



Financial Innovation and Output Growth of Small and Medium Scale Industries in Nigeria

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Abstract

The study assesses the role of financial innovation in output growth of small and medium scale industries (SMEs) in Nigeria using quarterly data from 2009 to 2016 as the sample period. It employs autoregressive distributed bounds testing approach (ARDL) and Granger causality test to ascertain the long run impact and the causal relationship between financial innovation variables and SMEs output growth. Evidence from the analyses reveal confirm the theoretical proposition that financial innovation contributes positively to the output growth of SMEs in Nigeria as the financial innovation variables of POS, MBK, ATM and INTB have positive and statistically significant impact on output growth of SMEs. The Granger causality test indicates that a unidirectional causal relationship runs from financial innovation variables to SMEs output in Nigeria. Based on this empirical evidence, the paper recommends that the positive impact of financial innovation variables (such as POS, MBK, INTB and ATM) on SMEs output demands that deposit money banks should not only improve but also expand the current level of financial service delivery channels in Nigeria by establishing more financial channels in both rural and urban areas.

Keywords: *Financial Innovation, Output, Small and Medium Enterprises, Relationship, Long Run, Growth and Nigeria.*

Introduction

Rapid growth and development cannot be possible for any country that gives no serious attention to the growth of small and medium scale industries (SMEs). An attempt by a country to reform its SMEs can be construed as another attempt by that country to industrialize its economy. Also, it can be said that such attempt is tantamount to supporting a simultaneous development effort in which industrial enterprises are expected to grow out of small and medium scale enterprise undertakings. A historical assessment of the economic history of the industrialized nations of the world such as England, China, Taiwan, South Korea (to mention but a few) revealed that they all kick-started with Small Medium Scale industries. For instance, the industrial revolution in Great Britain did not start with large scale industries; it started with inventions in the small and medium industries. Also, China is seen as the workshop of the world just on the basis of low-tech manufacturing activities (Agu, Ojimadu and Ogu, 2012)

The goal of industrializing through the growth of small and medium scale industries is feasible through government conscious policy to remedy one of the fundamental problems of SMEs which includes limited financial service delivery channels as well as limited access to financial resources. Industrial growth vis-à-vis economic

development cannot be fully achieved without policies that seek to enhance access to financial resources. Having access to financial services delivery channels has the implication of drastically cutting down on the cost associated with financial transactions by SMEs. Regrettably, SMEs in Nigeria have underperformed regardless of the fact SMEs constitute more than 90 per cent of the manufacturing sub-sector in Nigeria. Their contribution to the nation's gross domestic Product (GDP) is less than 10 per cent (NPC, 2009). The low contribution of the SMEs to Nigeria's GDP is not completely unconnected with pitiable funding options.

It is widely accepted in the received literature that the cost of accessing financial resources in the formal financial system is towering in Nigeria and is responsible for providing financial services to only 35 per cent of the economically active population while the remaining 65 per cent are excluded from access to financial services and are only barely served by the informal financial sector (NPC, 2009). Broadly speaking, financing has remained the teething problems confronting the SMEs in Nigeria. For the SMEs, the accessibility to funds and the cost of raising them have hindered their growth and development over time. A survey in Nigeria by

international finance corporation in 2010 suggests that 80 per cent of SMEs are excluded from the official or formal financial markets.

Financial sector reorganization and development is one of the means to solving the problems of finance facing SMEs in Nigeria. This is because financial sector development brings with it changes in the form of financial innovations and e-banking. With financial innovations, new financial instruments, products and services and new form of organizational structure in a more sophisticated and complete monetary markets would emerge. Financial innovations have been well thought out to be a powerful force in driving financial deepening in the growth of modern economies. This more so given the fact that financial innovation is capable of increasing the efficiency of financial intermediation by increasing the array of financial products and services by way of emergence of sophisticated payments and receipt outlets (Chou and Yuan, 2007). This would in turn promote the productivity of finance, reduce operation cost and ultimately, encourage industrial and economic activities.

In Nigeria, the financial system has undergone series of reforms intended at repositioning the system for optimal performance. The reforms in the Nigeria financial system have resulted in the evolution of new financial sector products and services. This is actually made possible by the advancements in information and communication technology (ICT) in the country. With the emergence of mobile telecommunication and internet services in the country within the millennium era, the financial system has lots of financial innovations especially in 2009 which include array of products and services ranging from debit/credit/prepaid cards for electronic payments and receipts through Point of Sale (POS) and Automatic Teller Machines (ATMs), internet banking, mobile payment, personal computer banking, Real-Time Gross Settlement System (RTGS) etc. Interestingly, statistics have shown that Nigeria has a low formal payment penetration rate of 21.6 percent as against 46 per cent observed in both South Africa and Kenya. Also, it is evidenced that the number of ATMs in Nigeria as at 2011 stood at 9,640, indicating an average of 11 ATMs per 100,000 adults. This is a clear contrast when compared with South Africa, Brazil and Indonesia who had an average of 59 ATMs per 100,000 adults, 120 ATMs per 100,000 adults and 13 ATMs per 100,000 adults respectively (Mbutor and Uba, 2013). Given this scenario, the study seeks to provide answers to the question: Does the availability of financial service delivery channels (which is the results of financial innovations) impact on output growth of small and medium scale industries? If it does, to what extent does it impact? This has become necessary due to the fact that the growth of SMEs through effective financial

service options from the financial institutions has been a subject of debate among policy makers and scholars due to the important role of the SMEs in fast tracking industrialization. Despite the inherent capacity for financial innovations to facilitate access to finances for SMEs, the extent to which this has impacted on output growth of SMEs in Nigeria is yet to be documented conclusively.

