




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

AUTHORS	Abiola John Asaleye  http://orcid.org/0000-0002-8391-3774 Joseph Ibrahim Adama  https://orcid.org/0000-0002-0328-1130 Joseph Olufemi Ogunjobi
ARTICLE INFO	Abiola John Asaleye, Joseph Ibrahim Adama and Joseph Olufemi Ogunjobi (2018). Financial sector and manufacturing sector performance: evidence from Nigeria. <i>Investment Management and Financial Innovations</i> , 15(3), 35-48. doi: 10.21511/imfi.15(3).2018.03
DOI	http://dx.doi.org/10.21511/imfi.15(3).2018.03
RELEASED ON	Friday, 06 July 2018
RECEIVED ON	Tuesday, 20 February 2018
ACCEPTED ON	Thursday, 24 May 2018
LICENSE	 This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License
JOURNAL	"Investment Management and Financial Innovations"
ISSN PRINT	1810-4967
ISSN ONLINE	1812-9358
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

51



NUMBER OF FIGURES

0



NUMBER OF TABLES

10

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BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10, Sumy,
40022, Ukraine

www.businessperspectives.org

Received on: 20th of February, 2018

Accepted on: 24th of May, 2018

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Ibrahim Adama, Joseph Olufemi
Ogunjobi, 2018

Abiola John Asaleye, M.Sc., Lecturer,
Department of Economics, Landmark
University, Omu-Aran, Kwara State,
Nigeria.

Joseph Ibrahim Adama, Ph.D., Senior
Lecturer, Department of Economics,
Landmark University, Omu-Aran,
Kwara State, Nigeria.

Joseph Olufemi Ogunjobi, M.Sc.,
Lecturer, Department of Economics,
Landmark University, Omu-Aran,
Kwara State, Nigeria.



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Abiola John Asaleye (Nigeria), Joseph Ibrahim Adama (Nigeria),
Joseph Olufemi Ogunjobi (Nigeria)

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 & Asaleye, 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 that 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, & Karjaluo, 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 transac-

tion 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 Karjaluoto (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 Grechyna (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 Alagidede (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 development, real sector output and economic growth using panel data for 101 developed and developing countries. The panel studies might be misleading due to some factor that might not have been considered, such as structural changes and grouping of the data. It has also been stressed in the literature that group countries study can help to understand the general phenomenon with less insight to the process involved (Fashina, Asaleye, Ogunjobi, & Lawal, 2018; Rodrik, 2003).

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 & Alagidede, 2017), long-run impact (Shaikh, Glavee-Geo, & Karjaluto, 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:

$$Y = f(K, L). \quad (1)$$

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:

$$Y_t = AK_t^\alpha L_t^\beta, \quad (2)$$

where A represents the labor augmenting factor, α and β are capital and labor shares in aggregate output, respectively. Equation 2 is divided by labor to determine output per capita, giving as:

$$y_t = Ak_t^\alpha \tag{3}$$

The capital can be expressed as:

$$K_t = sY_t - \delta K_t \tag{4}$$

In equations 3 and 4, s and δ 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: $f(k) = 0$; $f'(k) > 0$; $f''(k) < 0$; $\lim_{k \rightarrow 0} f'(k) = \infty$; $\lim_{k \rightarrow \infty} f'(k) = 0$.

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

$$y_t = Asy_t - \delta k_t \tag{5}$$

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 em-

ployment in the sector. Therefore, equation 5 can be modified as:

$$MGDP = f(MEMP, FMI, MCP, FCP, FPI, FDL) \tag{6}$$

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:

$$\Delta Y_t = \alpha + \delta_1 \Delta Y_{t-1} + \delta_2 \Delta Y_{t-2} + \dots \tag{7}$$

$$\dots + \delta_n \Delta Y_{t-p} + ECT_t + \mu_t$$

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 is the error correction term. This study follows Mishkin (1995) for ordering of the variables with slight adjustment as follows:

