MJSAT

Malaysian Journal of Science and Advanced Technology

journal homepage: https://mjsat.com.my/

Effect of Total Active Voice Call Subscribers on Economic Growth in Nigeria: An Application of Cross-Sectional Panel Data Model

[1]Samuel Olorunfemi Adams*[1], Davies Oluwatobi Emmanuel[1], and Chima Paul[2]

[1] *Department of Statistics, University of Abuja, Abuja, Nigeria*
[2] *Department of Public Administration, University of Abuja, Abuja, Nigeria*

KEYWORDS

Panel Data Regression Voice over Internet Protocol (VOIP)
Total number of active voice call subscribers (TNAVCS)
Growth rate (GR)
Global system for mobile communication (GSM).

ARTICLE HISTORY

Received 25 July 2023
Received in revised form 11 September 2023
Accepted 18 October 2023
Available online 22 October 2023

ABSTRACT

This study assesses the effect of active voice calls on Nigeria's economic growth rate. The data utilized in the study was extracted from telecom reports produced by the Nigeria Bureau of Statistics (NBS), and it was gathered between 2017 and 2021, the period following the economy's first spell of consecutively negative growth since it emerged from recession. The data were subjected to regression using fixed effect (FE), random effect (RE), and pooled ordinary least squares (POLS). The study's findings showed that the RE regression model was the most effective. Additionally, it was shown that there is a positive and significant correlation between the total number of active voice call subscribers (TNAVCS) and Nigeria's annual economic growth rate (GR). The conclusion suggests that as the total number of active voice call subscribers' rises, so does Nigeria's annual economic growth and development, with the total number of active voice call subscribers accounting for more than 86% of the annual economic growth rate and the stochastic error term accounting for the remaining percentage. Therefore, it can be concluded that the main elements that have favorably impacted Nigeria's annual economic growth rate during the study period are the total number of active voice call users. Therefore, this study suggested that the total number of active voice call users is a significant factor that favorably influences Nigeria's annual growth rate.

1. INTRODUCTION

Voice calling is the use of a telephone to make live calls to friends, family, and coworkers as well as to communicate with them in real-time. It promotes communication at all levels of your company, which can increase customer satisfaction and enhance consumer trust [1]. When two people use a phone to call each other from a separate location, this is known as voice calling. Without a doubt, communication is one of the main forces behind every economy. Nigeria is not excluded from the race for quick development, as mismanagement over the years has negatively affected its rate of growth and development [2]. Voice over Internet Protocol (VOIP), a voice-calling-compatible internet network, and cloud communications is a technology that makes it easier and more affordable for companies to benefit from local and international calls. Mobile telecom services continue to present unheard-of prospects for economic growth in both developing and developed countries, and they are now a crucial component of how the economy operates [3]. Today's active phone call users contribute significantly to Nigeria's economic, political, and social development, it is anticipated that it will promote economic development and expansion, like any infrastructure. Voice calls have been demonstrated to be employed in a variety of commercial production and distribution operations, the provision of social services, and government administration, [4]. The fourteen years evolution of the Global system for mobile communication (GSM) in Nigeria has been too difficult due to excessive prices and subpar services provided to innocent Nigerians as well as the high cost of GSM lines and mobile phones at the beginning of the GSM carriers in Nigeria [5]. So many households have benefited from voice calls, as mobile customers may now reach family members much more easily, especially in case of

