed that financial development substantially increases the industrial composition of output. Similarly, Shaikh, Glavee-Geo, and Karjalnuoto (2017) investigated the nexus between financial sector re-
forms and the emergence of digital banking culture in developing economies. Their research showed that there is a link between banking and financial sector reforms and the stimulation of financial innovation. Singh, Stone, and Suda (2015) analyzed the relationship between monetary policy and financial sector. Singh, Stone, and Suda (2015) concluded that the central bank should react to financial sector variable. Although, their findings showed that asset prices do not affect the determinacy condition, while responding to entrepreneurial net worth increases the likelihood of determinacy.

Ductor and Grechyna (2015) examined the nexus among financial development, real sector output and the effect on economic growth using panel data. It was shown by the scholars that growth in financial development has a long-run significant effect on net credit to private sector. Though, it was pointed out by Ductor and Grecgyna (2015) that it might result negatively in presence of no real growth. Szirmal and Verspagen (2015) re-examined the capacity of the manufacturing sector to drive economic growth for a sample of 88 developed and developing economies using panel data sourced for the period 1950–2005. The study observed that the impact of manufacturing sector on economic growth for the majority of the economics studied is moderate and that this impact is inherent in education and income gaps. The study, however, noted that the impact of manufacturing sector on aggregate growth can either increase or decrease. Some studies in literature focused on panel studies or economic growth. For example, Shahbaz et al. (2017) investigated the asymmetric relationship among energy consumption, economic growth and financial development base for the Indian economy. Ibrahim and Alagidele (2017) investigated the nexus among financial sector development, economic volatility and shocks in Sub-Saharan Africa using panel cointegration estimation. Ductor and Grechyna (2015) investigated the nexus among financial sector development, economic volatility and shocks in Sub-Saharan Africa using panel cointegration estimation. From the foregoing, three main channels have been identified in literature in which financial development affects the economy: the shock effects (Huang & Yeh, 2017; Manganelli & Popov, 2015; Ibrahim & Alagidele, 2017), long-run impact (Shaikh, Glavee-Geo, & Karjaluoto, 2017), and finally causal relationship (Desbordes & Wei, 2017; Campbell & Asaleye, 2016). Apergis, Filippidis, and Economidou (2007) and Graff (1999) identified four causal relationships between financial indicators and output sector. The first is the 'supply-leading view', which states that financial indicators cause economic growth. The second is the 'demand – following view', which states that financial indicators follow economic growth and demand of the real sector. The third view states that financial indicators and economic growth have mutual impacts. Lastly, the view that no relationship between the financial indicators and output sector. Based on the channels identified, this study examines the effect of shock, causal effect and long-run impact of the financial sector on manufacturing performance in Nigeria using Vector Error Correction Model, Granger Non-Causality and Dynamic Ordinary Least Square, respectively.

The study is organized as follows. The literature review is presented in section 1 and model specification in section 2. Presentation of results is summarized in section 3. Last section presents the conclusion of the study.

2. MODEL SPECIFICATION

2.1. Theoretical framework

The theoretical framework of this study is built on the growth model by Solow (1957). The model is given as:

\[ Y = f(K, L). \]  

In equation 1, \( Y \) is the output, where \( K \) and \( L \) are the capital and labor inputs, respectively. Equation 1 can be written explicitly as:

\[ Y_t = AK^{\alpha}L^{\beta}_t, \]
where \( A \) represents the labor augmenting factor, \( \alpha \) and \( \beta \) are capital and labor shares in aggregate output, respectively. Equation 2 is divided by labor to determine output per capita, giving as:

\[
y_t = Ak_t^\alpha.
\]

The capital can be expressed as:

\[
K_t = sY_t - \delta K_t.
\]

In equations 3 and 4, \( s \) and \( \delta \) are proportion of output that is saved and physical depreciation rate respectively. A constant return to scale is assumed in the model. Furthermore, it is assumed that equation 4 satisfies the Inada condition, given as:

\[
f(k) = \begin{cases} 0; & f'(k) > 0; \lim_{k \to \infty} f'(k) = 0; \\
0; & f''(k) < 0; \lim_{k \to \infty} f''(k) = 0. 
\end{cases}
\]

Using the transitional dynamic of Solow-Swan model, equation 3 can be re-written as:

\[
y_t = Asy_t - \delta k_t.
\]