Conceptual Issues:

Financial Innovation

Tufano (2003) explained financial innovation to mean the act of producing and then utilizing new financial instruments as well as new financial technologies, institutions and markets with an intention of overcoming market rigidities or imperfections. Broadly speaking, Nyamongo and Ndirangu (2013), viewed financial innovation as encompassing changes in the structure and depth of financial markets, in the role of financial institutions, the methods by which financial services are provided and the introduction of products and procedures in the wake of deregulation. These products and procedures include but not limited to automatic teller machine (ATM), Point of Sales terminal (POS), internet banking (Net Banking), mobile banking (M-Banking), branchless banking, etc. Suitably implemented financial innovation can lead to perfection in resource allocation, reduction in growth instability and the enhancement of credit developments by making it easier for banks to hedge credit risk and manage maturity and credit mismatches (Noyer, 2007). Jacque (2007) and Solans (2003) defined financial innovation as the evolution of new financial instruments and services as well as the emergence of new techniques of financial management and new form of financial organizational structure. The evolution of these new financial instruments and services is aimed at reducing transaction costs, which in turn may lead to improvement in resource allocation and reduction of volatility of economic growth. Financial innovation has not only opened up new opportunities for the sector participants but it has also increased new markets players arising from new products in the financial markets. These developments have increased the range of financing and investment opportunities available to both small and large scale industries.

Adoption of ICT has proved to be of countless advantages to the banking sector in Nigeria. It offers numerous advantages, for example, it enables customers to distantly withdraw and deposit money in financial institutions at any time, transfer money as well as correct data management and documentation. However, banks face many challenges among them are difficult to convince computer illiterate

customers to adopt ICT in banking services and also hard for banks to get well trained ICT professionals. There are also other challenges involving the weakening effect of financial innovation on monetary policy and hence the entire economy through the credit channel.

Small and Medium Scale Industries

Enquobahrie (1997) and Harabi, (2005) asserted that a passing look at the literature on Small and Medium Enterprises (SMEs) show that the meaning of SMEs extensively varies from nation to nation depending on some factors such as the nation's number of employees, level of technology used, the value of fixed assets, capital employed, production capacity, management characteristics and economic development. Mukole, (2010) opined also that there is no universally accepted definition of a SMEs because the classification of enterprises into large-scale or small-scale is a biased and qualitative judgment. On the basis of this, it is relatively difficult to compare SMEs among different countries when a common index is not used. Therefore, lots of bench marks have been used by Scholars to operationalize SMEs. In Nigeria, Central Bank of Nigeria (CBN) defines SMEs according to asset base, turnover and number of staff employed (Ekpenyong and Nyong, 1992).

The definition of SMEs is dynamic due to changes in price level, advances in technology and other peculiar considerations. In Britain, for example, SMEs are seen as that organization with annual turnover of 2 million pound or less with fewer than 200 paid employees. In the United States of America, manufacturing SMEs with fewer than 500 regular employees or wholesaling and retailing sectors with less than 100 regular employees and an average yearly operating income of less than US\$6 million are classified as SMEs. For the services and construction sector, they may have a mean annual income of less than US\$6 million and less than US\$28.5 million respectively to be grouped as SMEs (UNCTAD, 2001). In Japan, SMEs are defined based on the type of industry, paid-up capital and number of paid employees. This is as summarized in table 1. Thus, SMEs in manufacturing are viewed as those with one hundred million yen paid-up capital and three hundred employees, those in wholesale trade with thirty million yen paid-up capital and one hundred employees, and those in the retail and service trades with ten million yen paid-up capital and fifty employees (Ozigbo and Ezeaku, 2009).

Table 1: Definition and Classification of SMEs.

Country	Turnover	Total Investment	No. of Employees
UK	200Million Pounds		200
Japan	30Million Yen		100
Japan	100Million Yen		300

Nigeria(1990	0.5Million Naira	0.5 Million Naira	200
Nigeria (2001)	1.5Million Naira	5.0 Million Naira	300

Source: Adapted from Gbandi and Amissah, 2014

In Nigeria, SMEs have been defined and classified in different ways. For instance, in 1990, CBN defined SMEs for purposes of bank credits as those with a yearly turnover not exceeding 500,000 naira. The National Economic Reconstruction Fund (NERFUND) put the ceiling for small-scale industries at 10 million naira. In 2001, the National Council of Industries categorized small scale businesses as one with total Capital employed of over N1.5 million but not more than N50 million, including working capital but excluding cost of land, and or labour size of 11 to 100 workers, while Medium – Scale industries are those with a total capital of over N50 million but not more than N200 million, including working capital but excluding cost of land and a labour size of 101 to 300 workers (Mordi, Englama and Adebusuyi, 2010).

Empirical and Theoretical Issues:

Alvarez, (2009) clearly stated that a financial system whose performance is poor (owing to the absence of or undeveloped financial innovations) can adequately weaken the microeconomic foundations of a country. This may result in lower growth in income/output and employment. But well developed and specifically tailored products that ensure a win-win situation for both financial institutions and SMEs are therefore important in achieving profitability and attainment of organizational goals for both financial enterprises and SMEs. Financial innovations are important instruments through which banking institutions can turn around performance in SMEs and lead to an incredible positive change in SMEs performance.

