Digital Financial Development and Economic Growth in Selected Sub-Saharan Africa Countries: The Empirical Evidence

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ABSTRACT

Digital finance can narrow the gap between urban and rural populations and support inclusive growth, yet the evidence for Africa countries remains weak. This study examines the long-run relationship between digital finance and economic growth in a balanced panel of ten African economies (Nigeria, Rwanda, Mauritius, South Africa, Kenya, Ghana, Côte d'Ivoire, Botswana, Gambia and Uganda) over 2007–2023 (170 observations). The log of real gross domestic product (RGDP) measures economic growth; digital finance is proxied by mobile cellular subscriptions (MCT), mobile money operators per population (MMT), financial accessibility by operators (FAC) and internet users conducting mobile transactions (FTK), with research and development (RAD) as a control variable. Annual data from the World Development Indicators are analysed with the Panel ARDL technique after panel unit-root and cointegration tests. The cointegration tests indicate a long-run relationship. The long-run estimates show that FAC has a positive and statistically significant effect on RGDP (elasticity of 0.857, $p < 0.01$), and FTK is positive but significant only at the 10% level (elasticity of 0.550, $p = 0.053$), whereas the positive coefficients of MCT and MMT are not statistically significant. The evidence therefore supports a growth role for financial accessibility and, more tentatively, internet-based transactions, but not for mobile subscriptions or mobile money operator density .The study therefore recommends that policymakers should prioritise expanding access to, and use of, digital financial services, supported by regulatory frameworks that encourage financial innovation while safeguarding security and stability.

Keywords; Digital Finance, Economic Growth, Financial inclusion, Financial innovation

JEL Code; G20, G21, O16, O33

INTRODUCTION

Over the years, African region has been at the forefront of digital financial innovation, notably through mobile money platforms. Digital finance is widely regarded as a potential driver of economic expansion. Existing literature suggests that digital finance accelerates economic growth and reduces income inequality by formalising the financial sector (Tchamyou et al., 2019). According to Anane and Nie (2022), digital financial services utilise technology, software, and infrastructure that enable quick data transfer between people, businesses, devices, networks, and systems to boost global economic growth (Roessler, 2018).

Customers who use digital technology to access financial services are said to be engaging in digital financial services. Abbasi and Weigand (2017) noted that by adopting advanced technologies such as digital payment platforms, internet banking, mobile banking, and mobile money, digital financial services enhance the financial services traditionally provided by financial institutions. Similarly, Pazarbasioglu et al. (2020) define digital financial services as those that rely on digital technologies to be delivered and accessed by clients. In developing nations, where access to physical banks is often limited, people can now conveniently use their mobile phones to access financial services. According to the Asian Development Bank (2016), digital financial services provide not only money transfers but also safe electronic money storage, payment services, savings, and broader access to other financial products such as credit and insurance. Customers of deposit money institutions can therefore access basic financial services via digital payment platforms, mobile devices, and electronic money systems (Anane & Nie, 2022).

Pazarbasioglu et al. (2020) further argue that nations with more advanced financial systems experience faster economic growth and greater reductions in poverty and inequality. By improving transaction speed, security, and transparency, digital financial services reduce transaction costs and enable the provision of specialised financial services to underserved populations. Hasan et al. (2020) highlight that the rapid expansion of digital financial services, alongside technological advancements, has encouraged many countries to expand their digital finance ecosystems, thereby helping reduce poverty and mitigate social exclusion. These developments spanning applications, business models, and innovative products have fundamentally reshaped the traditional provision of banking and financial services (Sangwan et al., 2020).

In contemporary terms, information and communication technology (ICT) was mainly used to strengthen global networks. However, the surge in internet and smartphone usage has not only enabled business growth but also transformed living standards, communication styles, and work habits. Nowadays, mobile devices are also widely used for banking and other financial transactions, which fall under the umbrella of digital financial services (Chatterjee, 2020). Following globalisation, digital finance has transformed the banking industry by linking consumers to secure digital payment channels through computers, smartphones, and the internet, thereby providing safe, convenient, and affordable banking services.