*Corresponding author:
E-mail address: Samuel Olorunfemi Adams <samuel.adams@uniabuja.edu.ng>
https://doi.org/10.56532/mjsat.v3i4.175

an emergency. It is a crucial piece of infrastructure that supports the growth of other industries and sectors, including agriculture, banking, education, health, industry, defense, transportation, and tourism. In times of a national catastrophe or natural disaster, it is essential. It stops rural-urban migration and significantly lessens the hazards and hardships of travel. To preserve and grow competitive advantage at all levels, national, regional, and firm, voice calls are increasingly frequently regarded as a strategic investment because it serves as the foundation, infrastructure for the entire information economy, enhanced customer care, cost-savings, and productivity. It is a crucial link between producers, wholesalers, and retailers and is a crucial component of financial services, commodities markets, media, transportation, and the travel industry. Despite moves by telecommunication companies to increase the cost of their services due to harsh economic realities, the Nigerian government is set to impose a new tax on voice calls in the country that is the equivalent of a minimum of one kobo to meet the needs of Nigerian citizens considered to be most vulnerable to health challenges. According to research, the mobile communication sector supported approximately 500,000 employment in Nigeria in 2017 and added $21 billion, or 5.5% of the total Gross domestic product (GDP) to the nation's GDP. The study by [6] claims that the digital economy also contributed $1.8 billion in taxes, or 16% of all government tax collection in Nigeria. It is confirmed that Nigerian daily life has improved as a result of the government, industry, and consumer embrace of digital services. The telecom sector not only makes a large contribution to a country's economic activity but also to the expansion of other economic sectors, making it a crucial enabler of productivity across economies and societies.

In this study, panel data regression statistical methodology was employed to test the causal relationship between active voice call subscribers and Nigeria's economic growth rate is investigated. In the majority of case studies, it was automatically assumed that as communications investment rises, so will economic growth. Usually, this assumption was made without considering the possibility of a causal connection with an active voice call. Investment in telecommunications, without a doubt, aids in the expansion of infrastructure development for stimulation and acceleration of the economy. The question of how much this investment in Nigeria's active voice subscriber base contributes to the GDP growth rate of the country's economy naturally emerges. This study fills the knowledge vacuum by investigating the impact of voice calls on Nigeria's annual economic growth rate. The study will also determine how active voice call subscribers affect the economy of Nigeria.

2. LITERATURE REVIEW

Numerous studies have been conducted on the impact of telecommunication on a nation's political, social, and economic growth. [7] looked into the long-term correlation between telecommunications infrastructure and economic growth. For the estimate, a dynamic panel data technique that corrects for omitted variables bias in single equation cross-section regression is applied. After adjusting for several other parameters, the results reveal a strong and positive association between telecommunications infrastructure and growth. Twenty-two nations from the OECD were the subject of a study undertaken by [8] that covered the years 2002–2007, using a simultaneous equation statistical method. The result revealed that a significant causal non-negative association exists when a crucial mass of infrastructure is involved. According to [9], the increase in GDP and productivity are strongly correlated with the diffusion of mobile telephony. According to [10], economic growth in the panel of OECD nations between 1996 and 2007 was predicted to be impacted by broadband infrastructure, which facilitates high-speed internet. The results showed that yearly per capita growth was increased by 0.9–1.5 percentage points for every 10 percentage point rise in broadband penetration. The results hold up well when controlling for the linear second-stage effects of our instruments as well as country and year-fixed effects. The instruments forecast broadband adoption but not the spread of modern technologies like personal computers and mobile phones. [11] looked at the impact of the GSM sub-sector on the Tele-density rate using ordinary least square estimators. According to the Classical Linear Regression Model (CLRM) assumptions, it was found that the model is reliable and stable. The study also indicated that GSM has a positive impact on Nigeria's economic growth and telecommunications sector. Using their impact on per capita income [12] assessed the impacts of broadcast communications entrance on people groups' everyday environments in Africa. Generally speaking, the discoveries showed that while web use doesn't fundamentally add to financial development, versatile, and landline communication considerably affect individuals' everyday environments in Africa. In any case, the outcomes show that decent communication, portable communication, and Web use all essentially influence development in upper-center pay nations, while just cell phone entrance fundamentally influences development in both upper-low-pay and low-pay nations.