It is projected that SMEs contribute over 60 per cent in employments, 40-60 per cent to Gross Domestic Product (GDP) and 30-60 per cent to exports in the USA and EU countries. The Asian Tigers, (Malaysia, India, Indonesia, South Korea, China and Japan) also have flourishing SMEs sectors contributing between 70-90 per cent in employment and a projected 40 per cent contribution to their respective GDPs. Africa’s economic power-house (South Africa, Egypt, Nigeria and Kenya), the SME sector is estimated to contribute over 70 percent in employment and 30-40 percent contribution to GDP but contribute less than four percent to export earnings (United Nations, 2005). Financial innovation has made possible the payment of bills and purchase of goods and services, thus, transforming the

operations of SMEs from traditional ways to modern ways hence diversifying their access to essential utilities required by such SMEs (United Nations, 2005)

A good number of studies have shown that financing and financial services are bigger impediments to SMEs than it is for large firms, particularly in less developed countries. Emphatically, access to finance adversely affects the growth of the SMEs more than that of large companies (Nyangosi, 2008). A study by Silber (2003) in Spain using simple non parametric statistic found out that online banking (which is a form of financial innovation) was associated with lower costs and higher profitability for a sample of Spanish banks. This has enabled bank customers including the SMEs to access the fundamental banking services. For example, cash deposit, cash withdrawal and bank balance inquiry can be conveniently accessed. The convenience of access to banking services and the extended hours has been the most striking features of these innovations. The rural population (including SMEs in the rural areas) has welcomed this idea since they have had to sometimes go through inconvenient experiences to access banking services due to the poor road infrastructure and high costs (Giorgio, 2009).

According to Tufano, (2003), mobile banking has the potential to reduce operating costs up to 12% and can help shift some financial flows from informal to formal channels and most in correspondent with other banking channels. Such innovations have facilitated swift exchange of money and access to cash for quick decision making which has also necessitated access to banking services in rural areas leading to start and stabilization of SMEs.

In a related study by Nzove, (2013) on the impact of e-banking on SMEs in Kenya, it was discovered that banks had financial innovations such as small-scale business loans, small-scale business accounts, mobile banking, e- banking and direct marketing. Business loans, business account and mobile banking were specific innovation tailored towards SMEs. A sample size of 478 SMEs from 98608 SMEs was selected. Most SMEs indicated financial innovations such as SMEs business accounts, SMEs credit facilities and direct marketing strategies improved their customer relations and efficiency in their banking operations. A regression analysis revealed that service innovations by financial institutions had the highest influence on growth of SMEs. The study recommended among others, intervention on the side of the government in educating and training SMEs on managerial skills and enhancing accessibility to credit facilities.

In recent times, the adoption of internet financial services (e-finance) have been seen as an area of growing importance for small and medium sized enterprises (SMEs). This is due to the importance of the SME sector and the suitability of e-

finance for solving problems of SMEs. A study by Riyadh, Bunker, Rabhi (2010) using descriptive method that discusses barriers to e-finance adoption by SMEs in Bangladesh showed that most SMEs have structural issues and limited opportunities to participate in traditional markets by adopting internet driven financial services. This is because of the fact that very few SMEs make use of ICT based services. A study in Ghana by Attom, (2013) on the impact of ICT on business growth strategies and profitability of SMEs using a survey method indicated that 73.29 per cent of SMEs studied do not make use of ICT and this to a greater extent has had a negative effect on their growth potential and success as these SMEs cannot take advantage of financial service delivery options that are available. A shocking proportion of about 27% of SMEs used ICT in their businesses but further maintained it is too expensive to operate. The study recommended capacity building for SMEs on ICT use.

In a related study, Igbara, Emerenini and Daasi, (2015) analyzed the effect of cashless policy on the operations and growth of small scale businesses in Ogoni land, Nigeria. The results indicated that SMEs in Ogoni land are predominately sole proprietorship with meager income and a significant number having very poor banking habit. Also, bank transactions/services, such as ATMs usage and online banking (financial innovation instruments) are of less or no significance since SMEs transactions in this study area are grossly hinged on “cash and carry basis”. The study discovered that operators of SMEs have zero tolerance to ICT usage in both operations and financial transactions of their businesses and this constitutes a major challenge to the adoption of cashless policy in the study area.

A paper that examined the implications of electronic banking (a form of financial innovation) on selected businesses in Nasarawa state, Nigeria used chi-square statistical technique in its analysis. The results indicate that there was a significant relationship between electronic banking platform and the performance of businesses in the state. It was discovered that most of the respondents agreed that e-banking adopted by the banking institutions in Nigeria have improved tremendously the performance of SMEs in terms of efficiency in conducting business activities. It was therefore recommended that deposit money banks should expand on the points of Automated Teller Machine (ATM) to improve the quality of services rendered to allow the SMEs customers offset their bills and enhance business transactions (Oluma, Abdullahi, and Madu, 2016).

Aigboduwa and Oisaimoje (2013) examined the historical trend in the development of SMEs in Nigeria oil industry using descriptive survey technique. The study identified access to financial services for development of the capital base of SMEs

as one of the major constraints. The study suggested that the Nigerian content development act of 2010 should be implemented as it would serve as a turning point in the realization of all the policy trusts formulated for growing SMEs in Nigeria. In the same vein, Berg and Fuchs (2013) investigated access to financial services by SMEs in five sub-Saharan African countries using trend and descriptive methods to explain the drivers behind banks involvement with SMEs. Nigeria, Kenya, Rwanda, South Africa and Tanzania were covered in the study from 2010 to 2012. The study discovered varying degrees of access to financial services in the different countries. The authors suggested that the reason for these varying results is not absolutely unconnected with the structure and size of the economy, the degree of financial innovation mainly as introduced by foreign entrants to financial sectors and the state of the financial infrastructure and enabling environment.

