Evaluating the Impact of Electronic Payment Channels on Sustainable Financial Inclusion in Nigeria

Chinwe R. Okoyeuzu[1], Ebere Ume Kalu[1] and Wilfred Isioma Ukpere[2,*]

[1]*University of Nigeria, Nsukka, Enugu Campus, Nigeria*

[2]*Department of Industrial Psychology and People Management, Johannesburg Business School, College of Business & Economic, University of Johannesburg, South Africa*

Abstract: The underlining drives of many financial reforms were to motivate digital banking culture in order to achieve sustainable financial inclusion. It is not very clear the extent to which financial innovation reform has advanced financial inclusion in Nigeria. Similarly, some issues closely linked with digital finance have not been exhaustively addressed in the literature. This research paper therefore evaluated the effect that electronic payment channels had on financial inclusion in Nigeria. Quarterlized data obtained from the statistical bulletin of Central bank of Nigeria were used. The Autoregressive Distributed Lag Model was adopted and used for our estimation. Digital financing channels were not only significant but at same time positive with the financial inclusion variables under investigation. However, the observed financial inclusion may not have delivered access to all because the channels are elitist. The study advocates for a policy reform that takes care of structural rigidities to fully accommodate the excluded.

Keywords: Financial Inclusion, Electronic Payment, Financial Deepening, ARDL.

1. INTRODUCTION

Some scholars have explained digital finance as financial services delivered through electronic channels, such as mobile phones, computers and the internet (Manyika, Lund, Singer, White and Berry, 2016, Gomber, Koch and Siering 2017). The accessibility of banking transactions electronically via automated payment channels is increasingly drawing attention of policy makers globally. In the words of Gomber, Koch and Siering (2017), all financial products and related software electronically applied are classified under digital finance. Digital finance policy essentially was promoted to address the challenges of financial inclusion. The process of bringing the excluded or the underserved population to have formal bank accounts and engage in formal banking activities is known as financial inclusion. An effective digital financial inclusion is designed in such a way that the excluded and underserved are accommodated. Advancing financial inclusion through digital finance has several merits such as poverty reduction and economic growth.

In Nigeria for instance, financial inclusion has been a concern to policymakers. As at late 1970, rural banking programme was fashioned to facilitate financial inclusion by creating 466 branches. Conversely, the initiative was eroded due to banking crisis. The need for financial inclusion in Nigeria is heightened by poverty and limited financial awareness (Kama and Adigun, 2013). The adoption of information technology which facilitated banking services became effective in the 1990s. Overtime, the implementation of mobile telephony to boost mobile banking as well as the introduction automated teller machine (ATM) and Point of sale (POS) were all efforts towards financial inclusion. These electronic progresses in banking activities motivated the need for cashless policy, which is the more reason why the Central Bank of Nigeria in 2011, adopted cashless policy as strategy of promoting financial inclusion in Nigeria. To establish a strong programme for financial inclusion, the Central Bank of Nigeria (CBN) in 2012 launched the National Financial Inclusion strategy. This is focused towards advancing financial inclusion (Financial Inclusion Newsletter, 2017). Digital finance if properly implemented improves financial inclusion and could be becomes an effective solution towards poverty reduction in some poor economies. As a matter of fact, what signify financial inclusion are availability, accessibility and affordability of financial instruments to many individuals in a given country.

To advance financial inclusion therefore, mobile banking has played a pivotal role towards actualizing such dream. A strategy to accelerate financial inclusion by 2020 in Nigeria has been commissioned by CBN with measurable performance indicators (Berger, 2012). The commercial banks and other traditional financial service providers have been working towards encouraging customers to transact through the

*Address correspondence to this author at the Department of Industrial Psychology and People Management, Johannesburg Business School, College of Business & Economic, University of Johannesburg, South Africa; Tel: +27-735295587; Fax: +27-11-5593942; E-mail: wiukpere@uj.ac.za

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electronic payment channels as against the traditional channels. These new electronic payment channels include ATM, POS, internet web based transactions and others. Thus, individuals can only rely on their insignificant savings if they are not financially included. This can adversely affect entrepreneurship, particularly the newly established ones. The larger the population that are excluded, the higher the inequality and decrease in economic growth.

