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INCLUSIVE CASHLESS SOCIETY AND ECONOMIC GROWTH IN NIGERIA: THE ROLE OF DIGITAL EDUCATION

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Abstract

Inclusive cashless society – where everyone has access to basic banking and digital infrastructure, such as reliable internet and affordable smartphones is key to achieving sustained economic growth in Nigeria through digital education. This paper empirically examined inclusive cashless society and economic growth in Nigeria: the role of digital education between 2010Q1 and 2024Q4 using the institutionalist variant of the political economy method. Both descriptive statistics and the ordinary least squares (OLS) method of multiple regression analysis were utilized in data analysis. The result of the OLS revealed that Automated Teller Machine (ATM) has a positive and a significant relationship with Per Capita Real Gross Domestic Product (PCRGDP) proxy for economic growth in Nigeria. The OLS result also revealed that Point of Sale (POS) terminal has a positive and a significant relationship with PCRGDP, proxy for economic growth in Nigeria. The result of the OLS further revealed that both Web pay and Mobile pay has a negative and a significant relationship with PCRGDP, proxy for economic growth in Nigeria during the period of study. The paper further revealed that digital education is fundamental to achieving inclusive cashless society and economic growth in Nigeria through the adaptation of necessary digital skills. The study recommended amongst others that to reinforce the positive long-run impact of cashless payments on economic growth in Nigeria, the government should implement policies that incentivize banks and fintechs to deploy and maintain cashless payments technologies in rural and semi-urban areas. The paper also recommended that digital education should be introduced into our educational curriculum in order to improve our digital skills towards achieving an inclusive cashless society and economic growth in Nigeria.

Keywords: Inclusive Cashless Society, Economic Growth, Digital Education, Nigeria.

Introduction

Cashless societies are growing worldwide, especially after the pandemic boom in demand for online banking. Innovations in digital payment infrastructure, such as mobile payment, online banking services and digital currencies, have made it simpler for people and businesses worldwide (Vadarmoss, 2023). Improvements in digital payments infrastructure such as mobile payments, digital currencies and online banking, make it more convenient for people and business to buy and sell things without using cash (Tomkom Arun, 2023). Many countries have increased their reliance on digital payments, especially after the pandemic, as businesses and consumers look for faster and more convenient ways to handle transactions. Countries like Sweden, South Korea and China are leading this shift. In Sweden, many stores don't even accept cash anymore (Wavtec, 2025).

In Nigeria, the Central Bank of Nigeria (CBN) has been deriving the effort to establish a cashless society with several initiatives aimed at promoting digital payments and reducing the country's dependence on cash for over a decade. According to JUMIA (2023), the 2012 digital payment directive, issued by the CBN, was a significant milestone in this journey. The directive as noted by JUMIA required financial institutions to increase their investment in digital payment infrastructure, promote digital payments among their customers, and work with the CBN to develop a strong regulatory framework. The upshot of the foregoing is that a cashless society makes purchasing and paying for many goods and services quick and easy but most importantly secure and safe. The instantaneous payments that are possible using apps and cards through online terminals, phones tablets and laptops mean that large amounts of banknotes are now a thing of the past (Pinlieiro, 2024). Thus, the advantages that accrue from the new cashless development are widespread and can be enjoyed at every level of society and in every corner of the Nigerian society and the world over.

The aim of this paper was to empirically examine inclusive cashless society and economic growth in Nigeria: The role of digital education.

Literature Review

Theoretical Literature

Diffusion of Innovation Theory

According to Rogers (1962), this theory explains how innovations, such as cashless payment systems, are adopted by individuals and organizations. It suggests that adoption follows a pattern, with categories of people including innovators, early adopters, early majority, late majority and laggards. The theory identifies key factors influencing adoption, such as perceived benefits, compatibility with existing systems, simplicity, trialability, and observable results. This theory explains how new ideas and technologies, like cashless payments, spread through a society. It outlines the stages individuals go through from learning about an innovation (knowledge) to forming an opinion (persuasion), deciding to adopt it (decision) and finally using and confirming its benefits (implementations and confirmation).

The Solow-Swan Theory of Economic Growth

The Solow-Swan model is a neoclassical growth theory developed independently by Robert Solow and Trevor Swan in 1956, explaining long term economic growth through capital accumulation, labour growth and technological

progress. It posits that capital accumulates drives short-term growth, but diminishing returns lead to a steady state where growth depends on exogenous technological advancements. The model highlights how technology is a boundless, yet external factor essential for sustained increase in per capital output.