A study in Nairobi, Kenya by Mwaura (2009) on the effect of mobile banking (M-banking, which is a form of financial innovation) on enterprises using descriptive method revealed among other findings that only 18 per cent of small businesses in Nairobi have access to formal financial services through banks while 8% are served through micro finance institutions. Thirty five per cent are served through informal institutions. Sadly 38 per cent of small businesses in Nairobi have no access to any type of financial services and rely on personal savings. In summary, only 55 per cent of small businesses in Nairobi can access financial services through m-banking while 45 per cent of SMEs in Kenya currently cannot access m-banking services. Mwaura (2009) concluded that the high penetration of the mobile communication devices in Nairobi can serve to help the high percentage of unbanked small business access financial services through m-banking.

Interestingly, the developments in technology have played an important role in improving financial service delivery channels in the Banking industry. In its simplest form, Automated Teller Machines (ATMs), Point of Sale Terminals (POS), internet banking, mobile banking and deposit machine to mention but a few now allow bank customers (including SMEs) to carry out financial transactions beyond banking hours and these have enhanced customers' satisfaction in Nigeria and globally. It is agreed by scholars, (Polatoglu and Ekin, 2001, Adeyemi, Ola and Oyewole, 2014) that financial innovations are developed to help banks deliver services and products better, faster and cheaper to their customers. Though Emeni and Okafor (2008) had used statistical techniques to show in Nigeria that change in banking focus (cutting down of bank branches in rural areas) otherwise referred to as restructuring, tend to result into poor financial services to SMEs even with

mergers and acquisition. This may be due to poor financial innovative products in the rural areas where SMEs abound.

Theoretically, the Schumpeter's growth model, the Financial Innovation Hypotheses and Diffusion of Innovation theory seem to be relevant to this study. Schumpeter's growth model was developed in 1934 and is regarded as an alternate of endogenous growth theory. This theory is based on three major pillars, namely, a) that growth is generated by innovations, b) that innovations result from entrepreneurial investments that are themselves motivated by the prospects of monopoly rents and c) that new innovations replace old technologies. Implicitly, this theory is of the view that each innovation is aimed at creating some new process that gives its creator a competitive advantage over its business rivals. This is done by rendering obsolete some previous innovations and it is in turned destined to be rendered obsolete by future innovations. The role of financial innovation is captured by means of financial intermediation within the Schumpeter growth theory. This is because the theoretical connection between financial development and output growth is that the services provided by financial institutions are seen as drivers of innovation and output growth (Ukeje and Akpan, 2007). Specifically, Schumpeter (1912) considered the relationship between financial developments (financial innovation) and output growth from the supply leading perspective. By supply leading, it is the process by which the financial sector leads output growth by identifying and funding high yielding projects. This is based on the assumption that a well functioning financial system would promote innovation by selecting and funding enterprises that are considered to be successful (Ukeje and Akpan, 2007). Financial innovation hypotheses was developed as a result of various studies by various authors such as Merton (1992), Allen and Gale (1994) and Grinblatt and Longstaff (2000). The major propositions in financial hypotheses were derived from different theoretical postulations and empirical studies undertaken to assess the impact of financial innovation on output growth. There are two schools of thought in this hypothesis, namely, financial innovation growth view and financial innovation fragility view. The financial innovation growth view asserts that there is a positive relationship between financial innovation and output growth. According to this view, a financial innovation facilitates the reduction of firm's operation costs, facilitates risk sharing in the financial system and above all improves the quality and variety of financial services. All these in the long run, improve allocative efficiency and increase in economic output. In line with this reasoning, it is believed that financial innovations have the inherent capacity to improve the efficiency of financial intermediation by virtue of its available variety

of products and financial services. Also, with the emergence of innovations in the wake of financial innovations in the financial system, productivity of capital is promoted, thus stimulating higher levels of output growth in the economy.

On the other hand, the financial innovation fragility view tends to be skeptical on the issues of finance innovation. This view attributed the recent global financial crisis to financial innovation. According to this view, the unprecedented increase in credit creation that resulted in the initial boom and thereafter the burst in housing prices (Brunnermeier, 2009). Aso, others, like Henderson and Pearson, (2011) further argued that financial innovation includes engineering securities perceived to be safe but exposed to neglected risks and assisting financial institutions to design structured products to exploit customers' misunderstandings of financial markets. Given this scenario, financial innovation driven regulatory arbitrage does not ensure efficient resource allocation to promote output growth but rather reinforces financial fragility and hence output volatility (Houston, Chen, Ping and Yue, 2011).

Diffusion innovation theory was developed by Rogers in 1962 to explain how, why and the rate at which new ideas and technology spread across cultures. The theory identified four key elements influencing the spread of a new idea to include innovation itself, communication channels, time and the social system. According to the theory, this process depends more on the level of human capital development. Thus, the higher the level of human capital development, the faster the process of innovation transfer and adoption. Since its formulation, the diffusion of innovation theory has been applied in so many fields including the financial system. For instance, the revolution in the information and communication technology has given rise to financial innovation with the consequent proliferation of financial products or instruments and services such as ATM, internet banking, mobile banking, Point of Sales, branchless banking, etc.

Performance of SMEs in Nigeria

A World Bank report (2001) showed that 39 per cent of small scale firms and 37 per cent of medium scale firms in Nigeria are financially constrained. This may be out of the 17,000,000 SMEs that are playing significant role in Nigeria (Eniola and Entebann, 2015). Nigerian SMEs do not only provide employment and income for its citizens but are also seen as the breeding ground for domestic business capabilities, technological innovativeness, technical skills, and managerial competencies for private sector growth (SMEDAN, 2005, Aina, 2007).