The advantages of digital finance include fast decision-making, secure deposits and payments, and broader financial access. Accordingly, digital finance fosters financial inclusion and represents a win-win solution (Durai & Stella, 2019). Since 2010, the World Bank has urged developing nations to improve financial inclusion as a means of reducing poverty and helping marginalised groups break the cycle of deprivation (Ozili, 2022). Digital financial services are particularly valuable because they safeguard money and reduce the need to carry cash. People in remote areas or without access to traditional banking services can now open accounts via mobile phones (Wyman, 2017). These services empower users to deposit money, send payments, and manage their finances independently (Harelimana, 2017).

According to Demirgüc-Kunt et al. (2022), 30 percent of account holders in developing countries use their phones or the internet to make at least one direct deposit. Moreover, the share of adults in developing economies who make or receive digital payments increased from 35 percent in 2014 to 57 percent in 2021. Sub-Saharan Africa, in particular, shows remarkable growth in digital finance adoption. The COVID-19 pandemic further accelerated the uptake of digital financial services, especially in areas such as utility bill payments.

Globally, 865 million people created their first accounts with financial institutions to receive government transfers and participate in the digital finance ecosystem **(**Han, 2024**)**. Stakeholders such as network providers, financial organisations, regulators, fintech companies, agents, and retail networks, play a crucial role in this transformation. For those who are financially excluded, digital financial services can significantly lower transaction costs while offering convenient, affordable, safe, and reliable banking services (Haider, 2018). As a fundamental component of DFS, fintech has emerged as a critical tool for financial inclusion across both developed and developing nations. Regional studies (Lukonga, 2018) and country-level research (Jack & Suri, 2014) affirm that fintech promotes access to financial services.

Nevertheless, digital financial services also face limitations. Challenges such as building trust in digital savings, preventing cyberattacks, addressing high transaction costs, improving digital literacy, and expanding network coverage remain significant barriers to adoption, particularly in developing economies (Durai & Stella, 2019; Wyman, 2017).

Digital finance holds significant potential, but there is no guarantee that it will drive economic growth. The institutional and regulatory environment shapes how digital financial services operate: political instability, corruption, weak institutions and inadequate regulatory frameworks, which characterise several African economies, may weaken the effectiveness of digital finance initiatives. These considerations are important for interpreting the results, but institutions are not modelled in this study (see Section 5.2).

Over the past decade, the literature on digital financial inclusion (DFI) has grown considerably, with particular attention to its effects on economic growth, environmental sustainability, and poverty reduction (see Erlando et al., 2020; Williams, 2017; Khan et al., 2022; Ratnawati, 2020; Sethi & Acharya, 2018; Ozili, 2022; Odugbesan

et al., 2022). Nevertheless, much of this research relies on conventional measures of financial inclusion, primarily access, and therefore fails to capture the broader dimensions of inclusion.

It is also worth noting that digital finance remains a relatively new concept in the literature. A review of existing studies shows that the relationship between digital finance and economic growth has not been comprehensively explored, partly due to data limitations. While numerous studies investigate the impact of traditional financial inclusion on growth (Basnayake et al., 2024), digital finance differs significantly from conventional inclusion, and only a few studies have examined its specific effects in African contexts. Consequently, a gap exists in the literature on digital finance and economic growth.

Furthermore, the evidence for Sub-Saharan Africa is limited and mixed. Existing studies tend to examine a single dimension of digital finance, rely on composite financial-inclusion indices, or study the determinants of inclusion rather than its macroeconomic payoff. Few studies examine, within one dynamic panel framework, several distinct dimensions of digital finance (connectivity, mobile money provision, financial access and internet-based transactions) and report which of them is associated with long-run output. This study addresses that gap.

This study examines the effect of digital finance on economic growth in selected African economies. The research question is: to what extent do different dimensions of digital finance affect real output in these economies in the long run? Specifically, the study (i) estimates the long-run effect of each digital finance proxy on real GDP using a Panel ARDL framework, and (ii) examines the short-run dynamics and the speed of adjustment towards the long-run equilibrium.

The study covers ten African economies classified by the World Bank as Sub-Saharan African over 2007–2023. The period is chosen because it coincides with the advent and rapid expansion of mobile and digital financial services in the region.

LITERATURE REVIEW

Conceptual Review

The conceptual review defines and delineates the key variables that constitute the subjects of investigation. This section discusses digital finance and economic growth.