Inclusive Cashless Society

An inclusive cashless society refers to an economic system where digital payments are the basic method for transactions, designed to ensure that all individuals regardless of socio-economic status, age, location, or ability, can fully participate and benefit.

Digital Education

Digital education defines the use of digital tools, technologies and content to support teaching, learning and assessment.

Web-based Transactions

Web-based transactions refer to the process of conducting financial transactions, such as payments and transfers, through interest-based platforms (Uzochukwu, 2016).

Point of sale (POS) Transactions

Point of sale (POS) transactions refers to the process of conducting financial transactions using a point-of-sale terminal, typically through debit or credit cards (Nnanna & Dogo, 2019).

Automated Teller Machine (ATM) Transactions

Automated Teller Machine (ATM) transactions refer to the process of conducting financial transactions using an ATM, which allows individuals to withdraw cash, deposits funds, check balances, transfer money between accounts, pay utility bills, and perform other banking activities without needing to visit a physical bank branch (Nnanna & Dogo, 2019).

Mobile Banking Transaction

This is an electronic payment system that allows the banks to consummate financial transactions via a mobile phone. According to Gbanador (2023), mobile banking is performed using a smartphone or similar device software.

Economic Growth

Akpakpan (1987) defined economic growth as the achievement of yearly increase in both the total and per capital output of goods and services. It refers to the sustained increase in the actual output of goods and services of the nation concerned.

Empirical Literature

Enefiok & Emenyi (2024) studied cashless policy and economic growth in Nigeria. Specifically, the study aimed at ascertaining the relationship between web-based transactions, POS transactions and ATM transactions with real GDP of Nigeria over a period of 10 years (2013-2022). The findings revealed that POS transactions and ATM transactions have an insignificant positive relationship with real GDP while web-based transactions showed an insignificant inverse relationship.

Mbabie, Aigbedion & Obumneke (2024) studied the impact of cashless policy intensity on economic growth in Nigeria from 2009 to 2022. The Fully Modified

Ordinary Least Squares (FMOLS) methods were employed. The results show that there is ATM transaction intensity negative impact on economic growth in Nigeria. The results further showed that the internet transaction intensity has a positive but insignificant impact on economic growth in Nigeria.

Sreenu (2020) studied cashless payment policy and its effects on economic growth of India: an expository study from 2010 to 2018. The study employed the panel vector error correction model, Padroni residual cointegration and the hypothetical prototypical method. The results show that customers and sellers accept a cashless system policy. In the short period, the result shows a causality model running from a cad system to a check payment and telegraphic transfer system, and a causality model running from a telegraphic payment system to a card payment system. In the long run, the result shows a positive outcome in using a cashless policy on Indian economy.

Ibe, & Odi (208) studied cashless policy in models of economic growth: the Nigerian evidence from 2009 to 2016. The variables used for the study were Gross Domestic Product (GDP) as the dependent variable while Automated Teller Machine (ATM), mobile banking (MOBK) and Point of Sale (POS) were the independent variables. The findings of the study show the existence of a long run significant relationship between the variables of cashless policy and economic growth in Nigeria. The result further show that the ATM seems to be the best and most common based on the Magnitude of its relationship with GDP.

El-Yaqub (2024) carried out a study on analysis of the impact of cashless policy and naira redesign on economic growth in Nigeria: The study employed quantitative data analysis to establish the correlation between Nigeria's cashless policy and economic growth. The findings indicate the presence of a causal association between the cashless policy and economic growth in Nigeria.

Nasamu, Danjuma & Ozah (2020) studied the effect of cashless policy on Nigeria's economic growth from 2011 to 2018. Multiple regressions were applied to determine the impact of the policy on the GDP using the ATM, POS and the WEB. The study revealed that ATM has a positive effect on GDP. On the other hand, the regression results also show that POS and WEB had a negative effect on GDP.

Gbanador (2023) studied the effect of cashless policy on economic growth in Nigeria: an autoregressive distributed Lag (ARDL)was used for the data analysis. The findings revealed a significant relationship between cheque (CQ) and internet banking (IB) with the Gross Domestic Product while the relationship between the Automated Teller machine and the Gross Domestic Product is negatively insignificant.

Uzowulu, Anyanwu & Amakor (2024) studied the impact of cashless policy on the Nigerian economy from 2009 to 2022. The time series data of the variables, ATM transactions, POS transactions, mobile banking transactions, Web pay transactions and Nominal GDP were obtained from CBN statistical bulletin (2021). The study employed multiple linear regression model and the Granger Causality Test. The Findings of the study showed that, the value of ATM transactions is positively related to economic growth but has not significantly impact economic growth in Nigeria and that of POS transactions is negatively related to and has significant impact on economic growth in Nigeria.