Over the past few decades, there had been an remarkable increase in the number of Nigerian government projects that seek to stimulate the set up of SMEs by the unemployed and other disadvantaged persons of the population. Government has established several micro credit institutions which include the Nigerian Bank for Commerce and Industry (NBCI), National Economic Reconstruction Fund (NERFUND), the People’s Bank of Nigeria (PBN), the Community Banks (CB), and the Nigerian Export and Import Bank (NEXIM) to provide financial services to SMEs. This is in view of the fact that SMEs Nigeria are expected to contribute about 34% (gross value of manufacturing to GDP ratio) to the national income and generate 60-70% employment with sustainable annual growth (Egabor, 2004). Specifically, Aina (2007) and Ihua (2009) have it documented that SMEs in Nigeria contribute 10 per cent of the total manufacturing output and 70 per cent of the industrial employment. According to them (Aina, 2007 and Ihua, 2009) an average of 97 per cent of enterprises in Nigeria are SMEs and they employ 50 per cent of the working population as well as contributing an average of 50 per cent to Nigeria’s industrial output. Figure 2 reveals that there seem to be a dramatic increase in the output of SMEs in the years of financial innovations when compared to the output in the selected years before financial innovations. This may not be completely unconnected to the introduction of financial innovations in 2009 in Nigeria’s banking system.

Table 2: Performance of SMEs before and after Financial Innovation

YEAR	PRODUCTS OF FINANCIAL INNOVATION		MOBILE BANKING VALUE in N’M	INTERNET BANKING VALUE in N’M	SME OUTPUT in N’M
	ATM VALUE in N’M	POS VALUE in N’M			
2002	0.00	0.00	0.00	0.00	193,109.22
2008	0.00	0.00	0.00	0.00	875,795.40
2012	496.17	12.05	7.8	7.89	1,466,337.79
2015	919.97	78.08	86.61	18.51	1,516,988.93

Source: CBN Statistical Bulletin Various issues and National Bureau of Statistics (Various Issues)

Although financial statistics in 2006 to 2007 survey as published by World Bank (2007) indicated that percentage of firms using formal financial services from the conventional banks to finance investments in SMEs was an average of 2.6 per cent,

31.77 per cent and 35.65 per cent for Nigeria, South Africa and Brazil respectively. This shows the level of financial exclusion of SMEs in Nigeria as compared to other developing countries mentioned. Currently, the statistics must have changed but the pattern remains unchanged.

Methodology

Model and Data

The period of analysis covers 2009-2016. This is the longest period for which numerical data is not only available but also accessible. The study used quarterly data and the error correction model (ECM) is estimated using the contemporary econometric approach of ordinary least squares (OLS). To adequately examine the time series properties of the data, given that most time series data are unstable, it has become increasingly necessary to test the time series properties of the variables used in the regression for meaningful economic results. There are various theoretical models that have been used to explain the relationship between financial innovation and output growth of SMEs. This study adopts and modifies a theoretical framework in which the effect of financial innovations on output growth of SMEs is well derived and explained. Thus, the model for this study is anchored on the three theories reviewed (that is Schumpeter's growth theory, financial innovation and diffusion of innovation theories). It is an eclectic model with augmentations to suit the study. In line with these theories, financial innovations usually result in the evolution of new financial products and services which improve the productivity of capital, reduce transaction cost and stimulating higher output growth. In this regard, financial innovation can be measured by way of the emergence of sophisticated financial service delivery channels such as ATM, M-banking, Internet banking, Point of Sales (POS), interbank transfers and automated cheque clearing system. Thus, SMEs output growth – service delivery channels model can be formulated and expressed as:

$$SMQ = f(ATM, MBK, POS, INTB, LSM, TN) \quad (1)$$

Where:

SMQ = Output of small and medium scale industries (the proxy for measuring this is wholesale and retail trade output as a component of Gross Domestic Product).

ATM = Value of Automated Teller Machines transactions in millions of naira.

MBK = Value of mobile banking transactions in millions of naira.

POS = Value of point of sales transactions in millions of naira.

INTB = Value of internet banking transactions in millions of naira.

LSM = Loans to SMEs from deposit money banks in millions of naira.

TN = Technology (time variable, one year is one data point).

In this study, technology is simply a control variable which gives an idea on the level of human capital development in line with diffusion of innovation theory. The dynamic linear version of the model is of the general econometric form:

$$\ln\text{SMQ}_t = a_0 + a_1\ln\text{ATM}_t + a_2\ln\text{MBA}_t + a_3\ln\text{POS}_t + a_4\ln\text{INTB}_t + a_5\ln\text{LSM}_t + a_6\text{TN}_t + E_t \quad (1)$$

Where: $a_1, a_2, a_3, a_4, a_5, a_6 > 0$.

In equation (1), financial innovation variables (ATM, MBK, POS, INTB) are combined with other control variables (LSM and TN) in order to comparatively ascertain their effect on output growth of SMEs in Nigeria. It should be noted that a_0, a_1 to a_6 are the coefficients. All the variables are as previously defined and E_t and \ln are the error term and log respectively. The signs of all the elasticity coefficients are expected to be positive. Whether these financial service delivery channels/variables actually impact on output growth of SMEs in Nigeria would depend on its sign and statistical significance.

A quarterly time series data set was obtained from different sources. The data on output growth of SMEs (SMQ), Automated Teller Machine (ATM), M-banking (MOB), Point of Sales (POS), internet banking (INTB) and loans to SMEs (LSM) were obtained from the Central Bank of Nigeria Statistical bulletin (various issues), Annual Report and Statements of Accounts (various issues) and National Bureau of statistics (2015). Technology (TN) is time variable, one year is one data point.