$$\Delta \begin{pmatrix} AOUT \\ INT \\ EXC \\ CRFIN \\ CPI \\ AEMP \\ CLD \end{pmatrix} = \begin{pmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \\ \beta_5 \\ \beta_6 \\ \beta_7 \end{pmatrix} + \sum_{i=1}^k \Delta \begin{pmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} & \alpha_{15} & \alpha_{16} & \alpha_{17} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} & \alpha_{25} & \alpha_{26} & \alpha_{27} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} & \alpha_{35} & \alpha_{36} & \alpha_{37} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} & \alpha_{45} & \alpha_{46} & \alpha_{47} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} & \alpha_{56} & \alpha_{57} \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & \alpha_{66} & \alpha_{67} \\ \alpha_{71} & \alpha_{72} & \alpha_{73} & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} \end{pmatrix} \begin{pmatrix} AOUT_{t-i} \\ INT_{t-i} \\ EXC_{t-i} \\ CRFIN_{t-i} \\ CPI_{t-i} \\ AEMP_{t-i} \\ CLD_{t-i} \end{pmatrix} + [ECT_{t-1}] \begin{pmatrix} \tau_{1t} \\ \tau_{2t} \\ \tau_{3t} \\ \tau_{4t} \\ \tau_{5t} \\ \tau_{6t} \\ \tau_{7t} \end{pmatrix} + \begin{pmatrix} \epsilon_{1t} \\ \epsilon_{2t} \\ \epsilon_{3t} \\ \epsilon_{4t} \\ \epsilon_{5t} \\ \epsilon_{6t} \\ \epsilon_{7t} \end{pmatrix} \tag{8}$$

In equation 8, Δ 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:

$$MGDP = f(MEMP, FMI, MCP, FCP, FPI, FDL). \quad (9)$$

Equation 9 can be re-written explicitly as:

$$MGDP = \beta_0 + \beta_1 MEMP_t + \beta_2 FMI_t + \beta_3 MCP_t + \beta_4 FCP_t + \beta_5 FPI + \beta_6 FDL + \varepsilon_t, \quad (10)$$

where β_0 is the intercept, where $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 are the parameters of $MEMP, FMI, MCP, FCP, FPI$ 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:

$$\Delta Y_t = \mu + F(L) \varepsilon_t, \quad (11)$$

where $\Delta = 1 - L$ is first difference of the variables, ε_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:

$$y_t^{d+1} = \sum_{j=0}^d \mu_{d+1}^j, \quad (12)$$

$$j^{ij} + \sum_{j=1}^d \sum_{i=j}^d \theta_{d+1}^{d-i},$$

$$j(\Delta^{d-i} y_t^i) + \mu_t^{d+1},$$

where $\mu_t = H(L) \varepsilon_t$, $\mu_t = \mu_t^1, \mu_t^2, \dots, \mu_t^{d+1}$, $j = 1, \dots, d + 1$, $H(L)$ can be expressed as $\sum_{j=0}^{\infty} H_j L^j$.

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 $VAR(k + d_{max})$ is estimated, given that the d_{max} represented the maximum order of integration of the series. Assuming two variables, A and B , the model is specified as follows:

$$A_t = \psi_0 + \sum_{i=1}^k \psi_{1i} A_{t-i} + \sum_{j=k+1}^{d_{max}} \psi_{2j} A_{t-j} + \sum_{i=1}^k \lambda_{1i} B_{t-i} + \sum_{j=k+1}^{d_{max}} \lambda_{2j} B_{t-j} + v_{1t}, \quad (13)$$

$$B_t = \phi_0 + \sum_{i=1}^k \phi_{1i} B_{t-i} + \sum_{j=k+1}^{d \max} \phi_{2j} B_{t-j} + \sum_{i=1}^k \varpi_{1i} A_{t-i} + \sum_{j=k+1}^{d \max} \varpi_{2j} A_{t-j} + v_{2t}, \quad (14)$$

where ψ_0 and ϕ_0 are the constant terms for equations 7 and 8, respectively. Also, ψ_1 , ψ_2 , λ_1 , λ_2 , ϕ_1 , ϕ_2 , ϖ_1 and ϖ_2 are the parameters, v_{1t} and v_{2t} 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 estimations¹. 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

Source: Authors' calculation from Eviews 9.5.

Dependent variable <i>MGDP</i>				
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.

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

Source: Authors' calculation from Eviews 9.5.

Dependent variable <i>MEMP</i>				
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.

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 bi-directional 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 examination².