In equation 5, there is a positive long-run relationship between technology and capital, which is related to the rate of savings. Hence, positive long-run relationship exists between output and capital. The source of capital can be attributed to part of the role played by the financial sector, while the manufacturing sector is a subset of the aggregate output (Campbell & Asaleye, 2016). Consequently, it can be concluded from the theoretical perspective that development of financial sector can promote growth in the manufacturing sector. The financial development indicators considered in this study are market capitalization, broad money stock, credit to private sector, prime interest rate and deposit liability. The manufacturing performance indicators considered are output and employment. Therefore, equation 5 can be modified as:

\[
MGDP = f(MEMP, FMI, MCP, FCP, FPI, FDL).
\]

In equation 6, \( MGDP \) and \( MEMP \) represent output and employment in manufacturing sector respectively. \( MCP \) represents the market capitalization to GDP ratio; \( FMI \) represents the broad money stock to GDP; \( FCP \) represents the credit to private sector to GDP ratio; \( FPI \) represents prime interest rate; \( FDL \) represents deposit liability to GDP ratio. Positive relationship is expected between the independent variables and dependent variable, except from the interest rate.

2.2. Impact of monetary shock on manufacturing sector performance (model 1)

In the presence of non-stationary and long-run relationship among the series, the most appropriate technique is the restricted VAR, which is also known as the Vector Error Correction Model (VECM) (Enders, 1995). Preliminary tests are done on the series for the stationary test using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), and cointegration test using Johansen’s (1998) approach. The VECM is specified as follows:

\[
\Delta Y_t = \alpha + \delta_1 \Delta Y_{t-1} + \delta_2 \Delta Y_{t-2} + \ldots + \delta_n \Delta Y_{t-n} + ECT_t + \mu_t.
\]

In equation 7, \( Y_t \) represents the non-stationary variables at level, but linear combination of the first-differenced form are stationary I(0), \( ECT_t \) is the error correction term. This study follows Mishkin (1995) for ordering of the variables with slight adjustment as follows:

\[
\Delta \begin{bmatrix} AOUT & INT & EXC & CRFIN & CPI & AEMP & CLD \end{bmatrix} = \begin{bmatrix} \beta_1 & \beta_2 & \beta_3 & \beta_4 & \beta_5 & \beta_6 & \beta_7 \end{bmatrix} + \sum_{i=1}^{k} \left[ \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} & \alpha_{15} & \alpha_{16} & \alpha_{17} \\
\alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} & \alpha_{25} & \alpha_{26} & \alpha_{27} \\
\alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} & \alpha_{35} & \alpha_{36} & \alpha_{37} \\
\alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} & \alpha_{45} & \alpha_{46} & \alpha_{47} \\
\alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} & \alpha_{56} & \alpha_{57} \\
\alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & \alpha_{66} & \alpha_{67} \\
\alpha_{71} & \alpha_{72} & \alpha_{73} & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} \end{bmatrix} \right] \begin{bmatrix} AOUT_{t-i} \\
INT_{t-i} \\
EXC_{t-i} \\
CRFIN_{t-i} \\
CPI_{t-i} \\
AEMP_{t-i} \\
CLD_{t-i} \end{bmatrix} + \begin{bmatrix} \tau_{1t} & \tau_{2t} & \tau_{3t} & \tau_{4t} & \tau_{5t} & \tau_{6t} & \tau_{7t} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} & \varepsilon_{2t} & \varepsilon_{3t} & \varepsilon_{4t} & \varepsilon_{5t} & \varepsilon_{6t} & \varepsilon_{7t} \end{bmatrix}.
\]
In equation 8, \( \Delta \) represents first difference, it is assumed that the error term is not correlated. The VECM is used due to its strength, treats all the variables as both independent and dependent variables. The study evaluates the impact of the shock using variance decomposition.

2.3. Long-run relationship between financial sector indicators and manufacturing performance (model 2)

The long-run model is given as:

\[
MGDP = f (\text{MEMP, FMI, MCP, FCP, FPI, FDL}) .
\]

Equation 9 can be re-written explicitly as:

\[
MGDP = \beta_0 + \beta_1 \text{MEMP} + \beta_2 \text{FMI} + \beta_3 \text{MCP} + \beta_4 \text{FCP} + \beta_5 \text{FPI} + \beta_6 \text{FDL} + \varepsilon ,
\]