Okereke (2016) examined the impact of Automated Teller Machine (ATM) transaction value, point of sale terminal, internet banking and mobile banking transactions value on economic value of Nigeria. The quantitative design was used and Ordinary Least Squares (OLS) method of multiple regression analysis was employed to test the research hypothesis. The findings of the study show that only point of sales terminal was significant to economic growth while Automated Teller Machine, mobile banking and internet banking are insignificant to economic growth within the period of study.

Suberu, Afonja, Akande & Olure Bank (2015) studied the implication of cashless policy on the banking sector with a view of revealing the possible challenges and prospects to the Nigerian economy. The ordinary Least Squares econometric technique was employed to analyze the data collected. The findings of the study revealed that the marginal productivity coefficient of bank credit to the domestic economy is positive but insignificant.

Methodology

Research Design

This paper adopted the quasi-experimental research design.

Model Specification

This paper adopted and modified the linear motel of Nasamu, Danjuma & Ozah (2020), whose work was focused on effect of cashless policy on Nigeria's Economic Growth from 2011 to 2018. The multiple regression specified below:

GDP = $\delta + B_1$ ATM + B_2 POST B_3WEB +δ ……1

Where:

GDP: = Gross Domestic product
ATM: = Automated Teller machine
POS = Point of sale
WEB = Internet banking
δ = Constant
B_1-B_3 = coefficients of independent variables
E = error term

The adopted model was modified to enable us include the variables of the present study. The functional form of the model to be used in this study is expressed as;

PCRGDP = f (ATM, POS, WEB, MOB) ……..2
PCRDGP = per capita real Gross domestic product a proxy for economic growth.
ATM = Automated Teller Machine Transactions
POS = Point of Sale Transactions
WEB = Internet Banking Transactions
MOB = Mobile Banking Transactions
F = Functionality Symbol

The ordinary least squares multiple regression equation based on the mathematical model is expressed as:

PCRGDP = $B_0 + B_1$ ATM + B_2POS + B_3 WEB + B_4MOB + U ….3
B_0 = the regression constant

B_1 to B_4 = the parameter estimates of the explanatory variables

U = error term

All other variables are as earlier defined.

Apriori Theoretical Expectations

Based on economic theory, we expect the following signs of the parameter estimates

$B_1>0$; $B_2>0$; $B_3>0$; and $B_4> 0$

The implication of the above sizes of the coefficients of the explanation, variables shows that we expect a positive relationship between automated teller machine, point of sale, internet banking and mobile banking and per capital real gross domestic product.

Method of Data Analysis

This study employed descriptive statistics, correlation matrix as well as the ordinary least squares (OLS) regression to estimate the effect of the explanatory variables on the dependent variable.

Data Presentation

Table 1 shows the trend of Nigeria's Economic Growth (PCRGDP), Automated Teller Machine (ATM), Point of sale Terminals (POS), Web Pay (WEB) and Mobile Pay (MOP) between 2010Q1 and 2024Q4.

Table 1: Nigeria's PCRGDP, ATM, POS, WEB and MOP, 2010Q1-2024Q4

Year	PCRGDP (₦' B)	ATM (₦' B)	POS (₦' B)	WEB (₦' B)	MOP (₦' B)
2010Q1	327720.3	399.71	12.72	25.05	6.65
2010Q2	329684.5	690.2175	17.295	33.69	9.7325
2010Q3	331648.6	980.725	21.87	42.33	12.815
2010Q4	333612.8	1271.233	26.445	50.97	15.8975
2011Q1	335576.9	1561.74	31.02	59.61	18.98
2011Q2	336733.2	1667.47	35.26708	52.59934	22.11233
2011Q3	337889.4	1773.199	39.51416	45.58868	25.24467
2011Q4	339045.7	1878.929	43.76123	38.57802	28.377
2012Q1	340201.9	1984.659	48.00831	31.56736	31.50933
2012Q2	343446.2	2195.729	76.26032	35.50461	59.33129
2012Q3	346690.4	2406.799	104.5123	39.44185	87.15324
2012Q4	349934.7	2617.869	132.7643	43.37909	114.9752
2013Q1	353178.9	2828.939	161.0163	47.31633	142.7971
2013Q2	356302.4	3041.674	198.7802	53.99816	193.7147
2013Q3	359425.9	3254.408	236.544	60.67998	244.6322
2013Q4	362549.4	3467.143	274.3079	67.3618	295.5498
2014Q1	365672.9	3679.878	312.0717	74.04363	346.4673
2014Q2	365747.8	3752.471	346.1819	78.42804	370.4389
2014Q3	365822.8	3825.065	380.2921	82.81246	394.4105
2014Q4	365897.7	3897.659	414.4023	87.19688	418.3821
2015Q1	365972.7	3970.252	448.5125	91.58129	442.3538
2015Q2	362295.6	4224.723	526.1335	101.7761	520.9897

