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THE IMPACT OF PAYMENT SYSTEMS ON ECONOMIC GROWTH IN SELECTED WEST AFRICAN ECONOMIES

Iro, O.A.[1*], Eke, P.O.[2], Yunisa, S.A.[2]

[1*]*Department of Finance, Lagos State University, Nigeria, adairo18@gmail.com*

[2]*Department of Finance, Lagos State University, Nigeria, ekeopatrick@gmail.com, yunisasimon@yahoo.com*

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Abstract

The study examines the impact of payment systems on economic growth in West African economies from 2005 to 2021 using panel Fully Modified OLS method. The proxies for payment systems are the number of ATMs per 100 ,000 adults, mobile money payment (MMP), the number of Deposit Money Bank branches (DMBBs) per 100,000 adults. The findings revealed a significant positive influence of ATM and DMBBs on economic growth in West Africa. However, MMP highlighted insignificant effect on economic growth. The study concludes that greater accessibility to ATMs and the presence of a higher number of DMBBs enhances financial transactions, stimulates economic activities and improved access to credit thereby driving economic growth. Based on these findings, policymakers and stakeholders in West Africa are encouraged to focus on expanding the number of internet banking facilities such as ATMs and establishing more DMBBs to aid internet banking.

Keywords: Payment systems, economic growth, West African economies

1. INTRODUCTION

The financial sector is undoubtedly a very germane part of the growth of an economy. Over the years, transformations in the sector have been on the increase. In developing economies, modern payment systems are one of the technological advancements the sector has experienced. The Government through some payment systems seeks to facilitate the use of cash without requiring it to be physically transferred from one location to another. An economy where there is no physical exchange of money (notes and coins) for goods and services is known as a cashless economy. Payments should ideally be made through bank cards, online money transfers, or mobile phones (Gbanador, 2023).

The private and public sectors rely on the transmission and collection of money to function properly. When these exchanges are expensive and uncomfortable, economic activity is hampered. Modern payment system implementation is driven majorly through digitalization of financial transaction which could in turn drive innovative, inclusive, and sustainable growth in West African economies. As more information became available, a payment system that utilizes ATMs, Internet banking, and mobile banking emerged.

Ene, Abba, and Fatokun (2019) asserted that the cashless policy has made major advancements in the digitalization of financial services, particularly considering the expansion of ATMs, point of sale locations, online banking, and m-banking, among other things. Meanwhile, cash is s lowly losing appeal, especially in business-to-business transactions, as more technical platforms emerge to facilitate electronic transactions. Several economies place restrictions on the number of trades and the total number of deals

that can be made using non-electronic cash transfers (Apau, Obeng & Darko, 2019). Electronic devices and information technology are crucial to achieving long-term financial improvement and overall economic development. Payment systems have existed since Western Union introduced the Electronic Fund Transfer (EFT) in 1870. (Khan, Olanrewaju, Baba, Langoo, & Assad 2017; Otibo-Addo, 2021). Deposit Money Bank customers in the pre-modern payment systems era were unfortunately more predisposed to armed robberies because they had to carry huge amounts of cash to conduct trade and other financial operations. Customers had to wait in line for hours only to deposit or withdraw money during the pre- modern payment systems era, which made banking halls clumsy and crowded. Also, prior to the implementation of payment systems, there was a reputation for low savings rates since people preferred to keep their savings in their homes instead of in banks, which resulted in an excess of cash outside the banking system (Ekperiware & Anifowose, 2022).

Five West African economies have been attracting significant amounts of foreign direct investment (FDI), according to the World Bank and the United Nations Conference on Trade and Development (UNCTAD): Nigeria, Ghana, Cote d'Ivoire, Senegal, and Burkina Faso (World Bank, 2021; UNCTAD, 2020). They also have similar payment system regulations. Nigeria has the largest economy in West Africa and has attracted the most foreign direct investment (FDI) inflows of $2.6 billion in 2020 than any other country in the area (UNCTAD, 2020). The country has become a popular choice for foreign investors due to its sizable market, young and populous workforce, and supportive business environment.

Also, Ghana in recent years, has had both strong economic growth and political stability, making it a more desirable location for foreign investment, with FDI inflows of $2.5 billion in 2020 (UNCTAD, 2020). The nation has also put into effect several policy changes to enhance the business climate and draw in more international investment.

The World Bank likewise estimates that Cote d'Ivoire is one of the economies in West Africa that is fast rising and that it has recently attracted a significant amount of investment, with FDI inflows of $2.4 billion in 2020 (UNCTAD, 2020). Moreover, Cote d'Ivoire has made reforms to enhance its economic climate and draw in more foreign investment. In addition, Senegal with one of the most varied economies in West Africa, with FDI inflows of $1.2 billion in 2020 has enacted several policy reforms to increase foreign investment (UNCTAD, 2020).

