



## **Broadband Penetration and Economic Growth: Evidence from Nigeria**

**S. V. Oloja<sup>1</sup>, Olubokun Sanmi<sup>2\*</sup>, O. A. Obolo<sup>1</sup> and M. F. Ayinuola<sup>2</sup>**

<sup>1</sup>*University Medical Sciences, Ondo, Nigeria.*

<sup>2</sup>*Achievers University, Owo, Nigeria.*

### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author SVO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors OS and OAO managed the analyses of the study. Author MFA managed the literature review. All authors read and approved the final manuscript.*

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### **ABSTRACT**

This paper investigated the relationship between broadband penetration and economic growth in Nigeria. The secondary data for the study were collected from the World Bank and this includes data on Internet broadband usage and Gross Domestic Product while the primary data were generated from the questionnaire administered to the respondents. The descriptive statistics and the ordinary least square regression analytical method were used to examine the relationship between broadband penetration and economic growth. It was discovered that a per cent increase in broadband penetration will only increase output (Economic Growth) by 0.1 per cent in Nigeria. The data analysis showed a significant and positive relationship between broadband penetration and economic growth. The study thus recommended that efforts must be made towards the implementation of broadband policy and effective utilization of the broadband network. Also, better telecommunication reforms that will create enabling environment and encourage the inflow of broadband networks should be made.

\*Corresponding author: E-mail: [olubokunsanmi@yahoo.com](mailto:olubokunsanmi@yahoo.com);

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## 1. INTRODUCTION

The service industry is now a dynamic and dominant factor for economic development and the bedrock of economic competitiveness among nations. High-speed broadband Internet Protocol (IP) networks have become integral to daily life. As one of the few general-purpose technologies, broadband is becoming increasingly pervasive, continually improving and catalyzing new inventions and innovations. Internet and Broadband are like two different spears targeting the same object within the context of the Global System of Mobile communication (GSM) in Nigeria.

In Nigeria, the mobile telecommunication industry in Nigeria has over the past 12 years gained popularity amongst other service industries. Daily activities such as banking, commuting, education, entertainment, governance, manufacturing, medical care and shopping are increasingly dependent on telecommunications networks. Some of these mobile telecommunication industries include MTN, Globacom, Airtel, Etisalat, Visafone, Multilinks and Starcomms. The massive deployment of digital mobile services across the country and the rate at which they are being subscribed to have demonstrated the significance of the ICT services to the people. Consequently, the Global System of Mobile communication (GSM) has passed through different phases. Since the introduction of the mobile phone in the 1980s, they have experienced considerable acceptance worldwide. Mobile phones have evolved from analogue to digital [1,2]. The first generation of mobile phones was analogue, but subsequent generations have been predominantly digital [3]. Nigeria, like in any other developing countries the mobile phone has been instrumental to the rapid increase in telecommunications accessibility. In 2001, digital mobile telephony was introduced in Nigeria and had less than 500 thousand telephone lines. However, by April 2008, the numbers of telephone lines were put at about 43.5 million lines and since then the number of telephone subscribers has been on the increase to 1.2 million every month. This trend continues and in less than 10 years, the number of subscribers in Nigeria had tripled the number of lines the whole continent had, due to the mobile revolution [3]

However, in spite of the tremendous growth in the number of subscribers and improvement in broadband penetrations in Nigeria, it appears the impact on economic growth has been insignificant. In other words, the growth in the telecommunication subsector has not explained output growth in the economy. As a result, researchers have not been able to establish a statistically significant link between broadband penetration and economic growth in Nigeria. To this end, several questions have been raised on the situation: what has been the impact of broadband penetration on economic growth? How efficient and effective is broadband penetration in improving the quality of service offered to subscribers through network decongestions? Do the network providers claim of improved service delivery through broadband penetration realistic?

Against this background, this study seeks to investigate the nexus between internet broadband penetration and economic growth in Nigeria. Specifically, the study tends to investigate the growth implication of broadband penetration on network subscribers in Nigeria. Following this introduction, the remaining parts of the paper are organized as follows: Section two covers the literature review and the theoretical underpinnings. Section three presents the methodology of the study. Data analysis and interpretation of the result is the main thrust of section four while section five draws up policy recommendations and concludes the paper.

### 1.1 Literature Review

The literature that explores statistical evidence regarding the economic impact of broadband is fairly recent and scanty. It was discovered from the available sources reviewed that there are multiple approaches to estimate the economic impact of broadband, ranging from highly sophisticated econometric techniques to qualitative micro-level case studies. Not all approaches are suitable for all situations. The choice of analytical techniques will be driven by the availability of data and the type of effect to be analysed. The study of the impact of broadband on economic growth covers numerous aspects, ranging from its aggregate impact on GDP growth to the differential impact of broadband by industrial sector, the increase of exports, and changes in intermediate demand and import

substitution. While the research on the contribution of broadband to GDP growth has confirmed its positive impact, it has also yielded results that vary widely. Constrained by data availability, the analyses have primarily focused on OECD countries.