Presentation of Results

Table 3 presents the correlation matrix. This matrix shows the correlations among the variables in the model.

Table 3: Correlation Matrix

	SMQ	INTB	LSM	MBK	POS	TN	ATM
SMQ	1.000000	0.114225	0.200578	0.621653	0.672446	0.887860	0.821810
INTB	0.114225	1.000000	0.042170	0.403053	0.398598	0.295540	0.336153
LSM	0.200578	0.042170	1.000000	0.220400	0.254493	0.247000	0.233026
MBK	0.621653	0.403053	0.220400	1.000000	0.988842	0.859023	0.911676
POS	0.672446	0.398598	0.254493	0.988842	1.000000	0.905757	0.945630
TN	0.887860	0.295540	0.247000	0.859023	0.905757	1.000000	0.967612
ATM	0.821810	0.336153	0.233026	0.911676	0.945630	0.967612	1.000000

Source: Authors' Computation using E-views. (2017)

As revealed in Table 3, there is a high positive correlation between the output of SMEs and Mobile banking (0.62), Point of Sales (0.67), Technology (0.88), Automated Teller Machine (0.82) and a low positive relationship with Internet banking (0.11), Loans to SMEs (0.20). The correlation matrix provides opportunity to assess the degree of multi-collinearity between the variables of the study before regression is carried out. However, the results indicate that there is no perfect multi-collinearity among the variables. Thus, the analysis would depend more on the theoretical relationship as the correlation results have only descriptive values.

Table 4 shows the results of the unit root test using Augmented Dickey-Fuller (ADF). It reveals that all the variables are integrated of order one (that is I(1) except Internet banking (INTB) and Loans to SMEs (LSM) that are integrated of order zero, that is I(0).

Table 4: Augmented Dickey-Fuller (ADF) Test

Variables	ADF Statistics		Remark
	Level	1 st Difference	
SMQ	-1.536773	-4.146785	I(1)
ATM	-0.669534	-3.924664	I(1)
INTB	-4.020505	-	I(0)
LSM	-3.571434	-	I(0)
MBK	-0.896979	-2.980209	I(1)
POS	-0.708894	-2.976161	I(1)
TN	-0.484544	-6.864756	I(1)

ADF at 5% Level = 2.9627 and ADF at 5% 1st Difference = 2.9665

Source: Computed by the authors using E-views. (2017)

The result of the unit root test indicates that the variables are integrated of different order hence the need for ARDL bounds testing approach. To establish the long run relationship, the Wald tests based on bounds testing approach is conducted. The results of the bounds test is reported in table 5.

Co-integration Results of the SMQ Model

Table 5: Results of the ARDL Bounds Test for Co-integration

Unrestricted Intercept and Unrestricted Trend		Critical Value
F-statistic		10.50246
P-Value		0.000001

Critical Bounds (5%)*

Upper Bound	3.83
Lower Bound	2.55

Decision **Co-integration Exist**

*Unrestricted Intercept and Unrestricted trend (k=7) from Pesaran et al (2001).

Note: Upper and Lower Bounds critical values are obtained from Table C1.v of Pesaran, Shin and Smith (2001).

From the results obtained in table 5, the F-Statistics value calculated (10.50) is greater than the upper-bound critical value of 3.83 at 5 per cent level. Since the F-Statistics value is greater than the upper-bound critical value, the null hypothesis of no co-integration is rejected while the alternative hypothesis of co-integration is accepted. Thus, there is long-run relationship among the variables in the model.

Lag Order Selection Criteria

Endogenous variables: SMQ POS MBK LSM INTB TN ATM

Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4014.746	NA	2.50e+71	187.1045	187.4321	187.2253
1	-3617.076	628.8723	4.79e+64	171.5850	174.5339	172.6724
2	-3435.511	219.5680*	2.77e+62*	166.1168*	171.6871*	168.1709*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

The study used VAR lag length selection criteria to select the lag length. The outcome of the analyses suggests the maximum lag length of two at five percent level of significance.

Long-Run Static Regression of SMQ Based on ARDL.

Table 5: ARDL Long Run Estimates

Dependent Variable: LOG(SMQ)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(POS)	0.061673	0.028860	2.136971	0.0032
LOG(MBK)	0.030434	0.014568	2.089038	0.0033
LOG(LSM)	0.005007	0.019361	0.258625	0.7982

LOG(INTB)	0.015523	0.017104	0.907547	0.3735
LOG(ATM)	0.554773	0.132423	4.189401	0.0000
TN	0.018291	0.015915	1.149256	0.2623
C	28.86252	29.96251	0.963288	0.3454
R-squared	0.890503	F-statistic	29.40902	
Adjusted R-squared	0.868917	Prob(F-statistic)	0.000000	
Durbin-Watson stat	2.145135			

Source: Authors' computation using E-views. (2017)