where \( \beta_0 \) is the intercept, where \( \beta_1, \beta_2, \beta_3, \beta_4, \beta_5 \) and \( \beta_6 \) are the parameters of \( \text{MEMP, FMI, MCP, FCP, FPI and FDL} \), respectively. Engel and Granger (1987) proposed the Error Correction Model (ECM), which can be used to estimate the long-run relationship among non-stationary series. Studies have shown that using the ECM for small data might give inconsistent and unsatisfactory result. This shortcoming was overcome by three approaches. Firstly, Phillips and Hansen (1990) proposed the Fully Modified Ordinary Least Square (FMOLS). Also, Park (1992) introduced the canonical cointegrating estimation. Finally, the Dynamic Ordinary Least Square (DOLS) was introduced by Stock and Watson (1993). This approach has been independently proposed by Phillips and Loretan (1991) and Saikhonen (1991). Stock and Watson noted that DOLS is an efficient estimator for variables of differencing, higher order of integration using generalized least square or least square and Wald statistics, resulting in having an asymptotic distribution. The DOLS equation is given as:

\[
\Delta Y_t = \mu + F(L)\varepsilon_t ,
\]

where \( \Delta = 1 - L \) is first difference of the variables, \( \varepsilon_t \) is the error term and \( F(L) \) is the matrix lag polynomial. The triangular representation for an I(d) process is given by Stock and Watson (1993) as:

\[
y_t^{d+1} = \sum_{j=0}^{d} \mu_{d+1} ,
\]

\[
f_jy_t^{d-j} + \sum_{j=1}^{d} \sum_{i=j}^{d} \theta_{d+1} ,
\]

\[
f(\Delta^{d-1}y_t^{d+j}) + \mu_{d+1} ,
\]

where \( \mu_t = H(L)\varepsilon_t , \quad \mu_t = \mu_1, \mu_2, ..., \mu_{d+1} \), \( j = 1, ..., d + 1, \) \( H(L) \) can be expressed as \( \sum_{i=0}^{\infty} H_j L^j \).

The DOLS will be used to examine the long-run relationship between manufacturing sector performance and finance sector indicators. The estimation will involve two processes: using manufacturing output as dependent variable, and also using manufacturing employment as dependent variable to establish output and employment equations respectively in the manufacturing sector.

2.4. Causal relationship between financial sector indicators and manufacturing performance (model 3)

This study follows the approach by Toda and Yamamoto (1995) to investigate the causal relationship between financial sector indicators and manufacturing performance in Nigeria. Toda and Yamamoto (1995) proposed the Granger Non-Causality, which shows that in a system in the presence of integration and cointegration, the Wald test for linear restrictions on the coefficients has an asymptotic Chi-Squared distribution. In the estimation the \( \text{VAR}(k + d_{\text{max}}) \) is estimated, given that the \( d_{\text{max}} \) represented the maximum order of integration of the series. Assuming two variables, \( A \) and \( B \), the model is specified as follows:

\[
A_t = \psi_0 + \sum_{i=1}^{k} \psi_i A_{t-i} + \sum_{j=k+1}^{d_{\text{max}}} \psi_j A_{t-j} + \sum_{i=1}^{k} \lambda_i B_{t-i} + \sum_{j=k+1}^{d_{\text{max}}} \lambda_j B_{t-j} + v_t ,
\]

where \( \Delta = 1 - L \) is first difference of the variables, \( \varepsilon_t \) is the error term and \( F(L) \) is the matrix lag polynomial.
\[ B_t = \phi_0 + \sum_{i=1}^{k} \phi_i B_{t-i} + \sum_{j=k+1}^{d_{\max}} \phi_{i,j} B_{t-j} + \sum_{i=1}^{k} \sigma_i A_{t-i} + \sum_{j=k+1}^{d_{\max}} \sigma_{i,j} A_{t-j} + \nu_{2,t}, \]

where \( \psi_0 \) and \( \phi_0 \) are the constant terms for equations 7 and 8, respectively. Also, \( \psi_1, \psi_2, \lambda_1, \lambda_2, \phi_1, \phi_2, \sigma_1 \) and \( \sigma_2 \) are the parameters, \( \nu_1 \) and \( \nu_2 \) are the assumed uncorrelated error terms. The estimation of equations 13 and 14 are used to determine the direction of causality among the variables, the study carried out pairwise estimations on the variables.

2.5. Data sources and description of variables

The variables for the analysis are explained as follows: manufacturing sector contribution to GDP (MGDP), employment in manufacturing sector (MEMP), market capitalization ratio to GDP (MCP), broad money stock ratio to GDP (FMI), credit to private sector ratio to GDP (FCP), prime interest rate (FPI) and deposit liability ratio to GDP (FDL). The data for this analysis are obtained from Central Bank of Nigeria (CBN) Statistical Bulletin covering the period from 1981 to 2016, except MEMP, which is obtained from Nigerian National Bureau of Statistics (NBS).