Also, Burkina Faso is a landlocked nation with a modest economy, but in recent years, it has drawn an increasing amount of foreign direct investment inflows of $740 million in 2020. In addition, Burkina Faso has enacted reforms to enhance its economic climate and draw in more international investment (UNCTAD, 2020). By implementing a regional financial inclusion policy, the Central Bank of West African States (CBWAS) has made financial inclusion one of its top priorities. Increased mobile and internet penetration rates as well as flexible regulatory frameworks have been major drivers of West Africa's push towards financial inclusion through digital financial services (GSMA, 2021). West Africa has a mobile phone penetration rate of 86% and a mobile internet penetration rate of 26% as of 2018, with over 70% of internet users located in, Nigeria, Ghana, and Côte d'Ivoire. In Benin, Côte d'Ivoire, Ghana, and Senegal as a whole, about 54% of adults regularly use mobile money services. The countries with the largest proportions of adults who had access to financial accounts in the sub-region as of 2017 were Ghana (58 percent), Togo (45 percent), Côte d'Ivoire (41 percent), Burkina Faso (43 percent), Senegal (42 percent), and Nigeria (40

percent) (GSMA, 2021). Within the sub-region, using mobile money to pay for services, goods, wages, utilities, and government cash transfers is quickly becoming a common practise.

A rise in the output of economic goods and services from one era to the next is referred to as economic growth (Adefolake & Omodero, 2022). The most crucial economic metric is typically thought to be economic growth, which is widely employed in cross-country comparisons (DFID, 2008). Rapid and strong growth require physical capital, human capital, rule of law, competitive markets, a stable macroeconomic environment, infrastructure, openness to trade and investment, and increased agricultural productivity (DFID, 2008). The recent cashless payment systems implementation in Nigeria were met with many problems and difficulties, raising the question of whether they promote economic progress.

Based on the foregoing, this research work examines the impact of payment systems and economic growth in West African Economies.

With the adoption of a regional financial inclusion plan, CBWAS has made financial inclusion one of its top priorities. The amount of research on this problem in this zone is insufficient despite the CBWAS and other stakeholders paying close attention (Oumarou & Celestin, 2021). Access to credit has been tough for a lot of people in developing economies, Furthermore, Central Banks through various policies may have often hurt the credit system, where it raises the deposit money banks' credit reserve ratio to balance government's excess spending (Eke, 2022). Developing nations like Nigeria lag far behind peers like Kenya and South Africa when it comes to the use of modern payment systems for transactions to promote financial inclusion (World Bank, 2018; Eke, 2022).

Several studies have been carried out on payment systems and their impact on different macroeconomic variables (Mamudu & Gayovwi, 2019; Gbanador, 2023; Ropheka & Miapkwap, 2020; amongst others). However, only a few literature to the best of the researcher's knowledge, has focused on selected West African economies, hence the justification for this study. This research work thus sought to fill this gap in literature as it examines payment systems and economic growth in West African economies.

The main objective of this study is to ascertain the impact of payment systems on economic growth in West African economies. Specific objectives are:

1. To determine the extent to which usage of Automated Teller Machines (ATMs) has improved economic growth in West African economies.
2. To evaluate the extent to which Mobile money payment (MMP) has affected economic growth in West African economies.
3. To evaluate the extent to which the number of Deposit Money Bank branches (DMBBs) has improved economic growth in West African economies.

To achieve the broad objective, the following research questions are formulated to guide this study.

1. To what extent has usage of Automated Teller Machines (ATMs) improved economic growth in West African economies?
2. In what ways has Mobile money payment (MMP) affected real GDP per capita in West African economies?
3. To what extent has the number of Deposit Money Bank branches (DMBBs) improved economic growth in West African economies?

The following Hypotheses are formulated for this study in the Null forms:

$H0_1$: Usage of Automated Teller Machines (ATMs) has not significantly improved economic growth in West African economies.

$H0_2$: Mobile money payment (MMP) has not significantly affected real GDP per capita in West African economies.

$H0_3$: The number of Deposit Money Bank branches (DMBBs) has not significantly enhanced economic growth in West African economies.

The study looks at the relationship between payment systems and economic growth in selected West African economies. Five West African economies have been attracting significant amounts of foreign direct investment (FDI), these are Nigeria, Ghana, Cote d'Ivoire, Senegal, and Burkina Faso (World Bank, 2021; UNCTAD, 2020). They also have similar payment system regulations.

Within the sub-region, using mobile money to pay for services, goods, wages, utilities, and government cash transfers is quickly becoming a common practise. Since it aims to cover the time before and after the introduction of modern payment systems by several Central Banks in West Africa, the study covers the years 2005 to 2021. The remaining section of this paper is structured as follows: The literature review and gap in the literature are presented in Section 2. Materials and methods are discussed in Section 3. The study's findings are discussed in Section 4 while the conclusion and recommendations are presented in Section 5.