The advancement in technology has remained a global issue though it levels of adaptation differs across nations and sectors. For instance, in some economies, people can easily and consistently source financial products without difficulty (Kama and Adigun, 2013). Same may not be true in some other environments. One of the motivations for the choice of Nigeria as a focus of this study is the low level of observed financial inclusion, in addition to the fact that access to bank in the country is quite low compared to some advanced and emerging countries. With a very large unbanked population, there seems to be a lot of funds in the informal sources. These groups will invariably miss opportunities meant to improve their wellbeing. Advancement in technology, specifically, digital financing has appreciably accelerated in Nigerian. However, a majority of the populace remain excluded. It has been argued that some of these new channels are elitist and, as such, seems exclude the people they are designed to mainstream into the financial system. Based on these observations, this research work examines the causal relationship between electronic payment channels and financial inclusion in Nigeria.

Secondly, a policy implication of this study is appreciating the mechanics of digital finance and financial inclusion, which will enable policymakers to come up with some more realistic policies that will broaden financial inclusion in Nigeria. Such positive outcome will minimize income inequality by reducing poverty through economic development. In addition, this will help to mainstream all the hitherto excluded segment of the population, as well as enhance monetary policy efficacy given the fact that monetary authorities drive monetary policies through commercial banks and other financial institutions that deal directly with the masses.

The third value add of the study is the novelty of our methodological approach. In the first instance, we exposed the statistical properties of the variables under study through the measures of central tendency and variations, test for linear association and normality of digital finance channels and financial inclusion variables. Next, through the employment of the traditional and structural break consistent unit root tests, the stationarity properties of the variables were exposed. Employing the structural break consistent unit is necessitated by the fact that the traditional unit root tests became less powerful in the face of structural breaks. Furthermore, we estimated the ARDL framework given that our series are a mixture of I(0) and I(1). The bound test by Pesaran and Shin (2001) was also used and the error correction profile of the series investigated. In addition, we diagnosed the results to ensure conformity with the underlying assumptions of the employed estimation techniques. No prior study as far as we know has investigated financial inclusion and digital finance following the methodological sequence as adopted in this study.

Similarly, there is the expansion of the series employed in terms of size and currency. The datasets as published by the Central Bank of Nigeria is annualized, but following Arize (2017), the annualized datasets were quarterlized in a moving average format to increase the data frequency in a manner that looked at 2009:Q1 to 2017:Q4. This increased the robustness of our findings as estimation outcomes get better with increased data frequency. Moreover, volatility or change is hardly smoothened out in the face of high frequency data. Specifically, we turned the low frequency data to high frequency to improve robustness. The remaining parts of the paper were demarcated into five sections, namely section 2 is the literature review; Section 3 is the research methodology; the 4th section is the research findings and the concluding section is the 5th section, which also contains the policy implications of our findings.

2. LITERATURE REVIEW

To promote efficient and effective financial services, there is need to address market failures like asymmetric information. Such barriers to financial services can be overcome through digital payment systems. People can have access to bank without physical presence in any bank due to digital finance. Digital finance is financial services delivered over digital infrastructure. The financial limitations and exclusion that confront borrowers can be explained by the theories of information asymmetry and transaction costs. A careful study of the literature reveals that emphasis on financial inclusion is linked to information asymmetry and transaction cost. For instance, the welfare of people can only be improved if digital finance

should address the double digit inflation by reducing money in circulation (GPFI, 2016). There is high potential of improving the welfare of individuals and businesses if digital finance is well instituted to carry out financial transactions (CGAP, 2015 and Men 2014). Distinctively, such high transaction cost brings about low productivity. This will have an inverse relationship with financial inclusion.