Digital Finance

Digital finance refers to a range of products, applications, procedures, and business models that revolutionise conventional banking and financial services which describes how new technologies are affecting the financial services sector (CBN, 2024). It improves financial efficiency, inclusiveness, and innovation by streamlining financial procedures, increasing access to services worldwide, and transforming how people handle their money, make payments, and obtain loans. These are the services that clients use using digital technology. Abbasi and Weigand (2017) pointed out that by utilising cutting-edge and sophisticated technology like digital payment platforms, internet banking, mobile banking, and mobile money, digital financial services enhance the financial services offered by traditional financial institutions. Digital financial services are those that rely on digital technology to be delivered and utilised by clients, according to Pazarbasioglu et al. (2020). In underdeveloped nations, digital financial services allow people who have limited access to financial services to use their phones whenever it is convenient for them and avoid physically visiting a bank.

According to the Asian Development Bank (2016), digital financial services provide not only money transfers but also safe electronic money storage (mobile money), payment services, savings, and increased access to other financial services like credit and insurance. Customers of deposit money institutions can obtain basic financial services via digital payment arrangements, mobile devices, and electronic money structures thanks to digital financial services (Anane & Nie, 2022). Pazarbasioglu et al. (2020) claim that nations with more advanced financial systems show faster economic growth and a more significant reduction in poverty and inequality. By increasing transaction speed, security, and transparency, digital financial services lower transaction costs and

make it possible for more specialised financial services to benefit the underprivileged (Pazarbasioglu et al., 2020).

Economic growth

A rise in the value of a nation's commodities and services over time is referred to as economic growth, and it can be used to gauge a nation's size. Appah (2022) defines economic growth as a long-term, steady rise in net national product or per capita national output. It suggests that in order to improve or raise the quality of living for the populace, the rate of rise in total output must be greater than the rate of population growth. The most often cited indicator of economic growth is the gross domestic product (GDP), while there are other metrics as well.

The monetary value of products and services generated in a country over a specific time period by its citizens, regardless of their nationality, is known as the GDP. GDP can be calculated using the current market price, constant basic prices (Real GDP), or current basic prices (Nominal GDP). Since it takes into consideration changes in the level of prices of goods and services produced in the country within a certain time period, real GDP has been regarded as a reliable indicator of economic growth. Gross domestic product, according to Appah and Zibaghafa (2018), is the total amount of output that has occurred in the economy, regardless of the nationality of the individuals who generated the goods and services.

Theoretical Review

Technology Acceptance Model (TAM)

Davis (1989) technology acceptance model (TAM) served as the foundation for this investigation. This theory of information systems models the adoption and usage of new systems by information technology users. The technology acceptance model was used by Davis (1989) to explain the primary aspects that influence an individual's willingness to embrace and utilise new technology. The study found that perceived utility and simplicity of use are the two primary elements influencing an individual's desire to embrace and employ new technology. Perceived usefulness, according to Ailemen et al. (2018), is a factor that influences user acceptability since it is predicated on how well the new technology would enhance job performance. The technology must be able to provide a positive performance in addition to an advantageous outcome. How simple it is for people to use new technology is explained by perceived ease of use. It implies that using the new technology need to be simple (Iwedi et al, 2023). According to Anane and Nie (2022), in order to connect the acceptance of digital financial services, service providers must assess the chances of new technology introductions succeeding and comprehend the factors that affect acceptance in order to create proactive interventions aimed at user populations that might be less likely to adopt and use new systems.

In their study of the factors driving the adoption of mobile augmented reality (MAR) in Turkey, Yavuz and Mesci (2021) found that the two most important aspects influencing the use of MAR applications are security and privacy. High transaction costs, self-efficacy, and a lack of knowledge or awareness can all hinder the adoption of technology (Shaikh and Karjaluoto 2015).

Rogers (1962) devised the Diffusion of Innovation (DOI) Theory, which describes how new technology gradually spread throughout a community. This hypothesis aids in the analysis of the adoption of financial technologies in African economies, including digital banking, fintech applications, and mobile money. Digital financial solutions are introduced by innovators and early adopters (such as fintech startups and tech-savvy people), and the early and late majority (like SMEs and urban consumers) progressively incorporate these services into everyday transactions. However, elements including perceived advantages, usability, and confidence in digital banking systems all affect how quickly adoption occurs. Digital finance therefore offers considerable potential for the development of financial systems: unbanked populations can now access formal financial services through fintech platforms and mobile money. Digital transactions also improve efficiency and lower costs, which benefits customers and businesses alike.