2. LITERATURE REVIEW

A payment system is the set of instruments, rules, procedures, and technologies used to settle money transfers among economic agents (Aprigliano, Ardizzi, & Monteforte, 2019). Accordingly, payment systems also trace economic transactions and encourage the use of bank transfers, ATM cards, point-of-sale systems, and other financial tools instead of large amounts of raw cash in transactions.

Payment system implementation is driven majorly through digitalization of financial transaction which could in turn drive innovative, inclusive, and sustainable growth in West African economies. Ahmad, Green, and Jiang, (2020) asserted that 8.3 million active accounts and a 48% acceptability rate for mobile money exist in Ghana. The Bank of Ghana (BoG) and Ghana Interbank Payment and Settlement System (GHIPSS) developed the e-zwich smart card in 2008 as a significant part of the government's plan to move Ghana towards a cashless economy (Addai & Arthur, 2020). The Central Bank of Nigeria reveals that the modern payment systems seek to increase financial inclusion while decreasing instances of armed robbery, abduction, financing of terrorism, advance fee fraud, graft, ransom payment, extortion, and other crimes (Vanguard, January 30, 2023). Burkina Faso began adopting mobile money at the same time as its WAEMU counterparts to adopt a cashless economy (N'dri & Kakinaka, 2020). Under the terms of the BCEAO agreement, a non-financial organisation (often a telecommunications company) was permitted to offer mobile money services in the WAEMU.

Automated Teller Machines (ATMs) are self-service machines that allow customers to perform various banking transactions without visiting a bank branch. ATMs provide services such as cash withdrawals, balance inquiries, fund transfers, and bill payments. In the context of the payment systems concept, ATMs play a significant role in promoting digital transactions and reducing the reliance on physical cash.

Mobile money refers to financial services that allow individuals to conduct monetary transactions using mobile devices, such as smartphones. It enables users to make payments, transfer funds, and access other

financial services through mobile applications or USSD codes. Mobile money plays a vital role in the payment systems concept by providing a convenient and accessible platform for digital transactions (GSMA, 2021).

Deposit Money Bank branches are physical locations established by banks to provide financial services to customers. These branches act as intermediaries between individuals, businesses, and the central bank, facilitating electronic payment s and reducing the reliance on cash transactions (World Bank, 2019).

Economic advancements are correlated with the accumulating productive capital or investments while economic growth, refers to an continuous rise in a country's production level. Ekperiware and Anifowose (2022) ascertained that increases in material output are a part of economic growth, which lasts for a very little time, usually one year. According to economic theory, "growth" refers to an annual rise in the quantity of goods produced, the GDP's rate of growth, or the level of the national income. Economic growth is a complicated, long-term process that is subject to obstacles such as excessive population growth, limited resources, poor infrastructure, inefficient resource use, excessive governmental interference, institutional and cultural models that make the increase difficult (Yunisa & Babajide, 2019).

According to Ross (2019), an economy's productive potential increases when resources are employed more effectively, not because more money is transferred about. In other words, it is necessary to measure the link between total resource inputs and total economic outputs to assess economic growth (Ganti, 2020). Meanwhile, economic growth is the most effective tool for lowering poverty and raising living standards in developing nations (DFID, 2008). Strong evidence is presented by both cross-country research and country case studies which indicates that quick and sustained growth is essential to achieving all the Millennium Development Goals (DFID, 2008).

Theoretical Review

A plethora of theories attempt to elucidate the influence of payment systems on economic growth. This study reviewed two of the theories considered relevant.

The neoclassical growth theory has served as the benchmark for long-term economic growth since 1956. A long-run growth model, which is constructed from equations that contain the two production components of labour and capital, and the exogenous nature of technological progress, demonstrates this. According to the neoclassical growth theory, a steady economic growth depends on a balance between labour, capital, and technology (Solow-Swan, 1956; DFID, 2008). The development of technology and the accumulation of input components, such as labour and capital, would result in higher economic growth and capital accumulation. The purpose of a Payment system is to promote capital accumulation by attracting both local and international investment, which in turn promotes efficiency. Utilizing technological devices, such as, POS transactions, ATMs, mobile banking, can aid developing countries in accessing capital. New thoughts on payment innovations and technological absorptions can improve new investments and promote productivity in low-income countries such as sub-Saharan African countries. In essence payment innovations is critical to investment and productivity (DFID, 2008).

A similar theory that may be critical to the evolution of payment systems is the diffusion of innovation theory (DOI) (Rogers,1962). It assumes continuous advancements in payment systems technology. The adoption of new innovative payment systems can have a long-term impact on economic growth (DFID, 2008).