At the point when these nations are isolated into three gatherings as per the 2008 World Bank grouping models of being upper-center, upper-endlessly low pay nations, the outcomes show that decent communication, portable communication, and Web are very useful. [13] lead an observational examination of the drawn out relationship between media transmission venture and monetary development in a few Asian countries. The review used yearly information from 1990 to 2010 for 23 Asian countries and utilizes econometric investigations, for example, board unit root tests and board co-joining tests. The observational discoveries suggest a causal connection between monetary development and broadcast communications venture. Interest in broadcast communications and monetary development are causally related, yet not in any case, on the grounds that the media communications industry is normally ready to give and contribute altogether to financial development. Utilizing econometrics and development bookkeeping. [14] found that the quantity of voice call endorsers of versatile organizations in Singapore has a critical positive relationship with esteem added and financial development, quite in the assembling area. The influence of mobile phone evulsion on employment opportunities in sub-Saharan African nations was investigated by [15]. The study revealed that since prepaid services are dominant in countries within Sub-Saharan African, purchasing the prepaid card needs an efficient and excellent network of individuals, wholesalers and even informal sellers, thereby producing economic growth and job opportunity for the unemployed youths

A second study by [16] that employed the internet consumption model discovered that a 10% increase in information and communication technology (ICT) investment causes an average of 0.6% increase in growth. According to survey data from [17] that used broadband internet as a stand-in for telecoms, there is a positive correlation between mobile phone usage and economic growth. The study also revealed that the endogenous relationship between GDP and a country's mobile technology is the main issue to be addressed in research on the effects of active voice call customers. The impact of telecommunications infrastructure in sub-Saharan Africa was studied by [18]. The study used panel data from 47 nations collected from the world development indicators database from 1993 to 2012 and applied the generalized method of moments. The findings demonstrate how the internet and mobile devices have aided in economic expansion. Internet and mobile phone usage both contribute one percent to growth, increasing it by 0.12 and 0.03 percentage points, respectively. Using a panel dataset for the G-20 nations from 1990 to 2014. [19] investigated the relationships between the use of mobile phones, foreign direct investment, financial development, imports of ICT items, and economic growth. It was discovered that all of the variables are co-integrated using a multivariate framework. The results also show a network of short and long-term causal links between the variables, including a long-term unidirectional causal link between foreign direct investment and financial development and the spread of mobile phones and economic expansion. Structural equation models, instrumental variables, ordinary least square (OLS) fixed effects estimates, and dynamic panel data models with various cross-sectional data were used by [20 – 22].

According to [23], investments in telecommunications are being recognized more and more as having a significant potential to boost economic growth and productivity. The long-term association between telecommunications infrastructure and economic growth was empirically investigated. For an estimate, a dynamic panel data technique that corrects for omitted variables bias in single equation cross-section regression is applied. The 'fixed-effects' formulation takes into account the unique variations in aggregate production functions among the states. After adjusting for some other parameters, the results reveal a strong and positive association between telecommunications infrastructure and growth. [24] looked at how much telecommunications innovation and technology have aided both developed and developing countries economic growth. In both rich and emerging nations, empirical results demonstrated the existence of the kink effect in the relationship between telecommunications development and economic growth. The impact of tax income, as measured by Value Added Tax (VAT), on economic growth, as measured by the Real GDP of the telecommunication sub-sector, was explored by [25]. The annual time series data used for the study included the years 2001 through 2018 and were estimated using the Autoregressive Distributed Lag (ARDL) method. The study concluded that tax income has a favorable impact on the expansion of Nigeria's telecommunications industry. [26] studied how cash positioning affected mobile network providers' performance in Nigeria, particularly the increase in the number of active voice call subscribers. [27] used data from 2001–2017 and applied ARDL methodology to analyze the effect of mobile phones on economic growth in Nigeria. According to the report, real GDP per capita increased as a result of increased mobile penetration which means as more people get access to mobile phones, GDP per capita is expected to grow; therefore a 10% increase in mobile penetration will lead to a 0.5 % increase in average annual GDP per capita. A summary of the reviewed studies indicated that a gap exists since no study has been done on the impact of active voice calls on Nigeria's economic growth, even though there is empirical literature accessible on telecommunication and economic growth rate.

