Internet Usage, Financial Inclusion and Economic Growth in Nigeria

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Abstract

This study investigates the relationship between internet usage, financial inclusion and economic growth in Nigeria for the period 1999 to 2016. Using the time series data for the period, the study utilizes Engle Granger Cointegration Test and the Fully Modified Ordinary Least Squares (FMOLS) approach for analysis. The results showed that Internet usage and broad money have positive and significant effect on financial inclusion. Also, Internet usage has positive and significant effect on economic growth in Nigeria. However, the effect of financial inclusion on economic growth is negative, minimal and insignificant. Furthermore, the effect of the interacted coefficient of internet usage and financial inclusion on economic growth is positive, minimal and insignificant. Hence, the positive effect of internet usage on economic growth in Nigeria is not transmitted through the mechanism of financial inclusion. We recommend that government should strengthen and improve on the positive gains of internet usage on the economy. Also, the monetary authority should take measures to encourage the drive for more savings to improve financial inclusion and ensure that investment by government is channeled into more productive areas to improve the economy.

Key words: Internet usage, financial inclusion, economic growth, cointegrating regression, Nigeria.
J.E.L. classification: O30, O40, G20

1. Introduction

The governments all over the world both the developed and developing countries have felt the impact of the massive increase in internet usage especially in the past twenty (20) years (Salahuddin & Gow, 2015). There have been many benefits from the rise in internet usage following the ICT revolution around the world. The benefits are traceable to a broad span of areas covering improvement in technology, expansion in output of businesses, acquisition of skills for online education programmes, improved ease of doing business and access to a variety of online products and services. The entrance to financial products and services of banks constitutes one breakthrough that has been facilitated by internet usage (Lenka & Barik, 2018). From the comfort of home, customers can now log-into their the bank's data based to handle their transactions like opening an account, making money transfers, print bank statement, request for a credit facility and make payment for utility bills among others. Internet usage has enhanced the utilization of banks' facilities on several platforms. For instance, some writers have argued that internet availability has assisted the usage of bankers to recruited more unbanked customers that would have been the case without internet facilities (Alam et al. 2013). Besides, internet facilities have improved the utilization of banking products and services by the existing customers and to improve the lives of the average people and achieve economic advancement and growth in the country.

Based on the benefits of internet usage and in keeping the trend with globalization, several governments around the world have made conscious effort to adopt policies to improve the increased use of internet facilities (Ozili, 2018). Sadly, Nigeria has been a slow starter in internet connectivity and usage. With the largest population in the African continent, Nigeria had only a

couple of internet service providers and a few dial-up e-mail providers with operating slow links by 1998. However, recently, internet connectivity has grown at tremendous speed to catch up with other countries of equal economic status around the world. The 28 million internet users in Nigeria recorded in 2012, and there was an increase to a new of record 98 million users at the end of 2017. Nigeria has currently reached internet penetration of 50.5%, and it compares very favorably with the continent's average of 35.2% for the same period.

Some writers have argued that internet usage has facilitated improvement in financial inclusion in developing countries around the world (Andrianaivo & Kpodar, 2012; Ozili, 2018). Financial inclusion is a feature of financial development and has been characterized to underscore improvement in the efficiency, quality and quantity of intermediary financial services. It can improve the general level of savings, which increases productive investment in local businesses (Babajide, 2015). A development finance organization (EFInA) conducted a survey in Nigeria (2008) and revealed that only 18 million adults were banked and about 53.0% of adults were excluded from financial services (CBN, 2017). To facilitate financial inclusion, the Central Bank of Nigeria working in collaboration with other parties launched the National Financial Inclusion Strategy (NFIS). The NFIS is aimed at reducing the exclusion rate to 20% by 2020 through leveraging on technology with emphasis on internet and mobile banking facilities. The focus is to extend financial products and services to the unbanked customers urgently. Between 2008 and 2016, there was improved access to financial services as 47 million adults are now using bank product and services and about 41.6% of the population is financially excluded (EFInA, 2017). With many more Nigerian adults enjoying improved banking status, more people now (expectedly) have the opportunity to increase productivity and enhanced social welfare status.