Based on table 5, the long-run elasticity on output of SMEs (SMQ) with respect to financial innovation (that is financial service delivery channels) in Nigeria is positive. Specifically, the long-run impact of POS on SMEs output is positive and indicates that a one percent increase in the value of POS transactions would increase SMEs output by 0.061 per cent, all things being equal. Similarly, the long-run impact of mobile banking (MBK), loan to SMEs (LSM), internet banking (INTB), Automated Teller Machine (ATM) and technology on SMEs output is positive and reveals that a one percent increase in the value of MBK, LSM, INTB, ATM and technology would lead to 0.03 per cent, 0.10 per cent, 0.01 per cent, 0.55 per cent and 0.02 per cent increase in SMEs output respectively, holding all other factors constant. Despite the positive results and impact of financial innovation variables, only POS, MBK and ATM have statistically significant impact at 5 per cent significant level. The implication of this result is that ATM, followed by POS and MBK are the only significant financial service delivery options (financial innovation variables) that significantly impact on the performance of SMEs in Nigeria. Comparatively, the impact of ATM on SMEs output which is 0.55 is nine times greater than the impact of POS (0.06) and nineteen times greater than the impact of MBK (0.03). This result gives credence to the fact that financial innovation has contributed to output growth of SMEs in Nigeria. Particularly, the introduction and use of ATM, POS and MBK in 2009 has facilitated SMEs operations and this has actually reflected in the output growth of SMEs in Nigeria overtime. The result is in line with the works of Nzove (2013) in Kenya and Oluma, Abdullahi and Madu (2016) in Nassarawa state, Nigeria. Nzove (2013) discovered that financial service innovations had the highest positive influence on the growth of SMEs in Kenya. Also, Oluma, Abdullahi and Madu (2016) found a positive significant relationship between electronic banking platforms and business

performance in Nassarawa state, Nigeria. There is need to provide more financial service delivery channels (financial innovations) in Nigeria as this will be favourable to SMEs performance and the country economic-wise.

The adjusted R^2 shows that about 86 per cent of the total variation in SMEs output is determined by changes in the explanatory variables. Thus, it is a good fit. The F-statistics (29.4) indicates that all the variables are jointly statistically significant at 5 per cent level. The Durbin Watson statistics of 2.1 reveals that it is within the acceptable bounds, thus it is good for policy analysis.

The next step is to analyse the short-run dynamic impact of the independent variables on SMEs output. Short-run dynamics of the equilibrium relationship are obtained through the error correction model and the results are presented in table 6. The error correction term measures the speed at which the endogenous variable adjusts to change in the explanatory variables before converging to its equilibrium level.

Table 6 reports the results of short-run dynamics of Point of Sales, Mobile banking, Internet banking, Automatic Teller Machine, Loan to SMEs, Technology and output of SMEs in Nigeria. In the short span of time, the value POS, MBK, ATM and TN have significant positive impact on output of SMEs in Nigeria while LSM and past year INTB have insignificant positive and significant negative impact on output of SMEs respectively. The significant negative impact of internet banking (INTB) on SMEs output in Nigeria is at variance with economic theoretical expectations. This result may not be unconnected with the fact that internet banking has not been deepened and embraced by SMEs in Nigeria over time. Thus, its use may reduce SMEs output growth rather than increase it. Also, the positive impact of POS, MBK and ATM corresponds to the long-run result. Thus, a one percent increase in the value of POS, MBK And ATM would lead to 0.217170, 0.00066 and 2.435101 per cent increase in SMEs output respectively, all things being equal in the short-run.

The negative and statistically significant estimate of ECM validates the established long-run relationship among the variables in the model. The results also indicate that the estimated ECM is 0.125311 and is statistically significant at 5 per cent level. This implies that about 12 per cent of deviations from long-run equilibrium are corrected for in one quarter period.

Table 6: Dynamic Short-run Results

Dependent Variable: LOG(SMQ)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(SMQ(-1)))	0.585798	0.078244	7.486832	0.0000
D(LOG(POS))	0.007786	0.006016	1.294190	0.1987
D(LOG(POS(-2)))	0.217170	0.054261	4.002343	0.0001

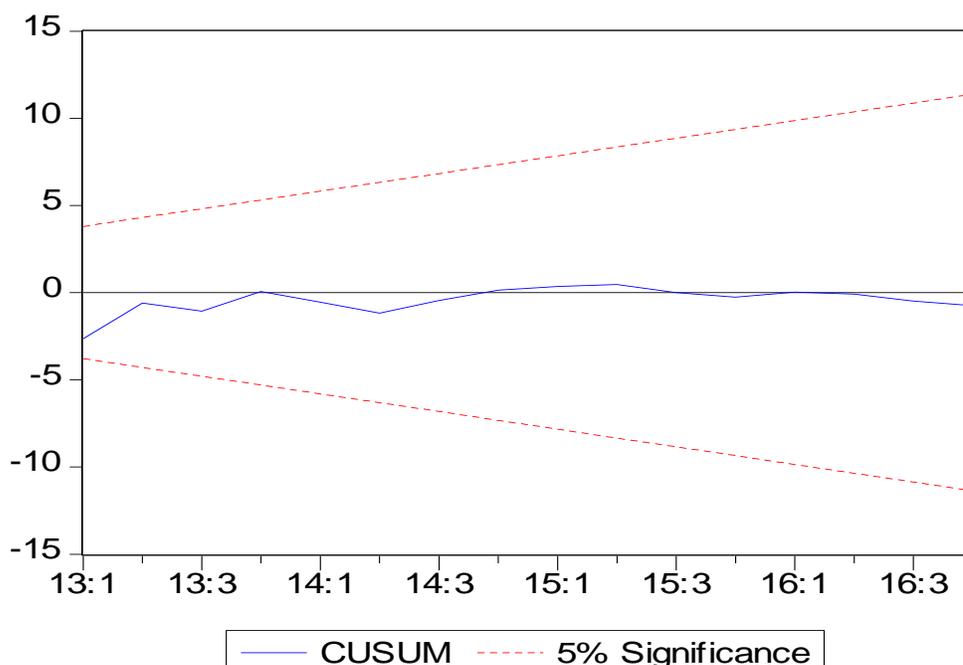
D(LOG(MBK))	0.000668	0.000308	2.171317	0.0324
D(LOG(MBK(-1)))	0.034192	0.049541	0.690172	0.0000
LOG(LSM)	0.009472	0.017580	0.538802	0.2623
LOG(INTB(-1))	-0.000190	0.000069	-2.744874	0.0072
D(LOG(ATM))	2.435101	0.060322	4.036837	0.0000
D(TN)	0.870700	0.414423	2.100993	0.0340
D(TN(-1))	0.022109	0.032272	0.067654	0.9469
ECM(-1)	-0.125311	0.032411	-3.870412	0.0013
C	78.12599	34.31213	2.306065	0.0088
R-squared	0.790503	F-statistic	23.77914	
Adjusted R-squared	0.778917	Prob(F-statistic)	0.000000	
Durbin-Watson stat	2.275924			