3. PRESENTATION OF RESULT

This section presents the results of the estimations\(^1\). The long-run relationship using MGDP (output in manufacturing sector) and MEMP (employment in the manufacturing sector) as dependent variables are presented in Tables 1 and 2.

Evidence from Table 1 shows that in the long run, FDL has negative relationship with MGDP, while positive relationship was depicted between MGDP and other independent variables (FMI, FCP, FPI, MCP and MEMP). All the variables are significant at the level of 5 percent, except for the variable FMI. \( C \) is the constant term, and it is not statistically significant at the level of 5 percent.

The result of the long-run relationship using MEMP as dependent variable showed that variables FMI and FCP are not significant at the level of 5 percent, while variables MGDP, FPI, MCP and FDL are all significant at 5 percent level. Also, FPI and MCP have long-run negative relationship with MEMP, while MGDP and FDL have positive long-run relationship.

This study carried out causality test using Toda and Yamamoto’s approach. The order of the integration \( d_{\max} \) and the optimal lag \( k \) was determined using Akaike Information Criteria and Schwartz Bayesian Information Criteria (SBIC). The result of the causality is presented in Table 3.

### Table 1. Long-run relationship using MGDP as dependent variable

| Variable | Coefficient | Std. error | t-statistic | Prob. value |
|----------|-------------|------------|-------------|-------------|
| FMI      | 0.007613    | 0.014997   | 0.507658    | 0.6254      |
| FCP      | 0.027531*   | 0.012588   | 2.187084    | 0.0502      |
| FPI      | 0.021280*   | 0.004187   | 5.082103    | 0.0010      |
| MCP      | 0.016306*   | 0.002785   | 5.854339    | 0.0004      |
| MEMP     | 0.990733*   | 0.115748   | 8.559413    | 0.0000      |
| FDL      | –0.011505*  | 0.002955   | –3.893897   | 0.0046      |
| C        | –0.442234   | 0.719476   | –0.614660   | 0.5559      |

R-squared: 0.996404  Adjusted R-squared: 0.985616  S.E. of regression: 0.032961  Long-run variance: 0.000558

Note: * Shows significance at the level of 5 percent.

\(^1\) The unit root tests are presented in the Appendix. The results of the cointegration test are available with the authors and can be provided upon request.

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The significance of the Wald test probability value showed that there is unidirectional causality between FMI and MEMP, FMI and MGDP, MEMP and FCP, MGDP and FPI, MGDP and MCP, FDL and MGDP, MEMP and MGDP, while there is a bidirectional relationship between FPI and EMP. No causality is observed between MCP and MEMP.

Impacts of financial indicators shocks on manufacturing performance are presented afterwards using the variance decomposition. Evidence from the result showed that FCP and FMI cause more variation in the indicators of manufacturing sector performance more than any other variables under examination.

Table 2. Long run-relationship using MEMP as dependent variable

| Variable | Coefficient | Std. error | t-statistic | Prob. value |
|----------|-------------|------------|-------------|-------------|
| MGDP    | 0.669843*   | 0.188009   | 3.562822    | 0.0074      |
| FMI     | −0.022965   | 0.020143   | −1.140128   | 0.2872      |
| FCP     | −0.007521   | 0.014519   | −0.518040   | 0.6184      |
| FPI     | −0.018316*  | 0.006587   | −2.780606   | 0.0239      |
| MCP     | −0.011648*  | 0.005700   | −2.043582   | 0.0453      |
| FDL     | 0.012581*   | 0.004135   | 3.042236    | 0.0160      |
| C       | 2.586777**  | 1.120747   | 2.308083    | 0.0498      |

R-squared: 0.956668
Adjusted R-squared: 0.826670
S.E. of regression: 0.033485
Long-run variance: 0.001346

Note: * Shows significance at the level of 5 percent.