Table 3. Causality result

Source: Authors' calculation from Eviews 9.5.

Variables	Direction	K	X2 value	Prob. value	Decision
FMI & MEMP	FMI → MEMP	9	27.05922	0.0014*	<i>FMI</i> → <i>MEMP</i>
	MEMP → FMI	9	10.84464	0.2865	
FMI & MGDP	FMI → MGDP	9	40.56447	0.0000*	<i>FMI</i> → <i>MGDP</i>
	MGDP → FMI	9	6.904603	0.6471	
FCP & MEMP	FCP → MEMP	10	10.29094	0.4153	<i>MEMP</i> → <i>FCP</i>
	MEMP → FCP	10	21.14794	0.0201**	
FCP & MGDP	FCP → MGDP	10	26.64215	0.0030*	<i>FCP</i> ⇌ <i>MGDP</i>
	MGDP → FCP	10	50.00757	0.0000*	
FPI & MEMP	FPI → MEMP	10	21.75055	0.0164**	<i>FPI</i> ⇌ <i>MEMP</i>
	MEMP → FPI	10	156.2036	0.0000*	
FPI & MGDP	FPI → MGDP	3	0.800834	0.8493	<i>MGDP</i> → <i>FPI</i>
	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	<i>MGDP</i> → <i>MCP</i>
	MGDP → MCP	8	268.3531	0.0000*	
FDL & MEMP	FDL → MEMP	7	12.16593	0.0152**	<i>FDL</i> ⇌ <i>MEMP</i>
	MEMP → FDL	7	22.73040	0.0019*	
FDL & MGDP	FDL → MGDP	8	14.87546	0.0616***	<i>FDL</i> → <i>MGDP</i>
	MGDP → FDL	8	8.795021	0.3599	
MEMP & MGDP	MEMP → MGDP	10	39.23474	0.0000*	<i>MEMP</i> → <i>MGDP</i>
	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.

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*

Source: Author's calculation from Eviews 9.5

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	1.235067	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	6.583546	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	30.76855	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*

Source: Author's calculation from Eviews 9.5.

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	3.086529	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	4.010419	37.63862	38.40233	4.396746	2.366686	10.22823
7	5.017608	4.309262	36.85164	36.61726	5.388687	2.263081	9.552451
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 credit to private sector 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 output in the manufacturing sector, so government policies should be channelled 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.

ACKNOWLEDGEMENT

The authors are thankful to Landmark University, Omu-Aran, Kwara State, Nigeria for financial support to publish this article.