More specifically, Andrianaivo (2010) posits that there is a positive correlation between the average real GDP per capita and mobile penetration in Africa. He maintains that the association between financial inclusion and mobile penetration is positive; suggesting that improvement in internet usage could stimulate financial inclusion and economic growth. Therefore, to effectively anchor the relationship between internet usage, financial inclusion and economic growth, we should underscore the relationship between internet usage and financial inclusion in Nigeria and seek to establish whether the combined effects of internet usage and financial inclusion stimulate economic growth. The findings will position us to suggest policies that can further improve the relationship between internet usage, financial inclusion and economic growth.

The remaining part of this study is organised as follows: Section 2 examines the review of related literature and the theoretical framework, methodology and sources of data are outlined in section 3. Section 4 presents the empirical results and discussion. Section 5 completes the study handling the conclusions and policy recommendations.

2. Literature review

2.1. Internet and economic activity: theoretical perspective

The Internet has gradually become the central pivot of the digital economy as it supports a substantial portion of the world's economic and social activities serving as an active catalyst for technology and innovation, enhancing the social wellbeing and economic growth of the nation. The internet is fundamentally designed to be open and global hence making the facility to serve as the hub for technological innovation and economic growth and development. The openness of the internet makes it a veritable tool for access to international cross-border trade. The result is a global value chain such that inputs for production are sourced worldwide, and the process of production shifts from location to location until the final product. The support from the internet enables firms to take advantage of trans-border data flows across nations to monitor the production value-chain across different areas (Salahuddin & Gow, 2016). Also, the internet assists innovation and entrepreneurship by providing the platform to access, share and coordinate knowledge in support of new ventures and professional services. Through cost savings and ease of information availability, the internet can promote productivity and growth of businesses and the economy.

The internet has become an essential organ of inclusive growth and development through the sources of financial inclusion. The measures of financial development among others would include

proxies like access to banking facilities, number of electronic transfers/transactions, average savings, access to credit facilities and number of mobile telephone and internet banking transactions (World Bank). In Nigeria, while historical data is not readily available on internet usage, the most readily available data on financial inclusion is that of average savings. Hence, this study adopts average savings as the proxy for financial inclusion.

The provision of information has become an input to the firms as internet usage allows the seamless generation and sharing of ideas across markets and international borders. The advent of modern theories of endogenous growth has categorized the internet as a strategic input in the development and utilization of innovation in the production process (Lucas 1988; Romer 1990; Aghion and Howitt 1998). The new growth theories acknowledge the growth effect contributions of modern communication technologies which strongly rely on the development and utilization of internet facility. The endogenous growth model, as postulated by Romer (1990) argues that the key drivers of growth revolve around ideas generation and information dissemination. The massive growth and utilization of internet in recent years have strongly impacted on innovation, production and economic growth through the adoption of new technologies, cheaper information dissemination, development of new products and services and the promotion of new business models (Benhabib and Spiegel 2005).

The growth of internet usage facilitates decentralized information processing through the speedy and seamless exchange of on-line-real-time data across multiple locations. Therefore, internet usage strongly supports modern firm-cooperation that is dependent on the spatial flow and transfer of large batches of information on continuously, helping to boosts innovation and competition among firms. Internet usage may raise the standard of market transparency through the ease of access to market information and further intensifying the standard of competition (Stiroh, 2008).

The use of search engines like Google coupled with YouTube facilitates the endless supply of knowledge and information for research which benefits organizations and academic institutions. Millions of web pages and libraries can be browsed in an instant to help explain various topics on different subjects to improve the skills and knowledge of the people. It has also become convenient for people to partake in on-line educational courses at both the local and international scale. Many educational programs facilitate on-line examination for students at different levels of learning. Therefore, the internet facilitates improvements in skill, research and convenience for the people.