3. MATERIALS AND METHODS

3.1 Data

From 2017 to 2021, a secondary data, which is the cross-sectional data on the active voice call subscriber count and the five-year annual growth rate for Nigeria's 36 states and Abuja, the federal capital territory, were collected. This is amid the first stretch of continuous negative growth in the telecommunications sector since the recovery from the recession.

3.2 Model Specification

The panel data model utilized in this study is given as:

$$\log(GR_t) = \beta_1 + \beta_2 \log(TNAVCS_{it}) + \epsilon_i \quad (1)$$

Where, GR is the growth rate expressed as the log of the percentage change over time for a specific metric period, β_1 is the constant; $\beta_2$is the regression coefficient, which represents the estimated rise in the dependent variable. The total active voice call subscriber count (TNAVCS) is calculated as the log of voice call subscribers to various mobile networks; ϵ_i is an Error term; t is the period from 2017 to 2021. The ideal and practical logarithm for both variables is used in this study to standardize the dataset, provide the minimum prediction error feasible, and enhance the model's fit to a more regularly shaped bell curve.

3.3 Data Analysis Techniques

Panel data regression analysis, which combines time series and cross-sectional data, was employed in this study. As indicated by [28 - 30], it is rehashed perception on similar cross-segment, sort of individual factors that are checked north of a few periods. It is a significant method for longitudinal information examination since it empowers a few regression investigations in both the fleeting (time) and spatial (units) aspects. The temporal perspective alludes to occasional verbose perceptions of a gathering of factors in the cross-segment units all through a particular period (for example 2017-2021), the geological viewpoint connects with many cross-sectional observational units, which are the 37 states. This statistical method was utilized to test the relationship and effect of active voice calls on Nigeria's economic growth rate. The assumption underlying the applicability of this statistical methodology like; stationarity, normality, multicolinearity and autocorrelation shall be considered in the pre-analysis test.

3.3.1 Random Effect Model

We accepted in the fixed-impacts model that changes in the coefficient esteem sufficiently mirrored every individual distinction. We believed that the coefficient β_{1i} are "fixed"

boundaries that we could straightforwardly assess with the least squares assessor. Despite the fact that we recognize that the people in our example were picked aimlessly, we actually expect in the irregular impacts model that all singular distinctions are caught by the capture boundaries. Thus, we treat individual contrasts as arbitrary as opposed to fixed, as we did in the fixed-impacts faker variable model. By characterizing the block boundaries $\beta_{1i}$to have a decent part that addresses the populace normal, $\bar{\beta}$, and irregular individual contrasts from the populace's normal u_i, we might remember arbitrary individual contrasts for our model. The model is composed as

$$\beta_{1i} = \beta_1 + u_i \quad (2)$$

The irregular distinctions u_i otherwise called irregular impacts, are similar to arbitrary residuals in that they have a zero mean, are unrelated with each other, and have a steady change σ_u^2, so that

$$E(u_i) = 0, \ \ cov(u_i, u_j) = 0 \ \forall i \neq j, \ \ var(u_i) = \sigma_u^2 \quad (3)$$

Rewriting equation (2) into (3):

$$y_{it} = \bar{\beta}_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + v_{it} \quad (4)$$

and now $\bar{\beta}_1$ is the capture boundary and the residual term v_{it}, it is comprised of the part e_{it}, which is the regular regression irregular error, and the part u_i, which mirrors an arbitrary individual impact. The consolidated error is given as

$$v_{it} = u_i + e_{it} \quad (5)$$

The random impacts equation is as often as possible alluded to as the irregular impacts regression residual since it incorporates two parts, one for the regression and one for the person.