Empirical Review

This section focuses on the empirical reviews of related areas of this study. Andabai and Bina (2019) examined the impact of e-banking on Nigeria's economic growth between 2000 and 2018. The study, which used Ordinary Least Square, showed that electronic mobile payments and automated teller machine transactions both had a big impact on Nigeria's GDP. Thus, concluded that e-banking has a significant impact on economic growth in Nigeria. Mamudu and Gayovwi (2019) examined the effects of the cashless policy on the Nigerian economy between 2011 and 2017. The study used Johansen cointegration techniques, which showed a long-term correlation between GDP and cheques cleared value, ATM Value, POS Value, and Mobile Payment Value in Nigeria.

In a recent study, Gbanador (2023) looked at how Nigeria's cashless policy affected economic growth from 2012 to 2021. The auto-regressive distributedlLag (ARDL) was used in the study, which discovered a substantial correlation between cheque and internet banking and GDP. On the other hand, there was no correlation between the GDP and the ATM. The study concluded that cashless policies affected economic growth.

Ropheka and Miapkwap (2020) studied the impact of Nigeria's cashless banking policy on economic growth from 2010 to 2018 using the ex-post facto research design. The study's findings showed a substantial correlation between internet banking and economic growth in N igeria using ordinary least square regression analysis.

Aminu, Hayewa, Mohammed and Abubakar (2022) examined the correlation between digital currency, monetary policy, and economic growth in Nigeria from 2013 to 2020. Structural vector autoregressive (SVAR) model was utilized, the findings revealed that digital currency did not have a significant impact on economic growth whereas the money supply and monetary policy rate had shock impact on economic growth meaning that the impact of monetary policy rate on economic growth is not much.

Givelyn, Rohima, Mardalena, and Widyanata (2022) ascertained the influence of cashless Payment on Indonesian Economy prior to and after the Covid-19 Pandemic from 2018 to 2022. Autoregressive distributed lag (ARDL) was carried out and showed that debit card and credit card had an insignificant impact on economic growth, in both in the short and long terms, while e-money had a favourable and considerable effect on economic growth. The study concluded that both before and during the COVID-19 epidemic, cashless payment had a large favourable impact on economic growth, but it was more pronounced during the pandemic.

Afaha (2019) evaluated the connection between electronic payment systems and Nigeria's economic growth from 2012 to 2017. Using Autoregressive Distributed Lagged regression (ARDL), the study revealed a significant positive relationship between the electronic payment system and real gross domestic product. Automated teller machines have a positive significant impact on economic growth. However, it made a negative contribution to the real GDP growth. Ugwoke, Okafor and Ugwoke (2019) assessed the effects of the CBN's cashless policy on Nigeria's payment system from 2015 to 2019. The study's survey research methodology and application of the correlation coefficient revealed a statistically significant association between the cashless policy and the expansion and upgrading of the payment system. Husein and Babalola (2020) ascertained the effect of Nigeria's cashless economic policy and financial inclusion on the country's economic activity through a survey of 240 respondents. The study made use of percentages, tables, and Chi-Square analytical techniques together with a cross-section survey and descriptive design. The results showed that Nigeria's cashless economic policy had a positive impact on both small-business

activity by individuals and financial inclusion. Umar (2020) investigated the impact of cashless policy, savings, and bank credit on Nigeria's deregulated economy. The autoregressive distributed lag model was utilized, and the results revealed the existence of a long-term correlation between Payment system, savings, and bank credit and economic growth in Nigeria.

Ndife (2020) studied the influence of electronic payment system on Nigeria's economic growth using descriptive design. The research used two-factor analysis of variance and correlation measures, which showed that the biggest volume of e-payment transactions is made through ATM channels, contributing to the expansion of the financial sector. Due to the CBN's numerous cashless policies and the Nigerian government's automation of various payments, there has also been a considerable change in the number of electronic payments across all channels. The study concluded that the economic development of Nigeria's banking sector was significantly impacted by e-payment.

Ekperiware and Anifowose (2022) in a survey of 235 respondents, examined the impact of ATMs, POS terminals and electronic banking transactions on economic growth in Nigeria using descriptive statistics. The study found that ATMs, POS terminals and electronic banking transactions had a favourable impact on economic growth and thus concluded that cashless payment system is highly significant to the Nigerian economy.

Almost all the research that has been done so far suggests, among other things, that cashless payment systems might promote economic growth. In these developing economies, a cashless system was implemented, among other things, to boost economic growth. Therefore, the focus of this study is on how payment systems affect the economic growth of selected western economies.

Gap in the Literature

Several studies have been carried out on payment systems and their impact on different macroeconomic variables (Mamudu & Gayovwi, 2019; Gbanador, 2023; Ropheka & Miapkwap, 2020; amongst others). However, only a few literature to the best of the knowledge of this study has focused on West Africa as a whole, hence the justification for this study. This research work thus sought to fill this gap in literature as it examines payment systems and economic growth in West African economies.