2015Q3	358618.6	4479.193	603.7545	111.9708	599.6256
2015Q4	354941.5	4733.663	681.3755	122.1656	678.2616
2016Q1	351264.5	4988.133	758.9965	132.3603	756.8975
2016Q2	349845.5	5350.498	921.7007	145.4194	843.1729
2016Q3	348426.5	5712.863	1084.405	158.4785	929.4482
2016Q4	347007.5	6075.228	1247.109	171.5376	1015.724
2017Q1	345588.6	6437.592	1409.813	184.5966	1101.999
2017Q2	345237.1	6448.216	1653.137	307.4266	1320.062
2017Q3	344885.6	6458.839	1896.461	430.2566	1538.125
2017Q4	344534.1	6469.463	2139.785	553.0866	1756.188
2018Q1	344182.6	6480.086	2383.109	675.9167	1974.251
2018Q2	344174	6488.216	2588.52	626.4719	2750.93
2018Q3	344165.4	6496.347	2793.931	577.0272	3527.608
2018Q4	344156.8	6504.478	2999.342	527.5824	4304.286
2019Q1	344148.1	6512.608	3204.753	478.1377	5080.965
2019Q2	340823.5	9434.371	3585.334	98443.66	7557.658
2019Q3	337498.9	12356.13	3965.915	196409.2	10034.35
2019Q4	334174.2	15277.9	4346.496	294374.7	12511.05
2020Q1	330849.6	18199.66	4727.077	392340.2	14987.74
2020Q2	332087.9	18957.48	9659.162	430515.1	24542.87
2020Q3	333326.2	19715.3	14591.25	468690	34098.01
2020Q4	334564.6	20473.12	19523.33	506864.8	43653.14
2021Q1	335802.9	21230.93	24455.42	545039.7	53208.27
2021Q2	336737.5	24085.21	28600.51	604694.8	67686.73
2021Q3	337672.1	26939.48	32745.61	664349.9	82165.19
2021Q4	338606.7	29793.75	36890.71	724004.9	96643.65
2022Q1	339541.3	32648.02	41035.8	783660	111122.1
2022Q2	340156.1	31539.17	58363.63	862028.3	138291.6
2022Q3	340770.9	30430.31	75691.45	940396.5	165461.1
2022Q4	341385.8	29321.45	93019.28	1018765	192630.6
2023Q1	342000.6	28212.59	110347.1	1097133	219800.1
2023Q2	343107.3	28500.41	372413.5	1120003	221860.9
2023Q3	344214	28788.22	634479.9	1142872	223921.8
2023Q4	345320.7	29076.04	896546.4	1165741	225982.6
2024Q1	346427.3	29363.85	1158613	1188611	228043.5
2024Q2	371427.3	31863.85	1408613	1438611	253043.5
2024Q3	396427.3	34363.85	1658613	1688611	278043.5
2024Q4	421427.3	36863.85	1908613	1938611	303043.5

Note: Economic Growth (PCRGDP), Automated Teller Machine (ATM), Point of sale Terminals (POS), Web Pay (WEB), and Mobile Pay (MOP)
Source: *WDI (2024) and CBN Statistical Bulletin (2024)*

The trend of the variables such as Economic Growth (PCRGDP), Automated Teller Machine (ATM), Point of sale Terminals (POS), Web Pay (WEB), and Mobile Pay (MOP)from 2010Q1 to 2024Q4 are presented in table 1 and figure 1.