3.3.2 Fixed Effect Model

One method for perceiving the presence of variable qualities in a panel information model is to permit variable residual in various periods to be related. In fixed-impact models, the coefficient n the model is permitted to fluctuate across space. A subsequent way is to loosen up the assumption that all variables have similar coefficients, this gives the model

$$y_{it} = \beta_{1i} + \beta_{2i} x_{2it} + e_{it} \quad (6)$$

In equation (6), every one of the addendums has an i after it, proposing that (β_1, β_2) can change contingent upon the variable. Albeit this model is a real one for panel information, it isn't fitting for boards that are short and limited. Each heterogeneity, or all social fluctuation between variables, should be covered by the intercept. To "demand" for individual-explicit, time-invariant attributes, each intercept are given. Having these qualities makes a model a proper impacts model. Two strategies are used to appraise condition (6). The coefficient are known as fixed impacts, and the expression "fixed impacts" are usually alludes more to the assessment interaction and different assumption that we make than it does to whether the coefficient are random or fixed.

3.3.3 Pooled Regression Model

A pooled model is one where the information on various variables are basically pooled along with no arrangement for individual contrasts that could prompt various intercept. A pooled model can be composed as

$$y_{it} = \beta_1 + \beta_2 X_{it} + \mu_{it} \quad (7)$$

The initial observation to see is the two addendums: i to mean the ith variable and t signify the tth time. Hence, y_{it}, for instance, addresses the th samples on the response variable for the ith member. Expecting we have T perceptions on N population, the parameter i and t are given as; $i = 1,2, \dots, N$ and $t = 1,2, \dots, T$, which implies the sum of NT.

3.4 Durbin-Wu-Hausman (DWH) Model Selection Test

The Durbin-Wu Hausman test is a method of contrasting the irregular and fixed impacts models is an overall thought. The premise of the Hausman test is that if there is no correlation between u_i and the explanatory variablesxit, then both the fixed and random effects estimators are consistent. One variation of the test proposed by [31] is addressed by this test measurement. Contrasting the irregular and fixed impacts models is an overall thought. In enormous examples, assuming the two assessors are solid, they should arrive at the genuine boundary esteem k. At the end of the day, the assessments for arbitrary impacts and fixed impacts should be similar for enormous examples.

Then again, the proper impacts gauge is steady regardless of whether u_i is related with anyx_{kit}, though the arbitrary impacts assessor is conflicting. The decent impacts assessor consequently combines to the certified boundary values in enormous examples, though the irregular impacts assessor joins to an alternate worth that isn't the genuine boundary esteem. In this case, we expect errors between the appraisals from fixed and irregular impacts. A simple method for interpreting the consequences of a Hausman test is to dismiss the invalid speculation if the p-esteem is low (under 0.05). The issue emerges from the presence of various test cycles with different speculations and likely results, a portion of the tests that are accessible deal contradicting results about the invalid theory [32].

4. RESULTS AND DISCUSSIONS

4.1 Summary Statistics

The statistical technique employed in this study is the panel regression model, which involves; the random, fixed, and pooled regression model, where the Durbin-Wu-Watson specification test was employed to check the models' performance. The descriptive statistics for the variables utilized in this investigation are shown in Table 1. It is discovered that both the standard deviations and the annual growth rate exhibit significant variances. The same discovery is made when the descriptive statistics for the explanatory and response variables are critically examined, it was observed that the average and median of the yearly growth rates of both TNAVCS and GR are 16.51 and 1.24 respectively. Table 2 shows that the p-value total number of active voice call subscribers (TNAVCS) and growth rate (GR) are 0.6303 and 0.6011, respectively, indicating that the sample data are normally distributed.

The data are stationary at the level since the p-value is less than the level of significance of 0.05, according to the test for stationary data shown in Table 3. Since the level of the series remains essentially constant throughout, the time series plot of the first difference shows that the mean and variance are stationary. Therefore, it is evident from the visual in Figure 1 that the mean is precisely zero, which results in a stationary series.