3. Methodology

The study used Panel Fully Modified Ordinary Least Square (panel FMOLS) and Granger Causality test were used to estimate the model. The relevant data for the study were sourced from World Bank indicators from 2005 to 2021. This period is chosen due to the availability of data, and it marks the period before and after the enactment of modern payment systems in West African economies. The study population consists of 15 West African economies with a population of over 362,261,579 million. However, five West African economies, Nigeria, Ghana, Cote d'Ivoire, Senegal, and Burkina Faso were selected because they have sizable amounts of foreign direct investment (FDI) (World Bank, 2021; UNCTAD, 2020).

Model Specification

Taking inference from the empirical findings and theories, this study adopted the financial innovations and sustainable development model used by Ajide (2017), but was modified with a multiple regression model in the form:

$$Y_{it} = b_o + b_1 Y_{it-i} + b_2 X_{1\,it} + b_3 X_{2\,it} + b_4 X_{3\,it} + b_5 X_{4\,it} + \mu_{it} \qquad eqn\ 1$$

To incorporate the Payment system indicators into the model, it becomes thus.

$$GDPc_t = \beta_0 + \beta_1 GDP_{t-i} + \beta_2 ATM_t + \beta_3 MMP_t + \beta_4 DMBBs_t + \beta_5 INF_t + \mu_t \qquad eqn\ 2$$

The long run form of equation 2 in log function, is thus specified.

$$\Delta InGDPc_{it} = \beta_0 + \beta_2 \Delta InATM_{it} + \beta_3 \Delta InMMP_{it} + \beta_4 \Delta InDMBBs_{it} + \beta_5 \Delta InINF_{it} + e_{it} \qquad eqn\ 3$$

The dependent variable in the analysis is GDP per capita, which represents economic growth in West African economies. The gross domestic product is the simplest approach for estimating output, while other metrics can also be utilised. By dividing the rise in a country's total GDP by its population (GDP per capita), economic growth is calculated.

The independent variables include Automated Teller Machine (ATM), Mobile Money Payment (MMP), and Deposit Money Bank branches (DMBBs), which represent the utilization of electronic payment systems for transactions. Additionally, inflation is included as a control variable, as it is expected to impact economic growth. β_0 is the constant term, $\beta 1$ to β_5 are the parameters of the regression equations and μ_{it} is the error term while Δ symbol represents the first difference operator, while the term e_t represents the stochastic white noise component. This model assumes a linear relationship between GDP per capita and the independent variables, and that the effects of the independent variables on GDP per capita are additive. It also assumes that the error term is normally distributed and has constant variance.

4. ANALYSIS

Descriptive Analysis

Table 1 Showing Result of Descriptive Analysis

	GDPC	ATM	MMP	DMBBs	INF
Mean	3.1456	6.7808	1.4872	4.4330	6.0494
Median	3.1732	5.3600	1.5695	4.6317	3.8181
Maximum	3.5052	17.1900	1.8876	11.4896	19.2469
Minimum	2.6463	0.6800	0.6464	1.2167	-3.2334
Std. Dev.	0.2081	4.2462	0.2908	1.8144	5.8700
Skewness	-0.6449	1.1019	-1.3587	0.6707	0.5672
Kurtosis	2.5532	3.2236	4.3992	4.6752	2.0767
Jarque-Bera	6.6000	17.3783	33.0854	16.3126	7.5775
Probability	0.0368	0.0002	0.0000	0.0003	0.0226
Sum	267.37	576.37	126.41	376.81	514.20
Sum Sq.Dev.	3.64	1514.61	7.10	276.54	2894.40
Observations	85	85	85	85	85

Source: Author's Computation (2023)

Table 1 displays the descriptive statistics for various payment system indicators in West African economies: GDP per capita, Automated teller machine, Mobile money payment, number of Deposit Money Bank branches, and Inflation rate, was conducted. The mean GDPc was found to be 3.14 dollars, with a standard deviation of 0.20. The median was 3.173. the result also indicates that the distribution was negatively skewed with a skewness value of -0.64. The kurtosis value of 2.553 suggests a platykurtic distribution while the Jarque-Bera test was statistically significant at $p<0.05$, indicating that the data deviates significantly from a normal distribution. For Automated teller machines, the mean value was 6.78, and the standard deviation was 4.24. The median was 5.36, indicating a slightly positively skewed distribution with a skewness value of 1.10. The kurtosis value of 3.223 suggests a moderately leptokurtic distribution while the Jarque-Bera test was statistically significant at $p<0.05$, indicating that the data deviates significantly from a normal distribution.