Increase development of digital technologies can advance financial inclusion in emerging economies. Literature on the marginal effect of ICT has been documented by (Waverman *et al*., 2005; Andrianaivo and Kpodar, 2012) The telecommunication is expected to promote costless flow of information to users. To maximally achieve financial inclusion, the cost implications associated with accessing electronic payment channels must be minimally reduced (IFC, 2017). There will be a reduction in translation cost with a rise in consumer surplus due to ICT improvement. This assertion has influenced Kpodar and Andrianaivo (2011a) to conclude that ICT is a key factor that contributed positively to financial deepening. Technological deepening will impact positively on financial inclusion by promoting branchless banking as well as eliminating transportation cost, while making effort to enhance access to physical facilities. For instance, ICT amenities are highly efficient for credit allocation, which promotes financial deepening (Hannig and Jansen, 2010). In recent times, mobile banking technologies have been very crucial towards financial sector innovations. This has achieved a wider geographical outreach. Similarly, mobile money has enabled many to perform financial transactions at a relatively cheaper cost.

A number of studies found that service providers were able to extend financial services to financially excluded individuals due to ICT development (Diniz, *et al*., 2012; Triki and Faye 2013). Mobile and digital technologies also give access to broader range of financial services. In Nigeria for instance, traditional financial services providers have improved immensely on the digital services they render to customers. In 2012 for instance, as mentioned earlier, as an approach to have an inclusive financial stable economy, the financial inclusion strategy was promoted by the Central Bank of Nigeria. The main focus of the inclusion strategy is to reduce financial exclusion to the barest minimal, specifically, to make the country to be financially excluded by 20% (Financial Inclusion Newsletter, 2017). Nigeria has indeed experienced greater positive development in digital finance in recent years. New technologies like mobile money have helped to improve financial deepening and foster financial inclusion. To foster sustainable economic development, the Nigerian financial system needs to interact with the rest of the economies. Launching the national financial inclusion Strategy (NFIS) in 2012 was to accomplish such dream. Until now, limited information is available concerning the people that are structured into mainstream of the financial system in Nigeria. It is therefore this gap that the study intends to also address.

3. METHODOLOGY AND MODEL SPECIFICATION

The study is concerned with establishing whether a link exists between financial inclusion and electronic payment channels, with special focus on Nigeria. Quarterly time series from the Nigerian economic environment covering the period 2009:Q1 to 2017:Q1 are employed and different tests for association, causation and impact adopted to expose the relationship between financial inclusions and an assortment of electronic payment channels. The study is empirical and fully analytical

The two major relationships for this study are as presented below:

$$cpsgdp = f(latmval, lmobpayval, lposval, lwebval, m2gdp)$$

$$m2gdp = f(latmval, lmobpayval, lposval, lwebval, cpsgdp)$$

The Models for this study are presented thus:

$$cpsgdp = \beta_0 + \beta_1 latmval + \beta_2 lmobpayval + \beta_3 lposval + \beta_4 lwebval + \beta_5 m2gdp + \varepsilon_t$$

$$m2gdp = \beta_0 + \beta_1 latmval + \beta_2 lmobpayval + \beta_3 lposval + \beta_4 lwebval + \beta_5 cpsgdp + \varepsilon_t$$

$cpsgdp$ is the ratio of credit to the private sector to economic growth, $m2gdp$ is the ratio of broad money supply to economic growth, $latmval$ is the natural logarithm of the value of Automated Teller Machines transactions, $lwebval$ is the natural logarithm of the value of Web payment transactions, $lposval$ is the natural logarithm of the value of Point of Sales transactions, $lmobpayval$ is the natural logarithm of the value of web payment transactions with ε_t as the error term.

This study followed the Autoregressive Distributed Lag Model as developed by Pesaran, Shin and Smith (2001). In order to model both the short run and long

run relationship amongst the variables, the bound test (cointegration) and error correction method were utilised. The benefits associated with this approach over other cointegration methods include its efficiency with small samples and its ability to tolerate an I(0) and I(1) combination.