Gillett et al. [4] present a first attempt to measure broadband's impact by applying controlled econometric techniques to national-scale data. After controlling for community-level factors that affect broadband availability and economic outcomes (income, education, and urban vs. rural character) the results show that broadband access enhances economic growth and performance and that the economic impact of broadband is real and measurable. In particular, they find that for the period 1998-2002 communities in which mass-market broadband became available by December 1999 experienced more rapid growth in employment, the number of businesses overall and businesses in IT-intensive sectors. They don't find a statistically significant impact on wages but the higher market rents imply an impact on property values. In like manner,[5] the impact of broadband penetration for 48 states of the US from 2003 to 2005. They, however, found that the variables are not statistically significant. In the same vein,[6] examined the relationship between the two variables from 25 OECD countries. It was discovered that a 10 per cent increase in broadband penetration raises per capita GDP growth by 0.9- 1.5 percentage point. In his contribution, [7] examined the relationship between broadband penetration and economic growth among 22 OECD countries. The study found that an increase in broadband penetration of 10 per cent yields 0.25 per cent increase in GDP.

In a related development, [8] investigated the high income, low income and middle-income economies in separate studies. For instance, [8] investigated broadband penetration and GDP growth for 66 high-income countries. It was discovered that a 10 per cent increase in broadband penetration yielded an additional 1.21 percentage points of GDP growth rate.

## 2. METHODOLOGY

Ondo State was created in 1976 from the former Western State and it originally included what is now Ekiti State, which was carved out in 1996 by late General Sanni Abacha. The state covered the total area of the former Ondo Province,

created in 1915 with Akure as the provincial headquarters. Ondo State took off formally on 1st April 1976, consisting of the nine administrative divisions of the former Western State, which then were Akoko, Akure, Ekiti Central, Ekiti North, Ekiti South, Ekiti West, Okitipupa, Ondo and Owo. Presently, the state comprises of three senatorial districts.

Ondo State which has a landmass of about 14,788.723 Square Kilometres (km<sup>2</sup>) and it geographically lies entirely in the tropical belt. The state lies between latitudes 5°45' and 7°52'N and longitudes 4°20' and 6°05'E. Its land area is about 15,500 square kilometres. Ondo State is bounded on the east by Edo and Delta states. The state is bounded on the north by Ekiti and the Kogi States; in the east by Edo State; in the west by Osun and Ogun States, and the south by the Atlantic Ocean. The state is predominantly occupied by the Yorubas who speak various dialects of the language such as the Akoko, Akure, Apoi, Idanre, Ijaw, Ikafe, Ilaje, Ondo and the Owo. Ondo State, which is indeed a microcosm of the Nigerian nation, is blessed with resourceful, industrious and hospitable people. Her crop of the educated elite has led to its being classified as one of the most educationally advanced states in Nigeria. With a population of 3,441,024 comprising 1,761,263 males and 1,679,761 females, the people of the state are mostly subsistence farmers, fishermen and traders. The life patterns of the people represent an embodiment of culture, ranging from the local foodstuff to the mode of dressing, dancing, wood crafts, such as carved house posts and decorated doors. The culture of the Ondo State people speaks volumes [9].

### 2.1 Research Design

A research design is a systematic plan to study a scientific problem. The study used the survey research design approach for data analysis. The survey research design does not give room for the manipulation of the situations, circumstances or experience of the participant as the case may be.

#### 2.1.1 Data requirement and method of collection

The study made use of both Primary and secondary data. The information was generated using a structured questionnaire instrument and direct observation and interview where applicable. However, secondary data for the

study were generated from the world bank. Data required for the study included Real GDP, Broadband Usage Per 100 and certain relevant socio-economic characteristics of respondents from three Universities within the state (FUTA, AAUA and OSUSTECH). The mobile telecommunication networks that were chosen for the research are the GSM and CDMA operators. They include MTN, Globacom, Airtel, and Etisalat. This is carefully chosen to capture Ondo State.

2.1.1.1 Sampling technique

Random sampling technique is also known as probability sampling technique was used to administer the questionnaire. A total of 144 questionnaires were filled by different

respondents from the three senatorial district of Ondo State.

3. DATA DISCUSSION AND ANALYSIS

Table 1 represents the respondent's, owning a mobile phone with the current service provider. The highest percentages of respondents were those that were subscribed to their current service provider with an age bracket of 21 - 25 years which represent 56.94% of the total population size.

Table 2 shows Internet Access connection with Respondent's mobile phone. This type of handset has internet access. It also enables one to perform any wireless connection over the internet.