One other important benefit of internet use is the improvement in employment generation and leisure. Besides, the software and hardware professional and companies which are fully engaged in internet services, a large number of the populace find employment and earn their living through the services of internet marketing and sale of various products and services. With internet connection, a number of people find it convenient to work from home and can set up the virtual office. Working from home can help people save the cost of childcare and transportation while improving efficiency.

The internet may also be used for negative purposes that could be criminal like internet fraud, bullying, pornography, spread of computer viruses and others.

2.2 The internet usage and the economy: empirical evidence

There is empirical evidence highlighting several direct economic impacts of internet usage on the various aspects of the man's economic life in several countries. Many studies have been conducted to relate internet usage to various macroeconomic variables that affect economic growth. For instance some writers found that internet usage positively affected trade services (like Frehund & Weinhold, 2002; Choi, 2010; Lechman & Marszk, 2015). In other studies, there is empirical evidence to suggest that internet usage positively and significantly affect economic growth (Holt & Jamison, 2009; Macdougald, 2011; Farhadi et.al, 2012; Andrianaivo & Kpodar 2012; Amiri & Reif, 2013; Jin & Jin, 2014; Kpodar & Andrianaivo, 2016; Salahuddin & Gow, 2016; Toader et.al, 2018; Changkyu & Myung, 2018). While Yi and Choi (2005) argue that internet usage reduces inflation, Noh & Yoo (2008) contend that inequality in income distribution can erode the positive gains from internet usage on economic growth. Choi (2003) opines that internet usage stimulates the inflow of foreign direct investment into developing countries. In his study on the German

economy, Czernich (2014) concluded that the relationship between broadband internet and unemployment is negative.

Some authors posit that internet usage stimulates financial inclusion and financial deepening (Farkhanda, 2007; Salahuddin & Gow, 2016; Ouma et.al, 2017; Olaniyi & Alenoghena, 2017; Chen et.al, 2018; Lenka & Barik, 2018). The last set of studies contends that financial inclusion or financial development positively and significantly impact on economic growth (Hariharam & Marktanner, 2013; Alenoghena, 2014; Babajide et.al, 2015; Olaniyi & Alenoghena, 2017).

From the discussion on the empirical review, most of the studies argue that while internet usage may affect economic growth directly, it could also impact on economic growth indirectly through other macroeconomic variables like inflation, unemployment, trade services, FDI inflows and income inequality. The existing studies fail to examine the effect of internet usage on the economy through financial inclusion. While this study intends to fill this gap, we also wish to explore the transmission mechanism of the effect of internet usage on economic growth through the mechanism of savings.

Theoretical framework and methodology

3.1. Theoretical framework

Internet usage assists in modern theories of endogenous growth, internet usage facilitate the development of innovation, improve the processes of production and distribution of goods and services and hence, boosts the economic growth and development of a nation (Romer 1986; Lucas 1988; Aghion & Howitt 1998). Internet usage facilitates the crossing of international boundaries to access the latest information on the products of research and development the improvements in particular production techniques. Internet usage intensifies competition through the dissemination of the newest information and ideas and information on specific products and services. Also, the internet may propel economic growth through the application of new technologies in business models, new products and process change.

Several contributors to the endogenous growth theory contend that ideas generation and market information serves as the catalysts for economic growth (Lucas, 1988; Romer, 1990; Aghion & Howitt, 1998). Consequently, the massive and sustained increase in Internet usage may enhance the innovative capacities of the economy through knowledge spillover, development of new products and processes, and business models to promote growth. Moreover, cheaper information dissemination encourages the adoption of new technologies which help stimulate economic growth (Nelson and Phelps, 1966; Benhabib and Spiegel, 2005). This also suggests that information technology can affect economic growth through other channels such as codified knowledge across firms and regions. The usage of the internet further enables the exchange of data across multiple locations and facilitates the decentralization in the processing of information. Furthermore, it assists in the formation of new businesses and the development of models on firm cooperation which would rely on the high level of exchange of high volumes of information in the face of innovation processes and competition. Also, internet usage facilitates transparency in the market and improves efficiency in competition resulting in productivity improvement among IT-using firms (Jorgensen et al., 2008).