Furthermore, The mean of MMP is 1.48 percent indicating that, on average, the number of MMP accounts holders tend to be around 1.4871 percent. Meanwhile the median of MMP is 1.56 and has a maximum of 1.88 percent and minimum of 0.64 percent, respectively. The standard deviation of MMP is 0.290, this indicates that the MMP clusters around its mean. The skewness of -1.358 indicates that the distribution of MMP is negatively skewed. MMP has a kurtosis of 4.399 suggests that the distribution of MMP is leptokurtic. Meanwhile, the probability of Jarque-Bera test statistic of 0.000 shows that the distribution of MMP significantly deviates from a normal distribution, as the probability is very close to zero. Similarly, the mean value of the number of Deposit Money Bank branches was 4.433, and the standard deviation was 1.81. The median was 4.63, indicating that the distribution is slightly negatively skewed with a skewness value of 0.67. The kurtosis value of 4.675 suggests a leptokurtic distribution while the Jarque-Bera test was statistically significant at $p<0.05$, indicating that the data deviates significantly from a normal distribution.

Finally, the mean inflation rate was found to be 6.04 percent across the west African countries, with a standard deviation of 5.870. The median was 3.81, indicating that the distribution is slightly positively skewed with a skewness value of 0.56. The kurtosis value of 2.07 suggests a mesokurtic distribution while the Jarque-Bera test was statistically significant at $p<0.05$ indicating that the data deviates significantly from a normal distribution.

Correlation Analysis

Table 2: Correlation Results

	GDPC	ATM	DMBB	INF	MMP
GDPC	1				
ATM	0.7589	1			
DMBB	0.7481	0.6435	1		
INF	0.2504	0.2360	0.2120	1	
MMP	0.4942	0.4099	0.4782	0.2301	1

Source: Author's Computation (2023)

Results in Table 2 shows correlation analysis among GDPc, ATM, MMP, DMBBs, and INF. The results are showed a correlation coefficient between GDPc, and ATM was 0.758, indicating a strong positive relationship between the variables. The correlation coefficient between GDPc and MMP was 0.494, indicating a weak positive relationship between the variables. Meanwhile, the correlation coefficient between GDPc and DMBBs was 0.748, indicating a strong positive relationship between the variables. Also, the correlation coefficient between GDPc and INF was 0.250, indicating a weak positive relationship between the variables. Overall, the results suggest that there are moderate to strong positive relationships between GDPc, ATM, MMP, DMBBs, and INF. It is noteworthy that none of the correlation coefficients exceed 0.8, indicating the absence of multicollinearity issues in the model.

Stationarity test

To ensure accurate and reliable results, the stationarity of the data was tested using Levin, Lin, and Chu (2002), and Im, Pesaran, and Shin (2003). Table 3 shows the results of the analysis.

Table 3 Panel Unit Root Test with Individual Intercept

Variables	Levin, Lin & Chu t*	Prob. Values	Decision	Im, pesaran and shin w-stat	Prob. Values	Decision
GDPc	-7.0723	0.0000	I(1)	-5.7515	0.0000	I(1)
ATM	-5.7218	0.0000	I(1)	-6.9029	0.0000	I(1)
MMP	-5.3609	0.0000	I(1)	-4.2434	0.0000	I(1)
DMBBs	-4.2576	0.0000	I(1)	-3.9912	0.0000	I(1)
INF	-7.6321	0.0000	I(1)	-7.0185	0.0000	I(1)

Source: Author's Computation (2023)

Table 3. presents the unit root result of GDP per capita, Automated teller machine, Mobile money payment, number of Deposit Money Bank branches, and Inflation rate. The stationarity test reported in table 3 shows LLC, and IPS test statistics with individual intercept of Gross Domestic Product, Automated Teller Machine, Mobile money payment, number of Deposit Money Bank branches and inflation rate in West African economies were stationary at first difference I~1(indicating existence of unit root but difference once makes it stationary). The finding implies a further test to determine whether there exists a long run relationship in the model.

Co-integration Test:

Following the findings in table 3 that the model is I (1) series, a Kao residual cointegration test was conducted to determine the existence of a long run relationship. The result is present in table 4.

Table 4. Kao Residual Cointegration Test Result

	t-Statistic	Prob.
ADF	-1.8804	0.0016

Residual variance	0.0027
HAC variance	0.0024

Author's Computation (2023)

The co-integration test for Payment system and economic growth model in table 4 shows that the null hypotheses of no co-integration in the model is rejected because the parameters values of ADF statistics is less than 5%. This implies that there is co-integration in the Payment system and economic growth model in West Africa. Given the existence of co-integration and the fact that the variables are I(1) series, panel Fully Modified OLS with incorporated long run variance estimated.

Table 5: Panel FMOLS Estimates: dep. Variable=GDP per capita

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ATM	0.2623	0.0914	2.8693	0.0055
DMBB	0.3408	0.0479	7.1119	0.0000
MMP	0.0547	0.0498	1.0979	0.2760
INF	-0.0855	0.0588	-1.4532	0.1507
R-squared	0.8469	Mean dependent var		3.1710
Adjusted R-squared	0.8292	S.D. dependent var		0.1902
S.E. of regression	0.0786	Sum squared resid		0.42631
Long-run variance	0.0016			

Source: Author's Computation (2023)

The results in table 5 revealed that 84% of the variations in GDP per capita was explained by the variation in the explanatory variables in the panel FMOLS model. The results from the panel FMOLS estimator show that there is a direct and significant relationship between payment system indicators and GDP. The results show the parameter estimates of the model for interpreting long-run elasticities hence, it can be inferred that payment system indicators (ATMs, MMP and DMBBs) have long run effect on GDP per capita in West African countries.