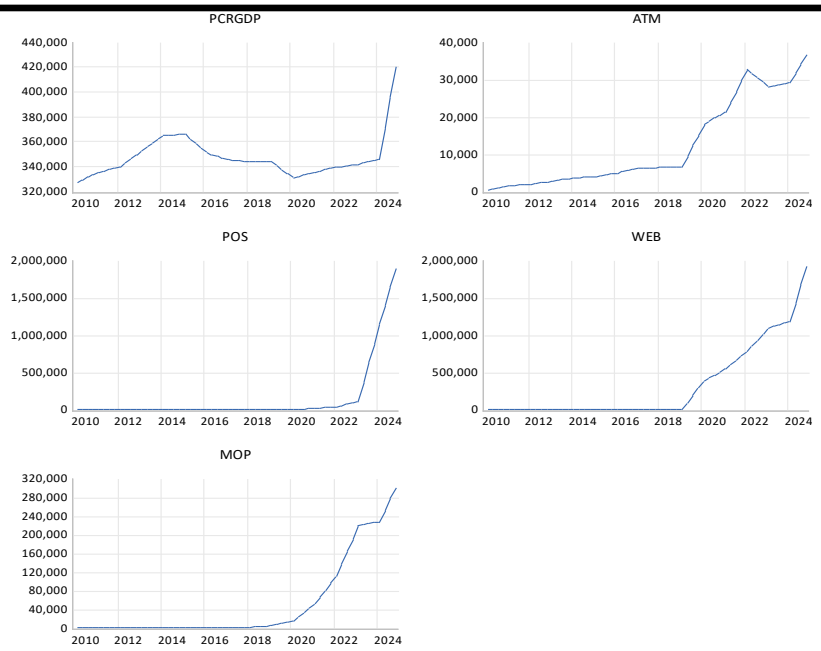

Figure 1: Trend of the Variables from 2010Q1 to 2024Q4

From Table 1 and figure 1, it shows that the values of Economic Growth (PCRGDP) a proxy by Per Capita Real GDP between 1981 and 2024 was also in puzzle form with fundamental strong up and down spike as shown in the figure. It increased steadily from 1981 to 1985, move up to 1990, and to 1995 and move up to 2000 to 2005 to 2010 and to 2015 before it went up steadily till 2024.

Also, the table shows that the value of Automated Teller Machine (ATM) between 2010Q1 and 2024Q4 was also in puzzle form with fundamental strong up and down spike as shown in the figure. It increased steadily from 1981 to 1985 to 1990 to 1995 to 2000 up to 2008 before it came down in 2009 went up again to 2011, came down to 2016, went up again to its peak in 2018, went down to 2020 before it went up till 2024.

Point of sale Terminals (POS) has been on the increased during the period chosen for this study. It increased from 1981 to 1985 to 1990 to 1995 to 2000 to 2005 and to 2010, it later increases to 2015 and move up to 2020 before it reached 2024.

Web Pay (WEB) has been on the increased during the period chosen for this study. It increased from 1981 to 1985 to 1990 to 1995 to 2000 to 2005 and to 2010, it later increases to 2015 and move up to 2020 before it reached 2024.

While Mobile Pay (MOP) has been on the increased during the period chosen for this study. It increased from 1981 to 1985 to 1990 to 1995 to 2000 to 2005 and to 2010, it later increases to 2015 and move up to 2020 before it reached 2024.

Descriptive Statistics

Table 2 below presents the result of the descriptive statistics of the variables employed in the estimations in this study.

Table 2: Descriptive Statistics Results

	PCRGDP	ATM	POS	WEB	MOP
Mean	347509.6	12207.35	143828.2	321953.6	50671.89
Median	344169.7	6453.528	1774.799	368.8416	1429.094
Maximum	421427.3	36863.85	1908613.	1938611.	303043.5
Minimum	327720.3	399.7100	12.72000	25.05000	6.650000
Std. Dev.	15751.28	11595.83	408812.8	501767.7	87683.49
Skewness	2.308849	0.779100	3.117865	1.445527	1.589407
Kurtosis	10.45184	1.968358	11.71535	4.113710	4.028448
Jarque-Bera	192.1326	8.730680	287.1042	23.99636	27.90641
Probability	0.000000	0.012710	0.000000	0.000006	0.000001
Sum	20850577	732440.9	8629694.	19317216	3040314.
Sum Sq. Dev.	1.46E+10	7.93E+09	9.86E+12	1.49E+13	4.54E+11
Observations	60	60	60	60	60

Source: *Author's Computation (2025)*

The result of the descriptive statistics shows that Economic Growth (PCRGDP) a proxy by Per Capita Real GDP has a mean value of 347509.6with a standard deviation of 15751.28. The skewness value of Economic Growth (PCRGDP) a proxy by Per Capita Real GDP is positive (2.308849), meaning that Economic Growth (PCRGDP) a proxy by Per Capita Real GDP has a long-left tail while the kurtosis value of Economic Growth (PCRGDP) a proxy by Per Capita Real GDP is 10.45184(i. e. greater than 3), meaning that it is leptokurtic. This means that the series has a more values higher the sample mean, that is, it has a peak distribution or surface.

Automated Teller Machine (ATM) has a mean value of 12207.35with a standard deviation of 11595.83. The skewness value of Automated Teller Machine (ATM) is positive (0.779100), meaning that Automated Teller Machine (ATM) has a long-right tail while the kurtosis value of Automated Teller Machine (ATM) is 1.968358(i. e. greater than 3), meaning that it is leptokurtic. This means that the series has a more values higher the sample mean, that is, it has a peak distribution or surface.