Empirical Review

Rahman et al. (2024) used monthly data from 2018 to 2021 to examine the connection between DFI and economic growth in Bangladesh. The Auto-regressive Distributed Lag (ARDL) model was used in the study, and a number of indicators, including transactions from automated teller machines, point-of-sale payment systems, e-commerce, utility bill payments made via mobile devices, and online banking, were used to measure DFI. The analysis's findings were conflicting; some DFI indicators showed a negative correlation with economic growth, while others showed a positive correlation.

From 2007 to 2019, Ozturk and Ullah (2022) investigated environmental sustainability and the relationship between DFI and growth in 42 OBRI countries. The findings, which were based on econometric methodologies such as pooled ordinary least squares (OLS), two-stage least squares (2SLS), and generalised method of moments (GMM), showed that DFI boosts economic development but degrades environmental quality by raising CO2 emissions. According to the report, in order to accomplish both environmental sustainability and economic performance, authorities in OBRI regions should create policies that enhance digital financial inclusion.

Demir et al. (2022) used data from the Global Findex surveys administered in 2011, 2014, and 2017 to investigate the connection between fintech, financial inclusion, and income inequality in 140 countries. The results of quantile regression analysis and a number of financial inclusion metrics, including the percentage of adults (aged 15+) who have an account at a formal financial institution, the percentage of adults who borrow from a formal financial institution, and the percentage of adults who save at a formal financial institution, showed that financial inclusion is important for lowering income inequality, with its effects being most noticeable in higher-income nations, even though it reduces inequality at all levels of the inequality distribution.

Liu et al. (2021) used province panel data from 2011 to 2019 to examine how digital financial inclusion affected China's economic growth. The Peking University Digital Finance Center's digital inclusive financial index was employed in the study due to the challenge of evaluating data on digital financial inclusion. The findings, which are based on a Bayesian macroeconomic framework, demonstrate that the increase of digital financial inclusion significantly boosts economic growth and has a notable Internet threshold effect. Together with Demir et al. (2022), this study suggests that the effects of digital and financial inclusion vary with the level of development and with the dimension of inclusion considered.

The effect of DFI on economic growth in 30 Asia-Pacific nations was investigated by Basnayake et al. in 2024. The DFI index was constructed using 16 factors that covered traditional access, traditional usage, digital access, and digital usage. The model was estimated using panel threshold regression econometric techniques and fixed effects. The findings demonstrated that DFI considerably boosts economic growth in Asia-Pacific nations, especially in high- and upper-middle-income nations. At household level, Koomson et al. (2020) similarly report that greater financial inclusion lowers the probability of being poor by 27% and the risk of future poverty by 28%.

In a sample of SSA nations, Kouladoum et al. (2022) investigated the impact of digital technologies on financial inclusion using the GMM methodology. The results imply that investments in both technology and financial infrastructure are necessary to support stability and inclusive finance in the area, since financial inclusion in SSA rises in tandem with the development of digital technologies. Abor et al. (2020) investigated the welfare implications of mobile penetration and financial inclusion using a large sample of household survey data and instrumental variable techniques. They discovered that mobile phone ownership and usage are linked to lower levels of household poverty in Ghana, suggesting that mobile technology is a promising means of promoting inclusive growth in the country.

Ugwuanyi et al. (2022) explored the effect of financial inclusion on economic growth for 29 Sub-Saharan African nations between 2012 and 2020, breaking it down into traditional finance and digital finance as its sub-dimension. The panel vector autoregression Granger causality test, panel feasible generalised least squares, and panel system GMM techniques were used in the investigation. Although the extent of the benefit is more noticeable when taking traditional financial inclusion indicators into account, the results showed that both conventional and digital financial inclusion had positive and significant impacts on economic growth for the

entire sample. Their findings are particularly relevant here because they cover Sub-Saharan Africa and distinguish traditional from digital dimensions of inclusion.