Table 3. Causality result

| Variables | Direction | K  | X2 value | Prob. value | Decision                        |
|-----------|-----------|----|----------|-------------|---------------------------------|
| FMI & MEMP| FMI → MEMP| 9  | 27.05922 | 0.0014*     | FMI → MEMP                      |
|           | MEMP → FMI| 9  | 10.84646 | 0.2865      |                                 |
| FMI & MGDP| FMI → MGDP| 9  | 40.56447 | 0.0000*     | FMI → MGDP                      |
|           | MGDP → FMI| 9  | 6.904603 | 0.6471      |                                 |
| FCP & MEMP| FCP → MEMP| 10 | 10.29094 | 0.4153      |                                 |
|           | MEMP → FCP| 10 | 21.14794 | 0.0201**    |                                 |
| FCP & MGDP| FCP → MGDP| 10 | 26.64215 | 0.0030*     | FCP ⇔ MGDP                      |
|           | MGDP → FCP| 10 | 50.00757 | 0.0000*     |                                 |
| FPI & MEMP| FPI → MEMP| 10 | 21.75055 | 0.0164**    | FPI ⇔ MEMP                      |
|           | MEMP → FPI| 10 | 156.2036 | 0.0000**    |                                 |
| FPI & MGDP| FPI → MGDP| 3  | 0.800834 | 0.8493      | MGDP → FPI                      |
|           | MGDP → FPI| 3  | 7.210711 | 0.0655***   |                                 |
| MCP & MEMP| MCP → MEMP| 5  | 1.896840 | 0.8632      | No causality                    |
|           | MEMP → MCP| 5  | 0.795343 | 0.9773      |                                 |
| MCP & MGDP| MCP → MGDP| 8  | 3.713089 | 0.8820      | MGDP → MCP                      |
|           | MGDP → MCP| 8  | 268.3531 | 0.0000*     |                                 |
| FDL & MEMP| FDL → MEMP| 7  | 12.16593 | 0.0152**    | FDL ⇔ MEMP                      |
|           | MEMP → FDL| 7  | 22.73040 | 0.0019*     |                                 |
| FDL & MGDP| FDL → MGDP| 8  | 14.87546 | 0.0616***   | FDL → MGDP                      |
|           | MGDP → FDL| 8  | 8.795021 | 0.3599      |                                 |
| MEMP & MGDP| MEMP → MGDP| 10 | 39.23474 | 0.0000*     | MEMP → MGDP                     |
|           | MGDP → MEMP| 10 | 6.426711 | 0.7782      |                                 |

Note: The d_{max} is the maximal order of integration, which is 1. K is the lag length shows the optimal lag used. *, ** and *** indicate significance at 1, 5 and 10 percent, respectively.

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2 The results of variance decomposition of FCP and FMI are presented in this section, while the results of other financial sector indicators are presented in the Appendix.
Table 4. Variance decomposition of $FCP$

| Period | MGDP  | FPI   | $FCP$  | $FMI$  | $FDL$  | MCP   | MEMP  |
|--------|-------|-------|--------|--------|--------|-------|-------|
| 1      | 11.38976 | 1.100606 | 87.50963 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 2      | 31.23472 | 1.230976 | 59.34083 | 3.380532 | 0.032903 | 3.866410 | 0.909544 |
| 3      | 21.55546 | 6.644206 | 44.75605 | 14.64612 | 0.928755 | 9.487633 | 1.981775 |
| 4      | 12.10554 | 7.707243 | 35.07999 | 21.38924 | 9.251750 | 7.725796 | 6.740434 |
| 5      | 7.280449 | 6.581546 | 33.73504 | 25.22834 | 11.09516 | 5.176894 | 10.90057 |
| 6      | 6.518395 | 8.477642 | 33.68347 | 26.89138 | 9.007106 | 4.602933 | 10.81907 |
| 7      | 9.699448 | 9.577919 | 31.98229 | 25.81041 | 8.284550 | 4.544574 | 10.10081 |
| 8      | 13.53710 | 9.247479 | 31.13475 | 24.35606 | 7.518626 | 4.929698 | 9.276284 |
| 9      | 14.20400 | 9.390170 | 30.76555 | 23.82908 | 7.68297 | 5.278960 | 8.846271 |
| 10     | 12.71483 | 9.037656 | 30.65457 | 23.96713 | 9.091784 | 5.379416 | 9.154620 |

Table 5. Variance decomposition of $FMI$

| Period | MGDP  | FPI   | $FCP$  | $FMI$  | $FDL$  | MCP   | MEMP  |
|--------|-------|-------|--------|--------|--------|-------|-------|
| 1      | 18.48287 | 7.755476 | 45.26970 | 28.49196 | 0.000000 | 0.000000 | 0.000000 |
| 2      | 11.43260 | 8.503755 | 37.70661 | 36.48921 | 0.047161 | 1.693521 | 4.127134 |
| 3      | 5.481778 | 4.239457 | 37.86200 | 38.98476 | 3.086259 | 4.084423 | 6.261048 |
| 4      | 3.403269 | 4.808026 | 34.50520 | 40.33118 | 5.536212 | 3.146663 | 8.269448 |
| 5      | 2.461935 | 4.326999 | 35.69710 | 39.32008 | 4.919104 | 2.538575 | 10.73620 |
| 6      | 2.956963 | 0.104049 | 37.63862 | 38.40233 | 4.396746 | 2.366868 | 10.22823 |
| 7      | 5.017608 | 4.309262 | 36.85164 | 36.67126 | 5.388687 | 2.263081 | 9.52451 |
| 8      | 7.466758 | 4.063744 | 36.77653 | 34.80346 | 5.387350 | 2.507468 | 8.994695 |
| 9      | 7.757542 | 3.901154 | 37.41213 | 34.26320 | 5.334969 | 2.679231 | 8.651782 |
| 10     | 7.218528 | 3.771756 | 37.69900 | 34.08386 | 5.756331 | 2.694118 | 8.776403 |