The result also revealed that Automated Teller Machine has positive significant long run effect ($\beta = 0.262^{***}$, n = 85, p=0.0055) on GDP per capita. The result implies that holding other variables constant, a 1 unit increase in the number of Automated teller machine per 100,000 adults will likely lead to 0. 26 percent increase in the GDP per capita on the average in West African economies. The result also revealed that the number of Deposit Money Bank Branch has a positive significant long run effect (β = 0. 0.340^{***}, n = 85, p 0.0000) on GDP per capita. The result implies that holding other variables constant, a 1 percent increase in the number of Deposit Money Bank Branches per 100,000 adults will likely raise the GDP per capita by 0.34 percent on the average in West African economies.

Meanwhile, Mobile money payment system was found to have a positive insignificant long run effect ($\beta = 0.0546^{***}$, n=85, p=0.2760) on GDP per capita. The result implies that holding other variables constant, a

1 percent increase in the mobile money account holders, will not likely affect GDP per capita on the average in West African economies. Also, inflation rate did not have a significant effect on GDP per capita (β = -0.085, n =85, p= 0.1507). Overall, payment system indicators have a significant long run effect on economic growth in West African economies within the period under review.

Panel Granger Causality Test

To establish the direction of causality between payment system indicators and economic growth, Granger causality test was conducted. The result is presented in table 6.

Table 6: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LATM does not Granger Cause LGDPC	75	0.6466	0.5269
LGDPC does not Granger Cause LATM		7.5285	0.0011
LDMBB does not Granger Cause LGDPC	75	0.3859	0.6813
LGDPC does not Granger Cause LDMBB		2.3856	0.0995
LMMP does not Granger Cause LGDPC	75	0.6763	0.5118
LGDPC does not Granger Cause LMMP		0.0936	0.9108

Source: Researcher's Computation (2023)

Result in Table 6 reveals that there is no unidirectional causality between GDP per capita and number of ATM per 100, 000 adults (f = 7.528***, n =75, p= 0.0011) running from GDP per capita to ATM in West African countries. This implies that the number of GDP per capita granger cause ATM use in West Africa. However, no causality was found among other explanatory variables with GDP per capita in West African countries within the period under review.

Post Estimation Test

Post estimation was also conducted to determine the reliability of the study. A coefficient diagnostic test using Variance Inflation Factor and residual diagnostics test using histogram were conducted to ensure that the model explanatory variables are not colinear and from a normal distribution. The result in presented in table 7.

Table 7: Multicollinearity Test Result

Variable	Coefficient Variance	Variance Inflation Factor
ATM	0.0016	1.3451
DMBB	0.0046	1.7269
MMP	0.0010	1.3993

INF	0.0001	1.0599

Source: Researcher's computation (2023)

The result in table 8 shows that the values of the Variance Inflation Factor (VIF) in all the variables in the panel Fully Modified OLS (FMOLS) are less than 2 for each variable. This indicates absence of multi-collinearity problem in the model (Hair, 1995).

5. DISCUSSION AND IMPLICATIONS

The study aimed at investigating the influence of Payment systems on Economic Growth in West African Economies. Pre-estimation checks were conducted to ensure accuracy and dependability of the results. From the finding, the number of ATM per 100,000 adults has a significant influence on economic growth in West Africa. This could be because increasing the number of ATMs can contribute to improving financial inclusion, as it provides individuals with access to basic banking services. It allows people to transfer funds more conveniently, promoting participation in the formal financial system. Financial inclusion is often associated with increased savings, investment, and entrepreneurial activity, which can drive economic growth (World Bank, 2014). Meanwhile Widespread access to ATMs can enhance the efficiency of financial transactions, reducing the time and effort required for individuals and businesses to access and manage their funds. It can also lead to cost reductions by reducing the reliance on traditional brick-and-mortar banking infrastructure. This efficiency can contribute to overall productivity and economic growth (Allen et al., 2014). Furthermore, ATMs facilitate the use of electronic payment methods, such as debit cards, by providing convenient cash access. The adoption of electronic payments can have several economic benefits, including reducing the costs associated with cash handling, improving transparency, reducing corruption, and enhancing overall efficiency in the economy (IMF, 2016).

The finding is consistent with Elechi and Rufus (2016) findings that 51% of transactions in Nigeria were performed through automated teller machines (ATMs). Their finding indicates that ATM transactions accounted for more than half of the total transactions in the West Africa subregion during that period, underscoring the vital role of ATMs in the country's banking system and their significance for Nigerians in conducting various business transactions (Elechi & Rufus, 2016).