A study on financial technology and financial inclusion in Nigeria was carried out by Iwedi (2023) . From 2009 to 2019, secondary data was gathered from the Central Bank of Nigeria as part of the study's ex post facto research design. Point of sale, automated teller machines, web banking, and mobile banking technologies were used to measure the independent variable of financial technology, whereas deposit ratios were used to test the dependent variable of financial inclusion. Both univariate and multivariate analysis were used to examine the secondary data that was acquired. The results of the vector auto regression estimation showed that, in Nigeria, mobile banking, automated teller machines, and point of sale technology have a positive but not significant impact on financial inclusion, whereas web banking technology has a positive and significant impact.

Critical Synthesis and Hypotheses Development

Taken together, the empirical studies point to a generally positive but heterogeneous relationship between digital financial inclusion and economic outcomes. Positive growth effects are reported for China (Liu et al., 2021), Asia-Pacific economies (Basnayake et al., 2024), One Belt One Road Initiative (OBRI) economies (Ozturk & Ullah, 2022) and Sub-Saharan Africa (Ugwuanyi et al., 2022). The results are, however, sensitive to the indicator used: Rahman et al. (2024) find that some digital finance indicators relate negatively and others positively to growth, and Iwedi (2023) finds that only web banking has a significant effect on financial inclusion in Nigeria. Effects also differ with income level (Basnayake et al., 2024; Demir et al., 2022).

The evidence also has limitations that motivate this study. It is dominated by composite indices and non-African samples, and the African studies either take financial inclusion rather than output as the outcome (Kouladoum et al., 2022; Iwedi, 2023) or use broad indices that conceal which component of digital finance matters. Two implications follow. First, mobile subscriptions measure connectivity rather than financial usage, so their growth effect need not be significant even where digital financial access matters (compare Gruber & Koutroumpis, 2011, on mobile telecommunications and growth). Second, indicators of access and transaction use are expected to be more closely linked with output than infrastructure alone. This is consistent with the Technology Acceptance Model and Diffusion of Innovation theory, under which benefits arise only when services are accessible, perceived as useful and actually used.

Gap in Literature

This section reviewed the conceptual, theoretical and empirical literature. Two gaps emerge. First, the evidence on digital finance and economic growth in African economies is limited and mixed, and much of it concerns financial inclusion rather than output. Second, few studies disaggregate digital finance into several proxies within one dynamic panel framework to identify which dimension is associated with long-run output.

This study contributes by estimating a Panel ARDL model for ten African economies over 2007–2023 with four digital finance proxies, and by reporting transparently which of them are statistically significant.

METHODOLOGY

Research Design

The study adopts a quantitative design combining ex post facto and correlational approaches. It uses annual panel data from the World Development Indicators (WDI) of the World Bank to estimate the long-run and short-run relationship between digital finance and economic growth.

Sample, Selection Criteria and Panel Structure

The study uses a balanced panel of ten African economies observed annually over 2007–2023 (T = 17), which gives N × T = 170 observations for every variable, as reported in Table 3. The countries are listed in Table 1.

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Table 1: Countries in the sample

Country	World Bank region	Country	World Bank region
Nigeria	Sub-Saharan Africa	Kenya	Sub-Saharan Africa
Rwanda	Sub-Saharan Africa	Ghana	Sub-Saharan Africa
Mauritius	Sub-Saharan Africa	Côte d'Ivoire	Sub-Saharan Africa
South Africa	Sub-Saharan Africa	Botswana	Sub-Saharan Africa
Uganda	Sub-Saharan Africa	The Gambia	Sub-Saharan Africa

Source: Authors' compilation (2026)

Two criteria determined the sample: (i) the country is among the African economies that the ILO (2023) identifies as having a relatively high rate of digitalisation alongside rising real GDP; and (ii) data are available for all variables for the full period, which yields a balanced panel. The start year, 2007, marks the advent of mobile money and widespread digitalisation in the region. Because the sample is selected on digital advancement, the findings may not generalise to less digitalised economies in the region.

Variable Definitions and Data Sources

Table 2 gives the operational definition, unit, transformation, source and expected sign of each variable. All variables enter the model in natural logarithms (prefix L). Real GDP is measured in levels, so the study uses "economic growth" to mean expansion in real output, and the coefficients are output elasticities rather than effects on the growth rate.