Point of sale Terminals (POS) has a mean value of 143828.2with a standard deviation of 408812.8. The skewness value of Point-of-sale Terminals (POS)is positive (3.117865), meaning that Point of sale Terminals (POS)has a long-right tail while the kurtosis value of Point-of-sale Terminals (POS)is 11.71535(i.e. greater than 3), meaning that it is leptokurtic. This means that the series has a more values higher the sample mean, that is, it has a peak distribution or surface.

Web Pay (WEB) has a mean value of 321953.6with a standard deviation of 501767.7. The skewness value of Web Pay (WEB)is positive (1.445527), meaning that Web Pay (WEB) has a long-right tail while the kurtosis value of Web Pay (WEB)is 4.113710(i. e. greater than 3), meaning that it is leptokurtic. This means that the series has a more values higher the sample mean, that is, it has a peak distribution or surface.

Mobile Pay (MOP) has a mean value of 50671.89with a standard deviation of 87683.49. The skewness value of Money Supply (MS) is positive (1.589407), meaning that Money Supply (MS) has a long-right tail while the kurtosis value of Money Supply (MS) is 4.028448(i. e. greater than 3), meaning that it is leptokurtic. This means that the series has a more values higher the sample mean, that is, it has a

peak distribution or surface.

Again, one important observation in this table is the Jarque-Bera statistics of the variables. It shows that the value of all the variables PCRGDP ATM POS WEB and MOP has a value greater than 5.99, suggesting that they do not has a normal distribution.

Ordinary Least Squares (OLS) Static Regression Analysis

In this section, we analyzed the OLS regression using the data in table 4. Specifically, we used the E-view software computer package version 10.0 for the analysis. The result of the estimation is reported in table 3.

Table 3: OLS Estimation Results

Dependent Variable: LOG(PCRGDP)				
Method: Least Squares				
Date: 10/08/25 Time: 00:47				
Sample: 2010Q1 2024Q4				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.44448	0.148749	83.66121	0.0000
LOG(ATM)	0.043229	0.023928	1.806578	0.0763
LOG(POS)	0.032337	0.006062	5.333941	0.0000
LOG(WEB)	-0.011802	0.002724	-4.333226	0.0001
LOG(MOP)	-0.029240	0.012135	-2.409549	0.0193
R-squared	0.496798	Mean dependent var		12.75760
Adjusted R-squared	0.460202	S.D. dependent var		0.043293
S.E. of regression	0.031807	Akaike info criterion		-3.978577
Sum squared resid	0.055644	Schwarz criterion		-3.804048
Log likelihood	124.3573	Hannan-Quinn criter.		-3.910309
F-statistic	13.57501	Durbin-Watson stat		1.805598
Prob(F-statistic)	0.000000			

Source: *Author's Computation (2025)*

Table 3 shows that the computed R^2 is 0.496798. This means that about 50 percent of the total variation in Economic Growth (PCRGDP) a proxy by Per Capita Real GDP is caused by the independent variables - Automated Teller Machine (ATM), Point of sale Terminals (POS), Web Pay (WEB), and Mobile Pay (MOP) while the remaining 50 percent is caused by other factors outside the model but covered by the error term. This further supported by the adjusted R^2 of 46 percent. Also, the F-statistic calculated is 13.57501with a probability value of 0.000000which is lower than 0.05 level. Thus, it means that the overall model is significant at 5 percent confidence level. Furthermore, Durbin – Watson value calculated is 1.805598. This value is very close to 2, which indicate that there is a minimal serial autocorrelation in the model. Hence, the model can be adopted for long-run analysis.

The result of the OLS shows the coefficient of Automated Teller Machine (ATM) has a positive (0.043229) and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a unit increase in Automated Teller Machine (ATM) increases Economic Growth (PCRGDP) a proxy by

Per Capita Real GDP by about 0.103933 units.

The coefficient of Point-of-sale Terminals (POS)has a positive (0.032337) and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a unit increase in Point-of-sale Terminals (POS)increases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP by about 0.032337units.

Also, the study found that the coefficient of Web Pay (WEB)has a negative (-0.011802) and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a one percent increase in Web Pay (WEB)decreases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP by about 0.011802 units.

Again, the study found that the coefficient of Mobile Pay (MOP)has a negative (-0.029240) and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a one percent increase in Mobile Pay (MOP)decreases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP by about 0.029240 units.