Table 1. Descriptive statistics

Variables	N	Range	Minimum	Maximum	Mean	Median	Variance	Std. dev.
TNAVCS	185	3.27	15.12	18.39	16.51	16.51	0.36	0.60
GR	185	1.63	3.51	5.14	1.24	1.24	1.15	1.07

Table 2. Shapiro-Wilk's Test of Normality

Variables	W	P-value	Alpha
TNAVCS	0.97498	0.6303	0.05
GR	0.95442	0.6011	0.05

Table 3. Augmented Dickey-Fuller Test for Stationary using

Variables	Dickey-Fuller	P-value	Lag Order
TNAVCS	-4.2857	0.01	5
GR	-6.0826	0.01	5

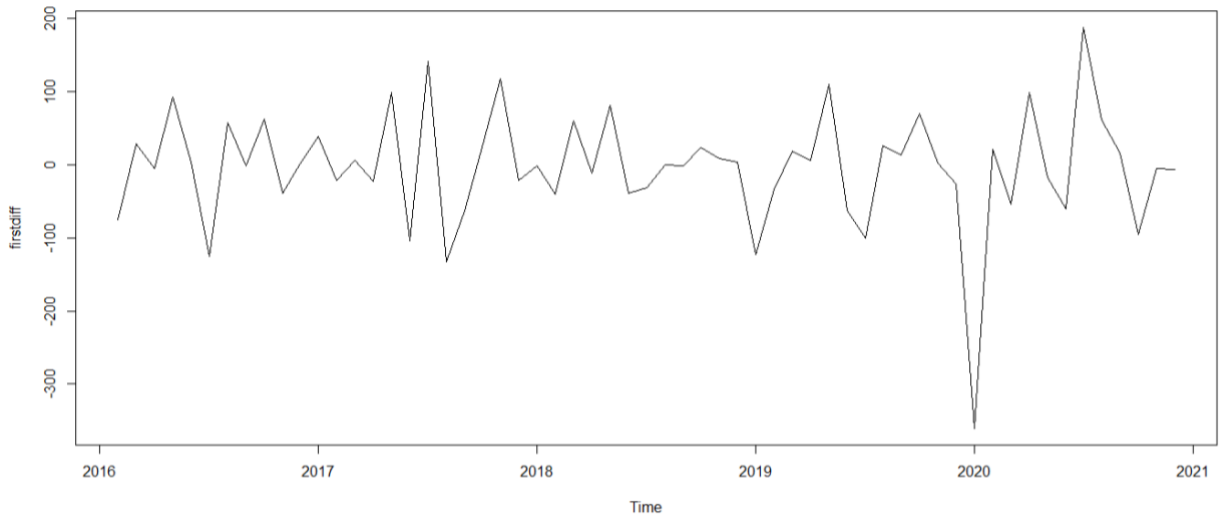

Figure 1. Time Series Plot of the First Difference

4.2 Panel Data Analysis

The results of the random effect regression model are shown in Table 4. The coefficient and p-value are given as (β_1 = 0.31458) and Pr(>|t|)=0.008948 at the 1% and 5% significant level, respectively, and they demonstrate a positive and significant relationship between TNAVCS and yearly GR. This result is confirmed with a correlation coefficient result of 0.92734. The study concludes that Nigeria's annual economic GR is significantly influenced by the TNAVCS. The investigations from [12] and [33] support this conclusion. The TNAVCS accounts for more than 86% and 80.7% of the variation in the annual economic GR, according to the R square and adjusted R square, respectively, for the random effect regression model, leaving the remaining percentage unaccounted for due to the presence of the stochastic error term. The TNAVCS and Nigeria's annual economic GR were both significantly correlated, according to the chi-square statistic and p-value of (χ^2 = 6.83324, p-value = 0.01947).