REFERENCES

1. Acemoglu, D., Philippe, A., & Fabrizio, Z. (2006). Distance to Frontier, Selection, and Economic Growth. *Journal of The European Economic Association*, 4(1), 37-74.
2. Ali, M., & Hassan, A. F. M. (2008). Dynamics of Financial Development in Co-integrated Error Correction Mechanism (ECM): Evidence from Bangladesh. *Studies in Business and Economics*, 14(2), 5-24.
3. Allen, F., Carletti, E., Cull, R., Qian, Q. J., Senbet, L. W., & Valenzuela, P. (2016). Resolving the African financial development gap: Cross-country comparisons and a within-country study of Kenya. In S. Edwards, S. Johnson, D. Weil (Eds.), *African Successes: Modernization and Development*. University of Chicago Press.
4. Ang, J., & Mckibbin, W. (2007). Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia. *Journal of Development Economics*, 84(1), 215-233.
5. Apergis, N., Filippidis, I., & Economidou, C. (2007). Financial Deepening and Economic Growth Linkages: A Panel Data Analysis. *Review of World Economics*, 143(1), 179-198.
6. Arizala, F., Cavallo, E., & Galindo, A. (2009). *Financial development and TFP growth: Cross-country and industry-level evidence* (Working paper, Inter-American Development Bank, Research Department, No. 682).
7. Asaleye, A. J., Okodua, H., Oloni, E. F., & Ogunjobi, J. O. (2017). Trade Openness and Employment: Evidence from Nigeria. *Journal of Applied Economic Sciences*, XII, 4(50), 1194-1209.
8. Asaleye, A. J., Olurinola, I., Oloni, E. F., & Ogunjobi, O. (2017). Productivity growth, wages and employment nexus: Evidence from Nigeria. *Journal of Applied Economic Sciences*, XII, 5(51), 1362-1376.
9. Bencivenga, V. R., & Bruce, D. S. (1991). Financial Intermediation and Endogenous Growth. *Review of Economic Studies*, 58, 195-209.
10. Campbell, O., & Asaleye, A. J. (2016). Financial Sector Reforms and Output Growth in Manufacturing: Empirical Evidence from Nigeria. *American International Journal of Contemporary Research*, 6(3), 112-125. Retrieved from http://www.ajcnet.com/journals/Vol_6_No_3_June_2016/12.pdf
11. CBN (2017). Central Bank of Nigeria Statistical Bulletin, 2016.
12. Desbordes, R., & Wei, S. (2017). The Effect of Financial Development on Foreign Direct Investment. *Journal of Development Economics*, 127, 153-168.
13. Diamond, D. W., & Dybvig, H. P. (1983). Banking Runs, Deposit Insurance, and Liquidity. *The Journal of Political Economy*, 91, 401-419. Retrieved from https://www.macro-economics.tu-berlin.de/fileadmin/fg124/financial_crises/literature/Diamond_Dybvig_Bank_Runs_Deposit_Insurance_and_Liquidity.pdf
14. Ductor, L., & Grechvna, D. (2015). Financial development, real sector and economic growth. *International Review of Economics and Finance*, 37, 393-405.
15. Economic Recovery and Growth Plan EGRP (2017). *Economic Recovery and Growth Plan 2017-2020, Federal Republic and Growth Plan 2017-2020*. Federal Republic of Nigeria, Ministry of Budget and National Planning. Retrieved from <https://estateintel.com/wp-content/uploads/2017/03/Nigeria-Economic-Reform-Plan-2.pdf>