Table 4 presents the variance decomposition of $FCP$. In the first period, the forecast error shock of $FCP$ explained about 87.5 percent variation in itself. In period 2, about 31.2 percent variation in $MGDP$ is explained by the forecast error shock of $FCP$. In period 3, about 1.98 percent variation in $MEMP$ is due to the error shock of $FCP$. In periods 4, 5 and 6, the forecast error shock of $FCP$ explained about 7.7 percent, 33.7 percent and 26.9 percent variations in $FPI$, $FCP$ and $FMI$ respectively. In periods 7 and 8, about 8.28 and 4.92 percent variations in $FDL$ and $MCP$, respectively, are due to error shock of $FCP$. In period 9, about 14.2 percent variation in $MGDP$ is explained by the forecast error shock of $FCP$, while in period 10, the forecast error shock of $FCP$ explained about 9.2 percent variation in $MEMP$.

Table 5 presents the variance decomposition of $FMI$. In the first period, the forecast error shock of $FMI$ explained about 45.3 percent variation in $FCP$. In period 2, it explained about 36.5 percent variation in itself. In period 3, about 6.3 percent variation in $MEMP$ is due to the error shock of $FMI$. In periods 4, 5 and 6, the forecast error shock of $FMI$ explained about 35 percent, 4.9 percent and 2.4 percent variations in $FCP$, $FDL$ and $MCP$, respectively. In periods 7 and 8, about 4.3 percent and 2.5 percent variations in $FPI$ and $MCP$ respectively are due to error shock of $FMI$. In period 9, about 7.8 percent variation in $MGDP$ is explained by the forecast error shock of $FMI$, while in period 10, the forecast error shock of $FMI$ explained about 8.8 percent variation in $MEMP$. 
CONCLUSION

This study examines the relationship between financial sector and performance of manufacturing sector in Nigeria. Three sets of model were estimated, for long-run relationship, shock effects and causal relationship. Evidence from the long-run result using output in manufacturing sector (MGDP) as dependent variable shows that it has positive significant relationship with credit to private sector to GDP (FCP), prime interest rate (FPI), market capitalization to GDP ratio (MCP) and employment in manufacturing sector (MEMP), while broad money stock to GDP ratio is not significant. Also, deposit liability to GDP ratio (FDL) has a significant long-run negative relationship. Using employment in manufacturing sector as dependent variable (MEMP), it has a significant positive long-run relationship with output in manufacturing sector (MGDP) and deposit liability to GDP ratio, and negative significant long-run relationship with prime interest rate (FPI) and market capitalization to GDP ratio (MCP). Broad money stock to GDP ratio (FMI) and credit to private sector ratio to GDP (FCP) were not statistically significant at the level of 5 percent.

The implication of the result is that employment in the manufacturing sector can promote output in the sector in the long run. Likewise, output in the manufacturing sector can promote employment in the long run. Deposit liability ratio can be used to promote both employment and output in the manufacturing sector in the long run. Broad money stock to GDP ratio is not statistically significant with output in the manufacturing sector. This result is in line with the Keynesian school of thought, that believed that money does not matter and irrelevant to the influence on output, though contradicts the Monetarists and the New-Keynesians who believe money does matter. Also, there is a negative relationship between output in the manufacturing sector and deposit liability to GDP ratio. This shows that savings witnessed in the financial sector are not channelled to the development of the manufacturing sector. So there is a need to channel the inflow from the surplus side to the deficit side, promoting diversification of risks towards savings and investment in the manufacturing sector. Though, a long-run relationship is observed between employment in the manufacturing sector and deposit liability to GDP ratio. Evidence from the result also showed that prime interest rate and market capitalization to GDP ratio have a negative long run impact on employment in the manufacturing sector. The indication of the result shows that in the long run, as output increases due to investment in the stock market at low cost, more capital input will be encouraged to be substituted for employment, thereby resulting in employment reduction in the long run.