Table 2: Variable definitions

Variable	Operational definition	Unit / transformation	Source	Expected sign
RGDP	Real gross domestic product (dependent variable) **constant US$;**	US$; natural log (LRGDP)	WDI	n/a
MCT	Mobile cellular subscriptions per 100 people (WDI IT.CEL.SETS.P2)	Per 100 people; natural log (LMCT)	WDI	+
MMT	Mobile money operators per population**,**	**unit**; natural log (LMMT)	WDI	+
FAC	Financial accessibility by operators	**unit**; natural log (LFAC)	WDI	+
FTK	Internet users conducting mobile transactions (financial technology)	**% of population/adults**; natural log (LFTK)	WDI	+
RAD	Research and development (control variable) **e.g. R&D expenditure, % of GDP**	**unit**; natural log (LRAD)	WDI	+

Source: Authors' compilation (2026). Variable choice follows Chinoda and Kapingura (2024), Meniago (2025), Han (2024), Murshed et al. (2023), Tariq et al. (2023) and Ugwuanyi et al. (2022).

Model Specification

Following Chinoda and Kapingura (2024), a dynamic ARDL model is formulated to capture both short-run and long-run dynamics between digital finance and economic growth. The functional form is:

$$RGDP_{it} = f(MCT_{it}, MMT_{it}, FAC_{it}, FTK_{it}, RAD_{it}) \quad (1)$$

where i = 1,…,10 indexes countries and t = 2007,…,2023 indexes years. The log-linear long-run relationship is:

$$\ln RGDP_{it} = \beta_0 + \beta_1 \ln MCT_{it} + \beta_2 \ln MMT_{it} + \beta_3 \ln FAC_{it} + \beta_4 \ln FTK_{it} + \beta_5 \ln RAD_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

where μ_i is a country-specific effect and ε_{it} is the error term. Because the variables are in logs, β_1 to β_5 are elasticities. The Panel ARDL(p, q, …, q) error-correction representation is:

$$\Delta \ln RGDP_{it} = \varphi_i[\ln RGDP_{i,t-1} - \theta_{0i} - \theta_1 \ln MCT_{it} - \theta_2 \ln MMT_{it} - \theta_3 \ln FAC_{it} - \theta_4 \ln FTK_{it} - \theta_5 \ln RAD_{it}] + \Sigma_{j=1}^{p-1} \lambda_{ij} \Delta \ln RGDP_{i,t-j} + \Sigma_{j=0}^{q-1} \delta_{ij}' \Delta \ln X_{i,t-j} + \varepsilon_{it} \quad (3)$$

where X is the vector of the five regressors, θ_1 to θ_5 are the long-run coefficients (reported in Table 7), δ are the short-run coefficients and φ_i is the error-correction coefficient, which measures the speed of adjustment to long-run equilibrium and is expected to be negative and statistically significant.

Estimation Strategy

Estimation proceeds in five steps. (1) Descriptive statistics and correlations describe the data. (2) Panel unit-root tests (Levin, Lin & Chu, 2002; Im, Pesaran & Shin, 2003; and the ADF- and PP-Fisher tests of Maddala & Wu, 1999) establish the order of integration. A variable is classified I(0) if the unit-root null is rejected in levels, and I(1) if it is not rejected in levels but is rejected in first differences. (3) Pedroni (1999) residual-based panel cointegration tests examine whether a long-run relationship exists. (4) The model in equation (3) is estimated with the pooled mean group (PMG) estimator of Pesaran, Shin and Smith (1999), which constrains the long-run coefficients to be equal across countries while allowing short-run coefficients, error-correction speeds and intercepts to differ. Because T = 17 is short, lag orders are kept low. (5) Diagnostic and robustness tests (Table 9) include Pesaran's (2004) cross-sectional dependence test, a Hausman test of PMG against mean group estimates, serial correlation and heteroskedasticity checks, variance inflation factors, and estimation.