The Schwartz Information Criterion was used for the selection of the lag length. This was established by following the Bound Test Approach. We did establish Cointegrating relationship amongst the variables. Two critical values for the test for cointegration were used, namely the lower and the upper bands. Decisions made have been presented in the format below:

Test Statistics > Upper Band = Cointegration

Test Statistics < Lower Band = No cointegration

Test Statistics within upper and lower band = inconclusive

In the third stage cointegration was established; we obtain the short run dynamic parameters by estimating an error correction model associated with the long run estimates:

$$cpsgdp_t = \pi_p + \sum_{i=1}^{k} \delta_{ip} \Delta cpsgdp_{t-i} + \sum_{i=1}^{k1} \tau_{ip} \Delta latmval_{t-i}$$
$$+ \sum_{i=1}^{k2} \theta_{ip} \Delta lwebpayval_{t-i} + \sum_{i=1}^{k3} \sigma_{ip} \Delta lmobpayval_{t-i}$$
$$+ \sum_{i=1}^{k3} \sigma_{ip} pospayval_{t-i} + \varpi_{1p} cpsgdp_{t-1} + \varpi_{2p} latmval_{t-1}$$
$$+ \varpi_{3p} webpay_{t-1} + \varpi_{4p} m2gdp_{t-1} + \xi_{1t} eq.14$$

$$m2gdp_t = \pi_p + \sum_{i=1}^{k} \delta_{ip} \Delta cpsgdp_{t-i} + \sum_{i=1}^{k1} \tau_{ip} \Delta latmval_{t-i}$$
$$+ \sum_{i=1}^{k2} \theta_{ip} \Delta lwebpayval_{t-i} + \sum_{i=1}^{k3} \sigma_{ip} \Delta lmobpayval_{t-i}$$
$$+ \sum_{i=1}^{k3} \sigma_{ip} pospayval_{t-i} + \varpi_{1p} cpsgdp_{t-1} + \varpi_{2p} latmval_{t-1}$$
$$+ \varpi_{3p} webpay_{t-1} + \varpi_{4p} m2gdp_{t-1} + \xi_{1t} eq.14$$

Some diagnostic tests were employed to confirm validity and reliability of the estimates.

Unit Root Test

Given the fact that Augmented Dickey Fueler Test (ADF) may not always be used to test for structural breaks, the variables under study shall firstly be tested for structural break before testing them for unit root. To achieve this, each variable should be run as an endogenous factor of its constant before subjecting the regression result to multiple breakpoint tests. The unit root tests will be done following a combination of the Zivot (1992) and Philip and Perron (1998) approaches, if a structural break is detected. The Table **1** below shows the basic descriptive statistics of the variables under study.

The measures of central tendency are shown basically by the mean of all the series under study with the spread and variations shown by the standard deviation, minimum and maximum. While ATM and Web pay show a high degree of variation, others like POS, CPSGDP and M2GDP show less spread as indicated by their respective standard deviations. This is not unconnected with the popularity of the Web pay electronic channel and the Automated Teller Machines.

To show the degree of linear association amongst the variables under study, Table **2** below shows the correlational matrix of the series under study.

One of the most significant observations from the correlational matrix is that all the variables share positive linear association with the financial inclusion variables which are CPSGDP and M2GDP. This suggests that value of electronic payment transactions increase side by side with financial inclusion.

The time series properties of the variables are shown through the unit root tests reported in Table **3** below:

In sum, it is observed that the variables following the results of the traditional and structural break consistent unit root test are all I(1) and I(0). There is no I(2) in the mix, which evidently justifies the use of the Autoregressive Distributed Lag Model reflected in Table **4** below.

4. RESULTS

A look at Table **4** shows that financial inclusion proxied by CPSGDP at 5% level of significance is a significant function of all the electronic payment channels. On the other hand, M2GDP is a significant function of only Point of Sales and Automated Teller Machine transaction value. All the others are found to be insignificant at the 5% and 10% levels of significance. The reliability and validity of the estimates are shown by the post-estimation test (diagnostic tests), which is reflected in the lower part of Table **4**. The goodness of fit of the models is shown by the

Table 1: Descriptive Statistic

Variables	Mean	Standard deviation	Minimum	Maximum
CPSGDP	19.5152	1.2161	16.926	20.7733
LATMVAL	12.8734	10.12433	4.1366	28.7715
LMOBPAYVAL	9.37604	11.1942	-2.813411	25.35091
LPOSVAL	9.8849	10.81614	0.62345	25.70035
LWEBVAL	9.27819	9.926553	1.21491	1.21491
M2GDP	20.03887	0.825216	18.92846	21.2905

Source: Authors' Fieldwork.