3.2. Model specification

Based on the contributions of several scholars to the endogenous growth theory (like Romer 1986; Lucas 1988; Barro, 1998) and in tandem with the growth equation utilized in the studies conducted by Choi & Yi (2009) and Salahuddin & Gow (2016), we construct an econometric model with per capita GDP growth (GDPC) as a function of the number of internet users per 100 people (NET), financial inclusion (FINC), trade openness (TOP) and broad money (BMN). Therefore, the equation used in the study was:

$$GDPC_{it} = \beta_0 + \beta_1 NET + \beta_2 FINC + \beta_3 (NET * FINC) + \beta_4 TO + \beta_5 BM + \mu_{it} \quad - \quad - \quad (3.0)$$

For the purpose of estimation, there is need to log-linearise the model as in equation (3.0). This is necessary to streamline the scales of the variables to minimize fluctuations in the data.

$LGDPC_{it} = \beta_0 + \beta_1 LNET_{1t} + \beta_2 LFINC_{2t} + \beta_3 (LNET * LFINC)_{3t} + \beta_4 LTOP_{4t} + \beta_5 LBMN_{5t} + \mu_{it}$ - - (3.1)

Equation (3.1) is designed to estimate the relationship that exists between economic growth (GDPC), internet usage (NET), financial inclusion (FINC) and other related macroeconomic variables in the Nigerian economy for the period under review. It is important to see how changes those explanatory variables influence the magnitude and direction of change in per capita income. In line with apriori expectations, the expected signs of the coefficients are: $\beta_1 > 0$; $\beta_2 > 0$; $\beta_3 > 0$; $\beta_4 > 0$ and $\beta_5 > 0$. The above sign (> 0) implies a positive relationship between (GDPC) and the coefficients of the independent variables.

The study would also examine the effect of internet usage on financial inclusion as shown in the model on equation (3.2) as follows:

$LFINC_{it} = \beta_0 + \beta_1 LNET_{1t} + \beta_2 LGDPC_{2t} + \beta_3 LTOP_{3t} + \beta_4 LBMN_{4t} + \mu_{it}$ - - (3.2)

The apriori expected signs of the coefficients are: $\beta_1 > 0$; $\beta_2 > 0$; $\beta_3 > 0$; and $\beta_4 > 0$. The above sign (> 0) implies a positive relationship between (FINC) and the coefficients of the independent variables.

3.3. Analytical framework

An estimator that may deploy a semi-parametric correction to remove the problems which are associated with the long-run correlation between the stochastic regressors and the cointegrating equation was proposed by Phillips and Hansen (1990). The outcome of their proposal is a Fully Modified OLS (FMOLS) estimator which is characteristically unbiased with an attribute of being a fully efficient mixture with normalized asymptotics that allows for standard Wald tests utilizing the standard Chi-square statistical inference.

The cointegrating regression methodology adopts preliminary estimates of the symmetric and one-sided long-run covariance matrices of the residuals. Suppose $\hat{u}_{1t}$ is the residuals obtained after estimating Equation 3.1, then $\hat{u}_{2t}$ can be generated indirectly and declared as $\hat{u}_{2t} = \Delta\hat{\epsilon}_{2t}$ from the regression analysis process.

$$X_t = \hat{\Gamma}_{21}' D_{1t} + \hat{\Gamma}_{22}' D_{2t} + \hat{\epsilon}_{2t}$$

r can be obtained directly from the difference regressions process. Hence, we can obtain

$$\Delta X_t = \hat{\Gamma}_{21}' \Delta D_{1t} + \hat{\Gamma}_{22}' \Delta D_{2t} + \hat{u}_{2t} \quad (3.2)$$

If we declare $\hat{\Omega}$ and $\hat{\Lambda}$ to be the long-run covariance matrices which are estimated utilizing the residuals $\hat{u}_t = (\hat{u}_{1t}, \hat{u}_{2t}')'$, then we may define the modified data as:

$$y_t^+ = y_t - \hat{\omega}_{12} \hat{\Omega}_{22}^{-1} \hat{u}_2 \quad (3.3)$$

and the estimated bias of the correction term may be declared:

$$\hat{\Lambda}_{12}^+ = \hat{\Lambda}_{12} - \hat{\omega}_{12} \hat{\Omega}_{22}^{-1} \hat{\Lambda}_{22} \quad (3.4)$$