Table 1. Respondents owning a mobile phone with the service provider

	Frequency			Frequency	Valid percentage	Cumulative percentage
	Yes	No	Not sure			
Valid 16-20	25	1	1	27	18.75	18.75
21-25	75	6	1	82	56.94	75.69
26-30	22	0	0	22	15.28	90.97
31-35	10	0	0	10	6.94	97.91
Over 36	3	0	0	3	2.08	100
<b>Total</b>	<b>153</b>	<b>7</b>	<b>2</b>	<b>144</b>	<b>100</b>	

Source: researchers' computation (2014)

Table 2. Internet access connection with respondent's mobile phone

	Frequency			Frequency	Valid percentage	Cumulative percentage
	Yes	No	Not sure			
Valid 16-20	20	6	1	27	18.75	18.75
21-25	68	8	6	82	56.94	75.69
26-30	19	3	0	22	15.28	90.97
31-35	9	1	0	10	6.94	97.91
Over 36	3	0	0	3	2.08	100
<b>Total</b>	<b>119</b>	<b>18</b>	<b>7</b>	<b>144</b>	<b>100</b>	

Source: researchers' computation (2014)

Table 3. Rated network in chosen experience with value-added services

	Frequency excellent	Good	Fair	Low	Not sure
Valid 16-20	7	11	3	0	6
21-25	12	42	13	1	14
26-30	2	11	6	1	2
31-35	2	3	4	0	1
Over 36	2	0	1	0	0
<b>Total</b>	<b>25</b>	<b>67</b>	<b>27</b>	<b>2</b>	<b>23</b>
<b>Valid per cent</b>	<b>17.36</b>	<b>46.53</b>	<b>18.75</b>	<b>1.39</b>	<b>15.97</b>

Source: researchers' computation (2014)

**Table 4. Do the respondent enjoy the service paid for**

	Frequency			Frequency	Valid percentage	Cumulative percentage
	Yes	No	Not sure			
Valid 16-20	17	4	6	27	18.75	18.75
21-25	54	15	13	82	56.94	75.69
26-30	14	6	2	22	15.28	90.97
31-35	6	2	2	10	6.94	97.91
Over 36	3	0	0	3	2.08	100
<b>Total</b>	<b>94</b>	<b>27</b>	<b>23</b>	<b>144</b>	<b>100</b>	

Source: researchers' computation (2014)

**Table 5. Regression result**

Regress Eco growth broadband						
Source	SS	DF	MS			
Model	.000339851	1	.000339851			
Residual	.006220149	13	.000478473			
Total	.00656	14	.000468571			
Ecogrowth broadband	Coef.	Std.Err	t	P>[t]	[95% Conf. Interval]	
_cons	0.0016858	.0020002	0.84	0.415	-.0026355	.006007
No of Obs	.0062904	.0107508	0.84	0.568	-.0169353	.0295161
F(1, 3)	15					
Prob> F	0.71					
R squared	0.4146					
Adj R Squared	0.0518					
Root MSE	-0.0211					
	.02187					

From Table 3 we see that the percentage distribution of Good is the highest. It is a known fact that people do prefer describing condition to be good with the service provider. While the lowest rating was low of 1.39% which shows that in respect to rating the service provider has fairly a pass mark from over the existing of telecommunication in Nigeria broadband as this would be shown relevant in the chi-square analysis that would be calculated in our chapter four, based on the predefined hypothesis to be made.

Table 4 shows the frequency distribution of the four mobile telecommunication networks used for the survey with age bracket of 21 -25year having the highest frequency distribution of 56.94%, followed by 16 - 20 years with a frequency distribution of 18.75% and the least of over 36 years having 2.08%

Table 5 is the regression result analyzed with STATA, showing the impact of broadband penetration on economic growth in Nigeria.

From the table, it was discovered that broadband penetration has marginally contributed to

economic growth since its inception in Nigeria. The result shows that a per cent increase in broadband penetration will only increase output (Economic Growth) by 0.1 per cent in Nigeria. This finding is consistent with that of [6] who argued that a 10 per cent increase in broadband penetration raises per capita GDP growth by 0.9-1.5 percentage point in a study of 25 OECD countries

**4. CONCLUSION**

The study has surveyed the theoretical and empirical literature on broadband penetration and investigated its impact on economic growth in Nigeria. The research study attempted to track empirically the growth of broadband penetration in Nigeria and to see how it relates to economic performance. The results generated from our descriptive statistics and regression result yielded several important findings:

- There is a positive relationship between broadband penetration and output growth and implying that the growth of broadband penetration tends to improve output growth in Nigeria.

- The magnitude of the impact of broadband penetration on economic growth in Nigeria has increased marginally in the study period.
- It was discovered that the bulk of the subscribers that enjoys broadband penetration are mostly youth.
- The network provider can increase their profit if internet connections can be assessed ubiquitously

The findings of the study support our earlier discovery on the growth and growth implications of broadband penetration, which argued that broadband penetration did promote growth in the economy [4,10,6,7]

Taken together, these results have important implications for policy. First, the growth of broadband penetration suggests a huge potential for economic growth in Nigeria if maximally exploited. Efforts must be made towards the implementation of broadband policy and effective utilization of the broadband network. Appropriate policy measures by the Nigerian Communication Commission (NCC) that would monitor the maximum and effective utilization of internet broadband facilities are therefore required. Also, better telecommunication reforms that will create enabling environment and encourage the inflow of broadband networks should be made.

#### DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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