16. Eichengreen, B., Gullapalli, R., & Panizza, U. (2009). *Capital Account Liberalization, Financial Development and Industry Growth: A Synthetic View* (Mimeo, University of California At Berkeley, Working Paper (No. 144)).
17. Engle, R. F., & Granger, C. W. J. (1987). Cointegration and Error Correction: Representation, Estimation and Testing. *Econometric*, 55, 251-276.
18. Fashina, O. A., Asaley, A. J., Ogunjobi, J. O., & Adedoyin, L. I. (2018). Foreign Aid, Human Capital and Economic Growth Nexus: Evidence from Nigeria. *Journal of International Studies*, 11(2), 104-117. <http://dx.doi.org/10.14254/2071-8330.2018/11-2/8>
19. Ghali, K. H. (1999). Government Size and Economic Growth: Evidence from a Multivariate Cointegration Analysis. *Applied Economics*, 31(1), 975-987.
20. Graff, M. (1999). *Financial Development and Economic Growth – A new empirical analysis* (Dresden Discussion Papers in Economics (No. 5/99)).
21. Green, C. J. (2013). *Financial Reform and Financial Development in Africa* (Commissioned Proposal prepared for AERC).
22. Greenwood, J., & Jovanovic, B. (1990). Financial Development Growth and the Distribution of Income. *Journal of Political Economy*, 98(5), 1076-1107.
23. Grossman, S. J., & Stiglitz, J. (1980). On the Impossibility of Informationally E-Client Markets. *American Economic Review*, 70, 393-408.
24. Hill, E., & Perez-Reyna, D. (2017). Financial Development and Occupational Choice. *Journal of Macroeconomics*, 54(PB), 393-409. <https://doi.org/10.1016/j.jmacro.2017.05.009>
25. Huang, H., & Yeh, C. (2017). Level, Structure and Volatility of Financial Development and Inflation Targeting. *Journal of Empirical Finance*, 44, 108-124.
26. Hung, F. (2003). Financial Development and Economic Growth. *International Review of Economics and Finance*, 12, 45-67.
27. Ibrahim, M., & Alagidede, P. (2017). Financial Sector Development, Economic Volatility and Shocks in sub-Saharan Africa. *Physica A*, 484, 66-81.
28. Johansen, S. (1988). Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, 12(2-3), 231-254.
29. Levine, R. (1997). Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature*, 35(2), 688-726.
30. Levine, R. (2005). Finance and Growth: Theory and Evidence. In P. Aghion & S. Durlauf (Eds.), *Handbook of Economic Growth Part 1* (pp. 865-934). Amsterdam: North-Holland Elsevier Publishers 1.
31. Lucas, R. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22, 3-42.
32. Lutkepohl, H., & Saikkonen, P. (2000). *Maximum Eigenvalue versus Trace Tests for Cointegrating Rank of a VAR Process*. University of Helsinki and Humboldt.
33. Manganelli, S., & Popov, A. (2015). Financial Development Sectoral Reallocation and Volatility: International Evidence. *Journal of International Economics*, 95, 323-337.
34. Mishkin, F. S. (1995). Symposium of the Monetary Transmission Mechanism. *The Journal of Economic Perspectives*, 9(4), 3-10.
35. National Bureau of Statistics, NBS (2017). Unemployment/Under-employment report 2016.
36. Ogun, T. P., & Akinlo, A. E. (2011). Financial Sector Reforms and the Performance of the Nigerian Economy. *The Review of Finance and Banking*, 3(1), 47-60.
37. Okun, A. M. (1962). Potential GNP: Its Measurement and Significance. In *Proceedings of the Business and Economics Statistics Section, American Statistical Association* (pp. 98-103). Washington D.C.: American Statistical Association.
38. Park, C., & Mercado, Jr., R. V. (2015). *Financial Inclusion, Poverty, and Income Inequality in Developing Asia* (ADB Economics Working Paper Series (No. 426)).
39. Park, J. Y. (1992). Canonical Cointegrating Regressions. *Econometrica*, 60, 119-144.
40. Phillips, P. C. B., & Hansen, B. E. (1990). Statistical Inference in Instrumental Variables Regression with I(1) Processes. *Review of Economic Studies*, 57, 99-125.
41. Phillips, P. C. B., & Loretan, M. (1991). Estimating Long-Run Economic Equilibria. *The Review of Economic Studies*, 58, 407-436.
42. Rodrik, D. (2003). *Growth Strategies* (NBER Working paper series (No. wp10050)).
43. Saikkonen, P. (1991). Asymptotically Efficient Estimation of Cointegrating Regressions. *Econometric Theory*, 7, 1-21.
44. Senbet, L. W., Otchere, I., Quintyn, M., & Verdier, G. (Eds.) (2010). *African Stock Markets in African Finance in the 21st Century*, IMF volume. Palgrav.
45. Shahbaz, M., Hoang, T. H. V, Mahahk, M. K., & Rouband, D. (2017). Energy consumption, financial development and economic growth in India: New evidence from the nonlinear and asymmetric analysis. *Energy Economics*, 63, 1999-2012.
46. Shaikh, A. A., Glavee-Geo, R., & Karjaluoto (2017). Exploring the Nexus between financial sector reforms and the Emergence of Digital Banking Culture: Evidence from a Developing Country. *Research in International Business and Finance*, 42, 1030-1039.
47. Singh, A., Stone S., & Suda, J. (2015). Monetary Policy and Financial Sector. *Economic Letters*, 132, 82-86.
48. Solow, R. M. (1957). Technical Change and the Aggregate Production Function. *The Review of Economics and Statistics*, 39(3), 312-321. Retrieved from <http://www.jstor.org/stable/1926047?origin=JSTOR-pdf>
49. Stock, J., & Watson, M. W. (1993). A Simple Estimator of Cointegrating Vectors in Higher Order Integrated System. *Econometrica*, 61(4), 783-820.
50. Szirmal, A. (2015). *Socio-Economic Development* (2nd ed.). Cambridge University Press.
51. Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector Autoregression with possibly integrated process. *Journal of Econometrics*, 66, 225-250.

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.	
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**	-3.263329***	-9.354557**	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 is with 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.	
FMI	-0.681804	-5.212322	-2.223353	-5.633790	I (1)
FCP	-0.064096	-4.905282	-1.507056	-8.068870	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	-2.318555	-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	23.83079	19.33107	7.291149
8	16.27192	7.622440	17.66185	7.607723	25.12286	18.97347	6.739751
9	17.53415	7.111475	14.58149	10.05176	25.54410	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	2.187734