The findings also revealed that the number of Deposit Money Bank branches has a significant long run influence on economic growth in West African subregion. The findings stem from the fact that increased access to Deposit Money Bank branches can enhance financial inclusion by providing individuals and businesses with a physical presence where they can access banking services. Financial inclusion is often associated with economic growth, as it allows more people to participate in the formal financial system, save money, and invest in productive activities (Demirgüç-Kunt, Klapper, & Singer, 2013).

The study also found that mobile money account as a percentage of the total population in West African economies does not have a significant influence on GDP per capita. This could be because there are not enough account holders with mobile banking system overtime. However, the importance of mobile bank accounts to cashless drive in West Africa cannot be overemphasized. Mobile money accounts, while having the potential to enhance financial inclusion and promote economic development, may not have a significant effect on GDP per capita. Several factors contribute to this finding. For instance, Mobile money accounts heavily rely on a well-developed telecommunications infrastructure and widespread mobile network

coverage to reach a significant portion of the population. However, in many developing countries like west Africa, the necessary infrastructure is lacking, hindering the adoption and usage of mobile money services (Mothobi & Grzybowski, 2017). The findings lend credence to Mas and Morawczynski (2009) who found that in Kenya, where mobile money services like M-PESA have achieved significant success, the impact on GDP per capita was limited due to the concentration of these services in urban areas, leaving rural populations excluded. This highlights the importance of widespread access to mobile money services for it to have a substantial effect on GDP per capita. Furthermore, low penetration rates may have contributed. Despite the growth of mobile money accounts in some countries, penetration rates remain relatively low in many developing economies. For instance, a study by Demirguc-Kunt *et al.* (2018) analyzed data from 84 countries and found that the average adoption rate of mobile money accounts was only 23%, indicating limited usage and impact. Meanwhile, In several cases, mobile money accounts primarily serve as a means of domestic remittance and payment transactions within the informal economy, rather than facilitating broader financial services and integration with the formal economy (Ikue, *et al.*, 2021). This limited integration can constrain the impact of mobile money accounts on GDP per capita.

While the panel FMOLS reveals positive influence of payment systems on economic growth, the evidence was corroborated by granger causality test which revealed a unidirectional causality between payment system indicators (ATM and MMP) and GDP, running from ATM and MMP to GDP. This lends credence to the fact that the utilization of information and communication technology (ICT) in the provision of banking services has undoubtedly led to enhanced service delivery and customer convenience, it is important to acknowledge that technological investments come with associated expenses (PricewaterhouseCoopers, 2016).

6. Conclusion and Further Studies

The study demonstrated that Mobile money has gained popularity as a secure and convenient means of financial transactions, especially in areas with limited access to traditional banking services however, its influence has not been significant enough to enhance economic wellbeing in West African economies. The findings indicate that the adoption of mobile money services has a significant long-term impact on economic growth by promoting financial inclusion, facilitating business transactions, and stimulating overall economic activities. Furthermore, the analysis highlighted a positive influence of the number of ATM and Deposit Money Bank branches per 100,000 adults on economic growth. Deposit Money Bank branches play a crucial role in providing essential banking services, such as aiding the establishment of electronic banking facilities and financial advice. The presence of Deposit Money Bank branches fosters financial intermediation, including internet banking, enhances access to credit, and encourages investment and entrepreneurship, thereby driving economic growth.

These findings hold important implications for policymakers and stakeholders in West Africa because they encourage the development of payment system infrastructure which can foster economic growth, enhance financial inclusion, and drive overall socioeconomic progress in West African economies.

Based on the findings of this research study, the following recommendations are suggested to policymakers, stakeholders and for future research in West African economies:

1. Increase Access to ATMs: Governments and financial institutions should prioritize expanding the number of ATMs per 100,000 adults. Enhanced accessibility to ATMs will facilitate electronic financial transactions, encourage savings, investment, and consumption, and ultimately contribute to economic growth.

2. Expand Deposit Money Bank Branches: Policymakers should consider policies that promote the establishment of Deposit Money Bank branches in areas with limited access to banking services. Increased availability of Deposit Money Bank branches will promote financial intermediation, improve access to credit, and foster investment and entrepreneurship, thus driving economic growth.
3. Enhance Financial Literacy: To maximize the benefits of payment systems, it is essential to invest in financial literacy programs. Educating individuals and businesses about the advantages and proper utilization of cashless technologies, such as ATMs and mobile money, will encourage their adoption and ensure effective usage.

This study suggests that further research on a test of the neo structuralists theory on the innovation of curb market payment system in sub-Saharan African countries. Further studies can also examine the possibility of mobile money adoption to unveil quality information of borrowers in the financial system of developing countries.

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