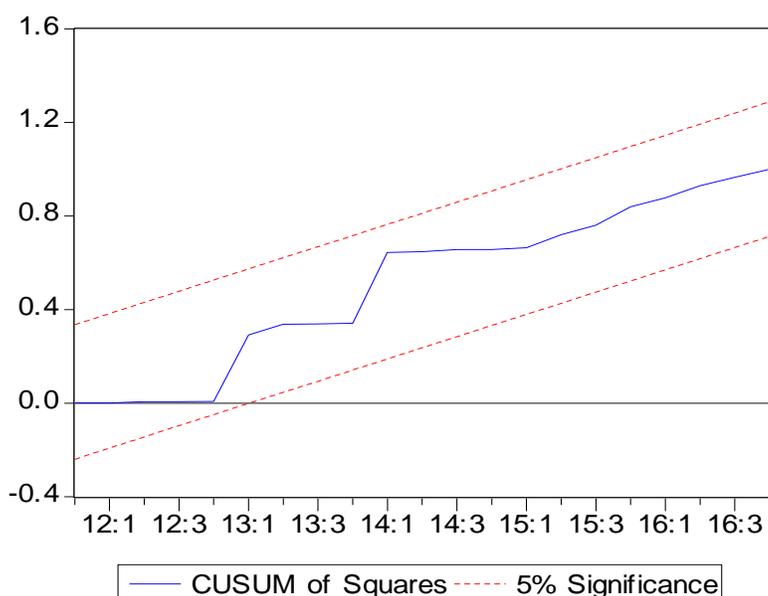
Source: Authors' computation using E-views

Post Estimation Test

The test for stability of the short-run model using the CUSUM and CUSUM of squares as shown in figure 1 reveals that the error correction model is stable since the recursive residual falls within the 5 per cent critical bounds. The stability tests show that the bound testing cointegration approach offers strong results with regard to the quarterly data.

Figure 1: CUSUM and CUSUM square tests.





The existence of the long-run relationships demands an investigation into the extent of causality between the independent and dependent variables. In line with this, Granger causality test as shown in table 7 was estimated. The table (that is table 7) shows rejection of the null hypotheses that POS, MBK, LSM and ATM do not Granger cause SMQ. This implies that there is evidence of causality moving from these endogenous variables to SMQ. Interestingly, three out (that is POS, MBK and ATM) of the four variables of financial innovation cause SMQ. In the same vein, there is no causality between internet banking (INTB) and SMQ. That is the null hypothesis that internet banking does not Granger SMEs output and SMEs output does not Granger cause internet banking is accepted. There is however a bidirectional causality between SMEs output and Technology (TN). This implies that technology causes SMEs output just as SMEs output causes technology. From this analysis, there is a clear indication of the relative positive impact of financial innovations on SMEs output in Nigeria.

Table 7: Granger Causality results

Null Hypothesis	Lags	Obs	F-Statistics	Probability
POS does not Granger Cause SMQ	4	30	4.76715	0.00046
SMQ does not Granger Cause POS			0.59733	0.55794

MBK does not Granger Cause SMQ	4	30	2.83131	0.00716
SMQ does not Granger Cause MBK			0.28215	0.75653
LSM does not Granger Cause SMQ	4	30	12.1029	0.00000
SMQ does not Granger Cause LSM			0.18035	0.83606
INTB does not Granger Cause SMQ	4	30	1.50247	0.24200
SMQ does not Granger Cause INTB			0.01743	0.98274
ATM does not Granger Cause SMQ	4	30	2.99548	0.00585
SMQ does not Granger Cause ATM			1.01702	0.37615
TN does not Granger Cause SMQ	4	30	2.29697	0.03351
SMQ does not Granger cause TN			4.29133	0.00071

Conclusion and Policy Implications:

This paper looked at the relationship between financial innovation and Small and Medium Scale enterprises (SMEs) performance in Nigeria. The paper went a step further to explore the causal relationship among financial innovation variables and SMEs performance in Nigeria. As expected, the positive and statistically significant results of POS, MBK, ATM and INTB confirms the theoretical proposition that financial innovation contributes positively to the output growth of SMEs in Nigeria. This means that in the long-run, improvement in financial innovations has the potential of stimulating growth of SMEs output in Nigeria. Similar conclusions were drawn by Nzove (2013) in Kenya and Oluma, Abdullahi and Madu (2016) in Nigeria. This means that financial innovation which increases financial service delivery channels or options is capable of leading to improvement in SMEs performance in Nigeria. Finally, financial innovations should be the financial service delivery options that will encourage more deposits than withdrawals.

Based on this empirical evidence, the paper recommends that the positive impact of financial innovation variables (such as POS, MBK, INTB and ATM) on SMEs output demands that deposit money banks should not only improve but also expand the current level of financial service delivery channels in Nigeria by establishing more financial channels in both rural and urban areas. Also financial institutions that are innovating should be protected with the necessary legal and security framework that will encourage them to innovate for the growth of SMEs.

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