Table 2: Correlational Matrices of Financial Inclusion and Digital Finance Channels

Probability	CPSGDP	LATMVAL	LMOBPAYVAL	LPOSVAL	LWEBVAL
LATMVAL	17% 0.894953 PV>0.05				
LMOBPAYVAL	12% 0.666827 Pv>0,05	98% t=30.39 PV<0.05			
LPOSVAL	17% 0.884318 Pv>0,05	99% 51.88475 Pv>0.05	99% 46.4273 Pv>.0.05		
LWEBVAL	17% 0.894802 Pv>0,05	99% 42.63214 Pv>0.05	0.976137 22.92079 Pv<0.05	98% 33.64178 Pv<0.05	
M2GDP	36% 2.019 Pv>0.05	53% 0.272101 Pv>0.05	40% -0.208075 Pv>0.05	39% 0.20178 Pv>0.05	12% 0.644737 Pv>0.05%

Source: Authors' Fieldwork.

Table 3: Unit Root Tests Results

Variables	Traditional ADF (Trend and Intercept)			Break With Innovation Outlier (Trend and Intercept)			Break With Additive Outlier (Trend and Intercept)		
	ADF Stat	Critical Value (0.05)	Order of integration	ADF Stat	Break Date	Order of integration	ADF Stat	Break Date	Order of integration
ATMVAL	-4.73	-2.97	0	-8.56	2014	0	-7.58	2013	0
ATMVOL	-4.95	-2.97	1	-6.55	2015	1	-8.26	2011	0
CPSDGP	-4.89	2.97	1	-8.11	2012	1	-5.47	2010	0
M2GDP	-5.89	-3.64	1	-5.33	2014	1	-5.69	2015	1
MOBPAYVA	-7.54	-3.55	1	-8.02	2014	0	-7.39	2014	1
POSVAL	-5.36	-3.54	1	-7.03	2014	1	-7.06	2014	0
MOBPAYVOL	-5.36	-3.54	1	-7.01	2015	1	-4.99	2012	0
POSVOL	-4.96	-3.54	1	-6.44	2016	1	-5.86	2013	0
WEBVAL	-5.90	-1.95	1	-19.42	2014	0	-43.21	2014	1
WEBVOL	-5.31	-3.54	1	-6.40	2015	1	-6.53	2015	1

Critical Value @ 0.05 for Breakpoint Unit Root Tests with Additive and Innovation Outliers = 5.18.
Critical Value for Zivot and Andrews Unit Root Test are -5.57, -5.30, -5.08 and -4.82 at 1%, 2.5%, 5% and 10% respectively.
Source: Authors' Fieldwork.

Table 4: ARDL Estimates for our Models

	CPSGDP=f(Latmval,Lmobpayval, lposval,lwebval,m2gdp)	***M2GDP=f(Latmval,Lmobpayval, lposval,lwebval,cpsgdp)***
Latmval	1.74 [6.42]**	-0.88 [-3.69]**
Lmobpayval	-	0.19 [0.40]
Lposval	-	0.50 [0.89]
Lposval(-1)	0.44 [3.25]**	-
Lposval (-2)	0.52 [2.91]**	0.47 -2.2**
Lwebval	-0.90 [-3.52]**	-
Lwebval(-1)	-0.26 [-2.00)*	-
Lwebval(-2)	-0.52 [-2.89]**	-
Diagnostic Tests		
R^2	93%	93%
Adj. R^2	88%	83%
DW-Stat	2.47	2.5
BG(F)	1.03>0.05	1.13>0.36
BPG(HET,F)	0.86>0.05	0.59>0.81

The values in [] are the t-statistics, and an ** denotes significance at 5% and an * shows significance at 10%.
Source: Authors' Fieldwork.

R^2 values that are well over 88% in all the cases, indicating that over 88% of the variation in the endogenous variables is explained by the exogenous variables. In addition, the absence of autocorrelation of first and higher order is confirmed by the Durbin Watson Statistics (by rule of thumb all are approximately equal to 2) and BG Serial Correlation LM Test. The Breusch Pagan (BP) test also shows that in all the models, there are no cases of heteroscedasticity as all the models are found to be homoscedastic.