The variance decomposition shows that the forecast error shock of FCP and MCP affects employment more than error shock of other financial sector indicators. Also that the forecast error shock from FMI and MCP affects the output in manufacturing sector more than other financial sector indicators. The result of the causality showed that there is unidirectional causality between: broad money stock ratio and employment in manufacturing sector, prime interest rate and output in manufacturing sector, employment in manufacturing sector and deposit liability to GDP ratio, output in manufacturing sector and prime interest rate, output in manufacturing sector and market capitalization to GDP ratio, deposit liability ratio to GDP and output in manufacturing sector. This result is in line with both the "supply-leading view" and "demand-following view" that believed inflows of financial performance is to output, and also that financial performance follows output, respectively. There is a bi-directional relationship between prime interest rate and employment in the manufacturing sector. No causality was observed between market capitalization to GDP ratio and employment in the manufacturing sector.

The financial sector can promote output by changing the rate of savings, technological and economic efficiency. Also, a well-functioning financial sector can support the economy to maximize the benefits for growth and development. The financial sector has the ability to efficiently allocate real investment opportunities to a particular sector. Based on the findings, this study recommended: credit channel for transmission of monetary policy using interest rate and broad money stock to improve the performance of manufacturing sector. Financial deepening will help to transfer funds that are created by banks to the manufacturing sector. Also, there is a need for efficient allocation of resources through capital capitalization to promote long-run
output and employment in the manufacturing sector. Finally, the findings posit that any change in financial indicators represented by prime interest rate, market capitalization and credit to private sector will significantly increase out in the manufacturing sector, so government policies should be channel towards adopting efficient policies that enhance the performance of the financial sector in order to improve the performance in the manufacturing sector.

This study considers the relationship between the financial sector and manufacturing performance in Nigeria through the channels identified in the literature. One of the main limitations of this study is the unavailability of complete data for manufacturing sector capital utilization, which was not used. Nevertheless, it is believed that suggestions made in the study will help Nigeria and other developing countries with a similar structure to maximize benefits from the financial sector to improve the manufacturing performance. Furthermore, most developing countries over the last decades have introduced different financial and banking sector reforms. So, investigating the impact of financial and banking sector reforms on labor market performance is recommended for further research. This will help to maximize benefit from the financial sector on the labor market performance.

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## APPENDIX A

### Table A1. Summary of the ADF unit root test of the series

| Variables | With intercept | With trend and intercept | Order of integration |
|-----------|----------------|--------------------------|----------------------|
|           | Level          | First diff.              | Level               | First diff. | I (1) |
| FMI       | −0.587247      | −5.173604**              | −1.985500           | −5.155081** | I (1) |
| FCP       | −0.255886      | −4.914909**              | −1.599214           | −4.982025** | I (1) |
| FPI       | −2.368760      | −5.808650**              | −3.263292***        | −3.954557** | I (1) |
| MCP       | −1.868029      | −6.477602**              | −3.229759           | −5.178954** | I (1) |
| MEMP      | −1.386896      | −4.398841**              | −1.961650           | −4.302856** | I (1) |
| MGDP      | 1.593715       | −3.106940**              | −1.111844           | −3.432610** | I (1) |
| FDL       | −2.809625***   | −4.810390**              | −2.817502           | −5.268938** | I (1) |

Note: The model includes intercept, and intercept and trend; *** show significance at 10%, ** shows significance at 5%.

### Table A2. Summary of PP unit root test of the series

| Variables | With intercept | With trend and intercept | Order of integration |
|-----------|----------------|--------------------------|----------------------|
|           | Level          | First diff.              | Level               | First diff. | I (1) |
| FMI       | −0.681804      | −5.212322                | −2.223353           | −5.633790   | I (1) |
| FCP       | −0.064096      | −4.905282                | −1.507056           | −8.068670   | I (1) |
| FPI       | −3.382478      | −9.402272                | −3.204887           | −9.742676   | I (1) |
| MCP       | −1.836849      | −8.139988                | −3.292559           | −7.906838   | I (1) |
| MEMP      | −1.675480      | −4.401177                | −2.318553           | −4.302785   | I (1) |
| MGDP      | 1.872673       | −3.065805                | −1.037185           | −3.765162   | I (1) |
| FDL       | −2.601531      | −7.249080                | −2.734213           | −6.562110   | I (1) |