Hence the FMOLS estimator can be given as:

$$\hat{\theta} = \begin{bmatrix} \beta \\ \hat{\gamma}_1 \end{bmatrix} = \left(\sum_{t=2}^{T} Z_t Z_t' \right)^{-1} \left(\sum_{t=2}^{T} Z_t y_t^+ - T \begin{bmatrix} \hat{\Lambda}_{12}^{+\prime} \\ 0 \end{bmatrix} \right) \quad (3.5)$$

where $Z_t = (X_t', D_t')'$ is the key to FMOLS estimation and would comprise the development of the long-run covariance matrix estimators given as $\hat{\Omega}$ and $\hat{\Lambda}$.

As a prelude to declaring the options which are available for estimating $\hat{\Omega}$ and $\hat{\Lambda}$, it will be necessary to properly determine the scalar estimator

$$\hat{\omega}_{1.2} = \hat{\omega}_{11} - \hat{\omega}_{12}\hat{\Omega}_{22}^{-1}\hat{\omega}_{21} \tag{3.6}$$

Equation (3.6) can be declared as the long-run variance of u_{1t} that is estimated conditional on u_{2t}. Furthermore, we may apply the correction of a degree-of-freedom to $\hat{\omega}_{1.2}$. Hence it can be demonstrated that null hypothesis for the Wald statistic $R\theta = r$ is

$$W = (R\hat{\theta} - r)'(RV(\hat{\theta})R')^{-1}(R\hat{\theta} - r) \tag{3.7}$$

Equation 3.7 possesses an asymptotic χ_g^2 (Chi-Square distribution) where g is defined as the restrictions that may be imposed by R. The restrictions which are imposed on the constant term or any other non-trending variables are not testable using the theory which underlies equation (3.7).

3.4. Estimation technique

The estimation technique for this study adopts a five-step procedure. The first step is the unit root test, which involves the determination of the order of integration, using the ADF - Fisher Chi-square and Phillips-Perron test statistic. The second test is for cointegration, uses the Engle-Granger single-equation cointegration test. The third step is the causality test. The fourth step is the impact relationship between the dependent and the independent variables, which is run over the sample period 1999 - 2016, using the Cointegrating Regression Method.

3.5. Sources of data

The data for this study is extracted from the World Development Indicators (WDI) on the selected variables used for analysis: Per capita income, Individuals using the Internet (% of the population), broad money and trade openness. WDI was an appropriate source because it offers a broad range of information on the variables. The data span is limited to 1999-2016 because of data availability. However, data on average savings was collected from the Central Bank of Nigeria Annual Statistical report for 2017. Data on national average savings is used as the proxy for the financial inclusion variable.

4. Empirical results and analysis

4.1. Unit root test

The unit root test is necessary to establish the stationarity status of the data. The order of integration may affect the longrun cointegration relation among the variables. The summary of the results of the unit tests are presented in Table 4.1. From the ADF test statistics, the results in 4.1 show that LGDPC, LNET, LFINC, LTOP and LBMN were all integrated at order one, that is I (1) or they became stationary at first difference. Comparing the variable levels with their first difference (the ADF unit root test statistic) and various associated probabilities, the conclusion can be drawn that all variables are integrated at order of one I (1). All variables are statistically significant at 1%, 5% and 10% critical values in first difference.