Post Estimation Test

The researcher also conducted a diagnostic test to ascertain whether or not the series are free from autocorrelation (Breusch-Godfrey Serial Correlation LM Test), heteroscedasticity (Breusch-Pegan-Godfrey Test) and linearity (Ramsey RESET Test).

The result of the diagnostic test is presented in Table 4 below.

Table 4: Serial Correlation LM Test, Homoscedasticity Test and linearity Test Results

	F-Statistic	Prob. Value
Breusch-Godfrey Serial Correlation LM Test	1.220198	0.1524
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.549179	0.1559
Ramsey RESET Test	0.156932	0.6943

Source: *Author's Computation using E-view Software*

From Table 4 above, the results of the diagnostic test shows that the serial or autocorrelation test using Breusch-Godfrey Serial Correlation LM Test shows that the f-statistic is 1.220198with a Chi-Square probability value is 0.1524. This indicates that the probability value of about 15 percent (0.1524) is greater than 5 percent (0.05) critical value; hence the study confirms no serial correlation in the model.

The result of the heteroscedasticity test using Breusch-Pegan-Godfrey test shows that the f-statistic is 1.549179with a Chi-Square probability value of 0.1559. The result suggests that there is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5 percent (P > 0.05). So, residuals do have constant variance which is desirable in regression meaning that residuals are Homoscedastic.

Parameter Stability Test

The stability of the parameters in the short-run of the model is examined using the plots of the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residual (CUSUMSQ) as advocated by Adebiyi and Dauda (2004). Instability of the parameters arises due to structural changes and the institution of different policy regimes over the sample period. Whilst the CUSUM test

is particularly useful for detecting systematic changes in the regression coefficients, the CUSUMSQ test is significant in situations where the departure from the constancy of the regression coefficients is haphazard and sudden. If any of the straight lines in the graph is crossed, the null hypothesis that the regression equation is correctly specified is rejected at the 5 percent level of significance. From figures 2, the CUSUMSQ stays within the 5 percent critical line, indicating parameter constancy throughout the sample period in this study.

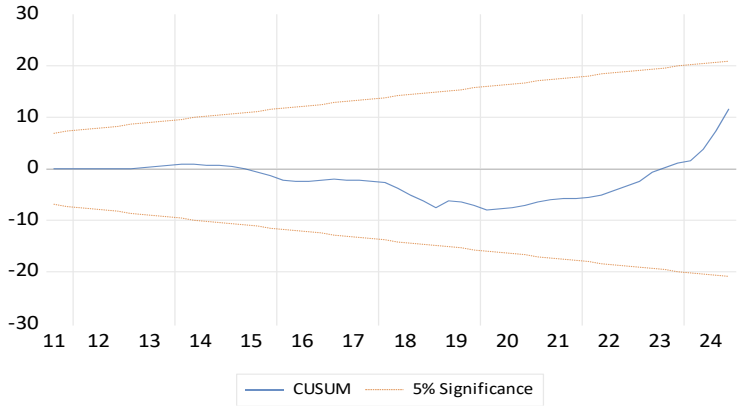

Figure 2: Stability Test Result based on CUSUM

Discussions

Automated Teller Machine (ATM) and Per Capita Real GDP (PCRGDP) in Nigeria

Based on the OLS result, the coefficient of Automated Teller Machine (ATM) has a positive and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a unit increase in Automated Teller Machine (ATM) increases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP in Nigeria within the period of study. The positive sign of the coefficient of Automated Teller Machine (ATM) conform to the a priori and therefore is in line economic theory, that increases in Automated Teller Machine (ATM) will increase Economic Growth (PCRGDP) a proxy by Per Capita Real GDP.

The coefficient of Automated Teller Machine (ATM) is statistically significant with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP at 5 percent level. This is so because the p-value calculated of 0.0763is less than the table p-value of 0.10 per cent level. Arising from the above, the study therefore rejects the null hypothesis which says that there is no significant relationship between Automated Teller Machine (ATM) and Economic Growth (PCRGDP) a proxy by Per Capita Real GDP but do not reject the alternative hypothesis.

Point of sale Terminals (POS) and Per Capita Real GDP in Nigeria

The result revealed that, the coefficient of Point-of-sale Terminals (POS) has a positive and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a unit increase in Point-of-sale Terminals (POS) will increase Economic Growth (PCRGDP) a proxy by Per Capita Real GDP in Nigeria within the period of study. The positive sign of the coefficient of Point-of-sale Terminals (POS) conform to the a priori and therefore is in line with economic theory, that increase Point-of-sale Terminals (POS) will increase Economic Growth (PCRGDP) a proxy by Per Capita Real GDP.