### Table A3. Variance decomposition of FDL

| Period | MGDP | FPI | FCP | FMI | FDL | MCP | MEMP |
|--------|------|-----|-----|-----|-----|-----|------|
| 1      | 3.932336 | 0.742515 | 2.037401 | 0.157545 | 93.13020 | 0.000000 | 0.000000 |
| 2      | 2.535908 | 1.207594 | 1.019610 | 0.434831 | 91.43171 | 0.802500 | 2.567842 |
| 3      | 13.03757 | 4.128162 | 2.950045 | 0.765386 | 76.20898 | 0.888045 | 2.021810 |
| 4      | 12.52553 | 4.644574 | 3.965557 | 0.719304 | 73.90412 | 2.018283 | 2.222629 |
| 5      | 12.54295 | 5.121494 | 3.694978 | 2.437475 | 71.28775 | 2.845949 | 2.069402 |
| 6      | 11.52547 | 7.090773 | 3.379186 | 6.351572 | 66.09361 | 2.967519 | 2.591871 |
| 7      | 9.984380 | 8.505421 | 3.212110 | 10.56389 | 61.58593 | 3.212037 | 2.936233 |
| 8      | 9.484371 | 9.864042 | 2.786696 | 11.91035 | 60.20605 | 3.061977 | 2.686510 |
| 9      | 10.59257 | 10.18058 | 2.496660 | 11.21455 | 60.19947 | 2.982650 | 2.333517 |
| 10     | 12.10421 | 9.755457 | 2.473153 | 10.29075 | 59.97970 | 3.125595 | 2.271136 |

### Table A4. Variance decomposition of MCP

| Period | MGDP | FPI | FCP | FMI | FDL | MCP | MEMP |
|--------|------|-----|-----|-----|-----|-----|------|
| 1      | 2.732703 | 5.844595 | 7.086568 | 4.519371 | 34.81594 | 45.00083 | 0.000000 |
| 2      | 5.479115 | 3.353878 | 11.80684 | 4.235871 | 33.06760 | 41.79430 | 0.262396 |
| 3      | 15.44838 | 4.615412 | 6.545432 | 9.501117 | 32.95421 | 21.82334 | 9.112105 |
| 4      | 20.21614 | 4.827995 | 5.846501 | 10.43603 | 28.54448 | 20.16859 | 9.960261 |
| 5      | 17.86177 | 7.879463 | 9.136711 | 10.00515 | 27.67484 | 18.56176 | 8.880306 |
| 6      | 17.03180 | 8.290189 | 14.13589 | 8.670231 | 25.98997 | 18.09243 | 7.789490 |
| 7      | 16.59627 | 7.740906 | 17.30532 | 7.904499 | 23.80307 | 19.33107 | 7.291149 |
| 8      | 16.27192 | 7.622440 | 17.66185 | 7.607273 | 25.12286 | 18.97347 | 6.739751 |
| 9      | 17.53415 | 7.111475 | 14.58149 | 10.05176 | 25.54140 | 17.31208 | 7.864945 |
| 10     | 17.92714 | 8.001821 | 12.48430 | 13.54811 | 23.34726 | 15.66159 | 9.029786 |
### Table A5. Variance decomposition of FPI

| Period | MGDP   | FPI     | FCP     | FMI     | FDL     | MCP     | MEMP     |
|--------|--------|---------|---------|---------|---------|---------|----------|
| 1      | 7.611395 | 92.38860 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 2      | 33.08622 | 52.35802 | 9.342924 | 0.174541 | 3.192926 | 1.258772 | 0.586598 |
| 3      | 28.14392 | 49.19220 | 14.69264 | 1.709441 | 3.054690 | 1.034449 | 2.172658 |
| 4      | 26.29892 | 48.06727 | 18.14814 | 2.429877 | 2.457132 | 0.710331 | 1.888325 |
| 5      | 28.38780 | 46.78053 | 17.91569 | 2.089585 | 2.298574 | 0.833943 | 1.693883 |
| 6      | 26.05154 | 50.00559 | 17.46376 | 2.082463 | 1.959912 | 0.930220 | 1.506517 |
| 7      | 23.20263 | 52.75643 | 16.07950 | 2.840726 | 2.189262 | 0.890705 | 2.040754 |
| 8      | 22.73192 | 52.38955 | 14.27976 | 4.342432 | 2.693901 | 1.065753 | 2.496688 |
| 9      | 21.73989 | 54.75350 | 13.51827 | 4.501217 | 2.319288 | 0.943146 | 2.224688 |
| 10     | 22.76521 | 54.79121 | 12.96441 | 4.246816 | 2.081998 | 0.962620 | 2.167734 |