Table 4.1 - ADF Fisher Unit Root Test

Null Hypothesis: Unit root (individual unit root process)				
Series: LGDPC, LNET, LFINC, LTOP, LBMN				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			35.5722	0.0031

ADF - Choi Z-stat			-4.11214	0.0000
Intermediate ADF test results D(UNTITLED)				
Series	Prob.	Order of Integration	Max Lag	Obs
D(LGDPC)	0.0333	I(1)	1	16
D(LNET)	0.0274	I(1)	1	16
D(LFINC)	0.0079	I(1)	1	16
D(LTOP)	0.0005	I(1)	1	16
D(LBMN)	0.0278	I(1)	1	16

Source: Author's Computation

4.2. Single-equation cointegration test

The Engle-Granger tau-statistic (t-statistic) and the normalized auto-correlation coefficient (termed the z-statistic) both reject the null hypothesis of no cointegration at the 5% significance level (shown in Table 4.2).

Table 4.2 - Engle-Granger Cointegration Test

Series: LGDPC LNET LFINC LTOP LBMN						
Included observations: 18						
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*		
LGDPC	-3.236351	0.5395	-13.8279	0.4955		
LNET	-4.050655	0.2451	-16.3557	0.2864		
LFINC	-5.922507	0.0423	-24.1656	0.0312		
LTOP	-2.300762	0.8837	-10.0812	0.8034		
LBMN	-4.444544	0.1533	-18.7106	0.143		
Intermediate Results:						
		LGDPC	LNET	LFINC	LTOP	LBMN
Rho – 1		-0.813408	-0.9621	-1.18621	-0.59301	-1.10063
Rho S.E.		0.251335	0.237518	0.240977	0.257747	0.247635
Residual variance		0.002074	0.096448	0.005082	0.037211	0.004738
Long-run residual variance		0.002074	0.096448	0.005082	0.037211	0.004738
Number of lags		0	0	0	0	0
Number of observations		17	17	17	17	17
Number of stochastic trends**		5	5	5	5	5

Source: Author's Computation

The associated probability values are estimated from the MacKinnon response to the surface simulation results. Given the small sample size of the probabilities and critical values there is evidence of five cointegrating equations at the 10% level of significance using the tau-statistic (t-statistic) and evidence of five cointegrating equation at the 10% level of significance using the z-statistic. Therefore, both tests confirm the existence of longrun cointegrating relationship among the variables: LGDPC, LNET, LFINC, LTOP and LBMN.

4.3. Cointegrating regression results

Cointegrating regression is adopted to assess (i) the effect of internet usage on financial inclusion and (ii) the effect of internet usage and financial inclusion on per capita income.

4.3.1. Examining the effect of Internet usage on financial inclusion in Nigeria

The cointegrating regression test result on the effect of internet usage on financial inclusion (Table 4.3) indicates that internet usage (LNET) and broad money (LBMN) are positively related to financial inclusion (LFINC) with coefficients of 0.16 and 0.97 respectively while per capita income (LGDPC) and trade openness (LTOP) are negatively related to the dependent variable with coefficients of 0.33 and 0.11 respectively. However, only the coefficients of LNET and LBMN are significant while the coefficients of the other independent variables are insignificant. Therefore,

internet usage and broad money have positive and significant effect on financial inclusion in Nigeria.

Table 4.3. Internet Usage and Financial Inclusion

Dependent Variable: LFINC				
Method: Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNET	0.1609	0.0381	4.2283	0.0012
LGDPC	-0.3321	0.3257	-1.0194	0.3281
LBMN	0.9730	0.0748	13.0017	0.0000
LTOP	-0.1064	0.0698	-1.5232	0.1536
C	2.0133	2.4980	0.8060	0.4359
R-squared	0.9604	Mean dependent var		2.3336
Adjusted R-squared	0.9473	S.D. dependent var		0.3585
S.E. of regression	0.0823	Sum squared resid		0.0813
Long-run variance	0.0037			

Source: Author's Computation

Substituted Coefficients:
LFINC = 0.1609*LNET - 0.3321*LGDPC + 0.9730*LBMN - 0.1064*LTOP + 2.0133

4.3.2. Assessing the Effect of Internet Usage and Financial Inclusion on Per Capita Income

The cointegrating regression test result on the effect of internet usage and financial inclusion on economic activities (in Table 4.4) indicates that internet usage (LNET) and broad money (LBMN) are positively related to per capita income (LGDPC) with coefficients of 0.12 and 0.14 respectively while financial inclusion ((LFINC) and trade openness (LTOP) are negatively related to the dependent variable with coefficients of 0.08 and 0.12 respectively. However, the intercept, LNET and LTOP have significant coefficients while the coefficients of LFINC and LBMN are insignificant. Furthermore, the effect of the interaction between LNET and LFINC on LGDPC has a positive coefficient that is not significant. The positive impact of internet usage on income is not quite transmitted through the mechanism of savings in the economy.