The coefficient of Point-of-sale Terminals (POS) is statistically significant with

Economic Growth (PCRGDP) a proxy by Per Capita Real GDP at 5 percent level. This is so because the p-value calculated of 0.0000is less than the table p-value of 0.05 per cent level. Arising from the above, the study therefore rejects the null hypothesis which says that there is no significant relationship between Point-of-sale Terminals (POS) and Economic Growth (PCRGDP) a proxy by Per Capita Real GDP but do not reject the alternative hypothesis.

In the long run, widespread use of POS terminals helps formalize economic transactions, boost financial intermediation, and expand access to financial services, all of which contribute positively to per capita real GDP growth in Nigeria.

Web Pay (WEB) and Per Capita Real GDP in Nigeria

The result revealed that, the coefficient of Web Pay (WEB) has a negative and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a one percent increase in Web Pay (WEB) decreases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP in Nigeria. The negative sign of the coefficient of Web Pay (WEB) do not conforms to the a priori and therefore not in line with economic theory, that increase in Web Pay (WEB) increases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP.

The coefficient of Web Pay (WEB) is statistically significant with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP at 5 percent level. This is so because the p-value calculated of 0.0001is less than the table p-value of 0.05 per cent level. Arising from the above, the study therefore rejects the null hypothesis which says that there is no significant relationship between Web Pay (WEB) and Economic Growth (PCRGDP) a proxy by Per Capita Real GDP but do not reject the alternative hypothesis.

Mobile Pay (MOP) and Per Capita Real GDP in Nigeria

The result revealed that, the coefficient of Mobile Pay (MOP)has a negative and a significant relationship with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP. This implies that a one percent increase in Mobile Pay (MOP)decreases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP in Nigeria. The negative sign of the coefficient of Mobile Pay (MOP)do not conforms to the a priori and therefore not in line with economic theory, that increase in Mobile Pay (MOP)increases Economic Growth (PCRGDP) a proxy by Per Capita Real GDP.

The coefficient of Mobile Pay (MOP)is statistically significant with Economic Growth (PCRGDP) a proxy by Per Capita Real GDP at 5 percent level. This is so because the p-value calculated of 0.0193is less than the table p-value of 0.05 per cent level. Arising from the above, the study therefore rejects the null hypothesis which says that there is no significant relationship between Mobile Pay (MOP) and Economic Growth (PCRGDP) a proxy by Per Capita Real GDP but do not reject the alternative hypothesis.

The Role of Digital Education towards Inclusive Cashless Society and Economic Growth in Nigeria

Digital education as defined by SmowlTech (2023) is a learning and training strategy to adapt to the new needs of the information society to improve the use of innovation and technology, as well as the development of digital skills applied to the educational ecosystem. It further refers to the use of digital technologies to

facilitate and improve teaching and learning.

According to European Education Area (2025), digital education helps learners of all ages build the digital skills they need to thrive in today's connected world. By making education more flexible, inclusive and accessible digital education plays a key role in creating a modern and resilient education system all over the world.

Digital payments play a significant impact on economic development. According to a study by Aguilar et al., 2024), a 1% rise in the use of digital payments is associated with a 0.1% decrease in employment in the unorganized sector. Digital payments also play a role in bringing economies into the formal sector by creating records that can be tracked, which broadens the tax base and supports, better governance (Singh & Jain; 2025). BIS (2024) noted that using digital payments is linked to a decrease in informal work and improvements in productivity.

The upshot of the foregoing is that digital payment systems are more than just ways to handle money; they are key to building stronger and more organized economic systems in developing countries (Crowdfund Insider, 2024).

Conclusion

Digital education is a key determinant in the global revolution to an inclusive cashless society and a veritable catalyst for economic growth. It bridges the "digital divide" by equipping individuals, especially marginalized households, with the knowledge, skills, and confidence needed to access and effectively use digital financial services.

Digital education enables adoption, fosters financial inclusion, builds trust and confidence, and addresses disparities among the populace in order to achieve inclusive cashless society. Furthermore, digital education increases efficiency and productivity, stimulates consumption and trade, reduces the informal economy, fosters innovation and job creation, and enhances economic resilience in order to achieve economic growth in Nigeria.

Lastly, digital education is the bedrock that unlocks the potentials of a cashless society; ensuring that its gains are widely distributed and contribute to an inclusive cashless and sustainable society.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. To reinforce the positive long-run impact of cashless payments on economic growth in Nigeria, the government should implement policies that incentivize banks and Fintechs to deploy and maintain cashless payments technologies in rural and semi-urban areas.
2. Digital education should be introduced into our educational curriculum in order to improve our digital skills towards achieving an inclusive cashless society and economic growth in Nigeria.

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