According to the results of the fixed effect regression model shown in Table 5, there is a substantial and positive relationship between the TNAVCS and Nigeria's annual economic GR. The correlation coefficient result of 0.90233 confirmed this findings. According to the coefficient and p-value (β_1= 0.30447 and Pr(>|t|)=0.01267), Nigeria's annual economic GR is significantly influenced by the TNAVCS at the 1% and 5% significant levels. In August this year, the National Bureau of Statistics (NBS) released data on active

voice calls' contribution to Gross Domestic Product (GDP) for 2022. According to NBS statistics, it has contributed 12.12% to total nominal GDP and 18.44% per cent to total real GDP in the second quarter of 2022. The Telecom services are the major contributor to the total nominal GDP in the first two quarter of 2022. It also contributes 76.29%, and 79.49% to the total real GDP in Nigeria. Explaining the sector's impact on the economy, NBS said, "in nominal terms, in the second quarter of 2022, the sector growth was recorded at 14.11% (year-on-year), 14.18% points increase from the rate of -0.07% recorded in the same quarter of 2021, and 6.43% points lower than the rate recorded in the preceding quarter. The quarter-on-quarter growth rate recorded in the second quarter of 2022 was 14.13%. Active voice calls contributed 12.12% to the total nominal GDP in the 2022 second quarter, lower than the rate of 12.22% recorded in the same quarter of 2021 and higher than the 10.55% it contributed in the preceding quarter.

Additionally, TNAVCS accounts for more than 81% of the variation in the annual economic GR, leaving the remaining percentage unaccounted for due to the presence of the stochastic error term, as shown by the R square and adjusted R square results of (R^2= 81.4% and adjusted R^2= 78.2%, respectively). The Chi-square statistics and p-value of (χ^2= 6.34222, p-value = 0.01947) further supported the existence of a significant association between the annual economic GR in Nigeria and TNAVCS at the 5% level of significance. This result is in agreement with the study from [6]; [7]; [23]; [24] and [34] are all in agreement with this discovery.

According to the pooled ordinary least square (POLS) result shown in Table 6, there is a substantial and positive correlation between TNAVCS and the annual GR increase. The pooled ordinary least square (POLS) result provided in Table 6, revealed that the TNAVCS has a positive and significant relationship with the yearly economic GR in Nigeria. The correlation coefficient result of 0.92032 affirmed confirmed this result. The p-value and coefficient are (Pr(>|t|)=0.001065 and β_1 = 0.42667), TNAVCS has a substantial impact on the annual GR, as projected by the pooled ordinary least square at 1% and 5% significant level confirmed. More than 84% of the improvement in the annual economic GR has been explained by TNAVCS, according to the R square and adjusted R square, which are (R^2 = 84.6% and adjusted R^2 = 81.2%), respectively. The remaining portion is unaccounted for due to the stochastic error term's presence.

The Chi-square statistics and p-value of (χ^2= 11.0614, p-value = 0.010651) further supported the existence of a significant association between the annual economic GR in Nigeria and the TNAVCS at the 5% level of significance. Between the fixed effect and random effect regression models, the preferred model was determined using the Durbin-Wu-Hausman (DWH) test. Random effects are the preferred model, according to the null hypothesis (H_0), while fixed effects are the preferred model, according to the alternate hypothesis (H_I). The result shown in Table 7 shows that the Chi-square test ($\chi^2 = 0.75928$) and the (p-value = 0.83836) were both larger than 0.05 level of significance, suggesting that the results of the random effect model are more accurate and reliable than those of the fixed effect models. To analyze the relationship between Nigeria's annual economic GR and the TNAVCS, the results from the random effect model are preferred.