Table 4.4. Internet Usage, Financial Inclusion and Per Capita Income

Dependent Variable: LGDPC				
Method: Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.64942	0.21275	35.95565	0.00000
LNET	0.11509	0.02199	5.23319	0.00020
LFINC	-0.08273	0.17516	-0.47228	0.64460
LNET*LFINC	0.03405	0.04534	0.75104	0.47180
LTOP	-0.11709	0.05406	-2.16584	0.04950
LBMN	0.14077	0.18286	0.76982	0.45520
R-squared	0.664035	Mean dependent var		7.592605
Adjusted R-squared	0.682047	S.D. dependent var		0.247241
S.E. of regression	0.054141	Sum squared resid		0.035176
Long-run variance	0.002225			

Source: Author's Computation

Substituted Coefficients:
LGDPC = 7.6494 + 0.1151*LNET - 0.0827*LFINC + 0.0341*LNET*LFINC - 0.11709*LTOP + 0.1408*LBMN

The elasticity direction of the coefficients indicates that with 100% change in the LNET and LBMN, LGDPC will change by 11.5% and 14.1% respectively in the same direction. Conversely, a 100% change in LFINC and LTOP will induce LGDPC to change by the magnitude of 8.3% and 11.7% respectively in the reverse direction.

The R-squared (0.66) and Adjusted R-squared (0.68) indicate good fit. About 68% of the variation in LGDPC is explained by the variation in the independent variables. Also, while the signs of the coefficients of LNET, LNET*LFINC and LBMN fall in line with our apriori expectations, the signs of the coefficients of LFINC and LTOP run contrary. It means that increase in average savings and trade openness did not induce increase in per capita income for the period.

5. Conclusions and recommendations

This study investigates the relationship between internet usage, financial inclusion and economic growth in Nigeria for the period 1999 to 2016. The time scope covered in the study is limited to mere sixteen annual observations as a result of the available data in Nigeria on financial inclusion and internet use. The conclusions drawn in this study are based on the magnitude and signs of the coefficients that arise from the cointegrating regression test that is conducted.

Internet usage and broad money have positive and significant effect on financial inclusion in Nigeria. Also, Internet usage has positive and significant effect on economic growth in Nigeria. Besides, the effect of financial inclusion on economic growth is negative, minimal and insignificant. However, the effect of the interacted coefficient of internet usage and financial inclusion on economic growth is positive, minimal and insignificant. Hence, the positive effect of internet usage on economic growth in Nigeria is not transmitted through the mechanism of financial inclusion.

While the effect of broad money on economic growth is positive and insignificant, the effect of trade openness on economic growth is negative and significant. Therefore, the country has not been enjoying positive net benefit of the level of trade with the rest of the world.

The government has to strengthen and improve on the positive gains of internet usage on the economy. Some of the gains highlighted include: improvement in research and technology, ease of data availability and flow, employment generation and improvement in leisure among others. Accordingly, the government should take measures to invest in more appropriate and modern telecommunications and internet infrastructure to further lower internet cost, improve the speed and availability. The provision of more steady power supply will lower the cost and improve the availability of the internet.

The government should take measures to encourage the drive for more savings to improve financial inclusion and ensure that investment is channeled into more productive areas to improve the economy. Along this line, the implementation of specific targets for the existing banks and other institutions should be enforced by the Central Bank. Banks must emphasis presence in more remote and rural locations and carry out activities to enhance savings and monetization of business transactions.

The policy makers should take measures to improve on the direction and quality of trade with the rest of the world. This may involve the actions and incentives to encourage the production and exports of more stable foreign exchange generating products.

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