Cointegration Bound Tests

From the bound test as shown in Table **5**, a long run relationship is found in the two models under study. Given that the F-stat in the cases are all greater than the upper bound I(1). This confirms that a long run association exist between the dependent and independent variables in the two modes under study. When the value of F-statistics is higher than both the upper and lower bounds, there is existence of cointegration. From our result, the F-statistics for the two dependent variables (CPSGDP and M2GDP) are higher than both the upper and lower bounds. Therefore, Cointegration exists.

Having established a long run relationship in all two models, it is necessary to show the error correction representation and long run coefficients as contained in

Table 5: Bound Test Summary

Model	Dependent Variable	F-Statistics	Critical Value Bounds @ 5%		Inference/Conclusion
			I0 Bound	I1 Bound	
A	*CPSGDP*	9.60	2.39	3.38	Cointegration Exists
B	*M2GDP*	4.48	2.81	3.76	Cointegration Exists

Table **6** below. The primary aim is to establish a long run equilibrium in line with its speed of adjustment in all the models as estimated.

Table 6: Error Correction Representations

	Model 1	Model 2
Latmval	1.70 [26.18]**	-0.92 [-6.26]**
Lwebval	-1.85 [26.57]**	0.50 [5.01]**
Lwebval(-1)	1.99 27.80**	-0.32 [-3.73]**
*CointEq(-1)**	-0.59	-0.68

For the identified cointegrating vectors, the outcomes shown in Table **6** demonstrate proof of a convergence to long-run equilibrium for the two models. In each of these frameworks, the error-correction terms are negatively significant. These coefficients are the speed of adjustments from short-run disequilibrium to long-run equilibrium. The faster of the two models is the M2GDP model which stands at 68%, with CPSGDP following closely at 59%. This implies that in the current year, the convergence to equilibrium level in the long run from a short deviation takes place as at about 2 years for each of them respectively as indicated from the error term analysis

From our findings, there is not only a short run relationship but also a long run and appreciable speed of adjustment between the financial inclusion variables and the studied electronic payment channels. In addition, some of the payment channels share negative relationship with financial inclusion while others are positive. It is obvious that all the channels do not enjoy the same level of acceptance. Some are elitists, others are more inclusive hence the differences in the sizes and signs of the coefficient.

5. CONCLUSION AND POLICY IMPLICATION

Financial inclusion has become a focal point in nation building. This originates from the realization that inclusive financial system is critical in reducing extreme poverty. The challenges of financial inclusion in Nigeria are receiving attention owing to the advent of electronic payment systems. The positive effect of banking the unbanked is geared towards poverty reduction and economic growth. This paper has a set of important policy implications. First, the paper has shown that digital payment channels play a significant role in achieving sustainable financial inclusion in Nigeria. With the level of economic development and infrastructural decay in the country, it is very obvious that most of these channels are elitist and exclude the poor and uneducated. From the look of things, financial system can become deep without delivering access to all. The likelihood of excluding a majority of the populace is very high. The poor who have been excluded may remain so despite a positive and significant relationship that exists between the digital payment channels and financial inclusion variables under investigation. Digital finance can only promote inclusive growth as well as economic inclusion, if structural rigidities in the country are addressed. Majority of the people in the rural setup find it near impossible to access the internet and are completely excluded from transacting online. Power outage is the order of the day in the country. Many people within the rural areas do not have good access to electricity infrastructure and as such may not benefit from the opportunity provided by digital financing.

Policymakers and industry players must as a matter of urgency pay attention to the digital deepening and address infrastructural challenges so as to attain a wider and a more sustainable inclusive financial system in Nigeria. This is proposed not only as blueprint for Nigeria but also for countries with economic and financial peculiarities like Nigeria. We suggest that future studies in this area should be directed towards establishing a strong relationship between reform programs in the country and banking performance. The ideas raised in this paper should be further explored. One way to go about this could be through more collaborative research to better understand the relationship between electronic payment options and financial inclusion with a view to resolving infrastructural challenges in the country.

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