Table 4. Random effect regression model

Coefficients	Estimate	Std. Error	z-value	Pr(>|t|)
(Intercept)	3.94818	2.00234	1.9718	0.048634 *
log(TNAVCS)	0.31458	0.12034	2.6140	0.008948 **
Total Sum of Squares	165.23			
Residual Sum of Squares	159.28			
R	0.92734			
R-Squared	0.85996			
Adj. R-Squared	0.80728			
Chi-square	6.83324			
p-value	0.01947			

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation), Balanced Panel: n = 5, T = 37, N = 185, Minimum = -4.516944, 1st Quartile = -0.400581, Median = 0.063056, 3rd Quartile = 0.4358, Maximum = 0.4358 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 5. Fixed effect regression model

Coefficients	Estimate	Std. Error	t-value	Pr(>|t|)
log(TNAVCS)	0.30447	0.12090	2.5184	0.01267 *
Total Sum of Squares	161.46			
Residual Sum of Squares	155.93			
R	0.90233			
R-Squared	0.81421			
Adj. R-Squared	0.78241			
F-statistic	6.34222			
p-value	0.012666			

Balanced Panel: n = 5, T = 37, N = 185, Minimum = -4.46986236, 1st Quartile = -0.36146434, Median = 0.048305 , 3rd Quartile = 0.41324920, Maximun =3.11049674, Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 6. Pooled ordinary regression model (POLS)

Coefficients	Estimate	Std. Error	t-value	Pr(>|t|)
(Intercept)	-5.79858	2.11919	-2.7362	0.006827 **
log(TNAVCS)	0.42667	0.12829	3.3259	0.001065 **
Total Sum of Squares	211.67			
Residual Sum of Squares	199.61			
R	0.92032			
R-Squared	0.846999			
Adj. R-Squared	0.811846			
F-statistic	11.0614			
p-value	0.010651			

Unbalanced Panel: n = 6, T = 54-54, N = 324, Minimum = -4.62060, 1st Quartile = -0.50861, Median = 0.13667, 3rd Quartile = 0.42971, Maximum = 4.10876,
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 7. Durbin-Wu-Hausman (DWH) Specification Test Result

Chisq	*p-value*
0.75928	*0.83836*

*Hausman Test, df = 1, Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

5. CONCLUSION

This study looked into the connection between TNAVCS and Nigeria's economic GR. The cross-sectional data on the active number of voice call subscribers and the annual growth rate for five years in the 36 states and the federal capital territory of Abuja in Nigeria were used in the panel data statistical approach to achieve this goal. The total number of active voice call customers and the annual economic growth rate in Nigeria has a positive and significant association, according to the results of a regression test on panel data using the random effect model. The conclusion suggests that greater annual economic growth and development in Nigeria are correlated with greater total active voice call customer numbers.

The study's findings also demonstrate that the number of active voice call subscribers accounts for more than 86% of the growth in the annual economic growth rate, with the stochastic error term accounting for the remaining 14%. Therefore, it can be concluded that the main elements that have favorably impacted Nigeria's annual economic growth rate during the study period are the total number of active voice call users. It is however noteworthy that, some potential confounding variables of this study that could influence the observed correlation between active voice call subscribers and economic growth are; improved infrastructure funding, exchange rate and cost of purchasing diesel.Despite the achievements of TNAVCS on Nigeria's annual growth, it faced some economic challenges, some of which includes; facilities suffered too many destructions of telecom equipment, which affected infrastructure rollout across the country. Telecom masts and a lot of fibre optic cables were damaged in 2022. The sector suffered multiple regulations from different tiers of government and government agencies, who used that opportunity to impose multiple taxes and levies on telecom operations in the country. The TNAVCS in Nigeria also face the challenges of Forex, and high cost of diesel to power base transceiver stations (BTS). A lot of the telecom sites run on diesel and cost of diesel jumped from less than N300 per litre in January 2022 to over N800 per litre by December 2022, which affected the cost of delivering telecom services.

In light of the study's conclusions and challenges, it is recommended that;

- The Nigerian government should lower the cost and increase the accessibility of mobile communications. To improve the quality of services and products, as well as to boost employment prospects in the nation, more licenses should be granted to mobile network operators.
- To ensure effective services and to make voice calling easier, the government should provide the required telecommunications infrastructure, such as telecommunication grids.
- The government should promote local production of mobile operating systems and their parts.
- To prevent men from the underworld from damaging telecommunication equipment, the government should enhance the security system in the nation.

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