RESULTS AND DISCUSSION OF FINDINGS

Descriptive Statistics

Table 3: Descriptive Statistics

	RGDP	MCT	MMT	FAC	FTK	RAD
Mean	1.33E+11	92.56097	43.00079	29.43174	26.27541	0.475481
Median	4.63E+10	88.07720	42.30622	18.84034	19.95000	0.455510
Maximum	5.74E+11	179.0270	96.28901	142.4220	81.40000	4.284440
Minimum	1.23E+09	6.650700	6.256400	5.221100	1.800000	0.024360
Std. Dev.	1.62E+11	39.08373	20.21385	31.27037	21.36678	0.471672
Skewness	1.072173	0.265619	0.427820	2.396329	0.949535	4.650067
Kurtosis	2.556826	2.398005	2.622647	7.573629	2.938977	34.31839

Jarque-Bera	33.96192	4.566003	6.194485	310.8709	25.57218	7560.282
Probability	0.000000	0.101978	0.045174	0.000000	0.000003	0.000000
Sum	2.25E+13	15735.37	7310.134	5003.396	4466.820	80.83172
Sum Sq. Dev.	4.42E+24	258153.9	69053.38	165254.3	77155.14	37.59812
Observations	170	170	170	170	170	170

Source: Authors' computation (2026)

Table 3 presents the descriptive statistics of the variables in their raw form (before logarithmic transformation). Nigeria records the highest real GDP (US$574,183,763,411.51 in 2014), while The Gambia records the lowest (US$1,229,461,721.41, 2008). Mobile cellular subscriptions per 100 people are highest in Botswana in 2023 (179.03; the figure exceeds 100 because individuals may hold several subscriptions) and lowest in Rwanda in 2007 (6.65). MMT is highest in Kenya in 2023 (96.29) and lowest in Togo in 2009 (6.26). FAC ranges from a minimum of 5.22 percent in Uganda in 2007 to a maximum of 142.42percent in 2010. All variables are positively skewed, and the Jarque-Bera test rejects normality at the 5% level for all variables except MCT (p = 0.102).

Panel Unit-Root Tests

Table 4: Panel unit-root tests (statistic and probability)

Variable	**Levin, Lin & Chu t***	**Im, Pesaran & Shin W-stat**	**ADF-Fisher Chi-square**	**PP-Fisher Chi-square**	**Order of integration (as reported)**
LRGDP	-7.34475 (0.0000)	-4.58330 (0.0000)	57.2936 (0.0000)	113.794 (0.0000)	I(1)
LMCT	-6.56779 (0.0000)	-5.10874 (0.0003)	60.7072 (0.0000)	153.725 (0.0000)	I(1)
LMMT	-25.9982 (0.0000)	-26.3389 (0.0000)	61.7148 (0.0000)	80.6772 (0.0000)	I(0)
LFAC	-5.83163 (0.0000)	-3.75012 (0.0001)	49.3757 (0.0003)	83.8370 (0.0000)	I(1)
LFTK	-6.31468 (0.0000)	-3.66994 (0.0001)	51.5594 (0.0001)	68.7724 (0.0000)	I(1)
LRAD	-14.9232 (0.0000)	-6.79350 (0.0000)	47.0614 (0.0006)	52.6413 (0.0001)	I(0)

Source: Authors' computation (2026). Null hypothesis: unit root. Probabilities in parentheses.

Table 4 reveals four panel unit-root tests, all with the null hypothesis of a unit root. The Levin-Lin-Chu test assumes a common autoregressive process across countries, whereas the Im-Pesaran-Shin and Fisher-type tests allow it to differ. As reported, LMMT and LRAD are classified as I(0), and LRGDP, LMCT, LFAC and LFTK as I(1). No variable is classified as I(2), so mixed integration orders are compatible with the ARDL approach.

Panel Cointegration Test

Table 5: Pedroni panel cointegration test

			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel PP-Statistic	-5.292782	0.0000	-5.214983	0.0000

Panel ADF-Statistic	-3.071189	0.0011	-3.643827	0.0001
Group PP-Statistic	-13.37188	0.0000		
Group ADF-Statistic	-4.052198	0.0000		

Source: Authors' computation (2026). Null hypothesis: no cointegration. Panel statistics are within-dimension; group statistics are between-dimension.

Because the variables are of mixed integration orders, a residual-based panel cointegration test was applied (Pedroni, 1999). Table 5 reports the unweighted and weighted panel statistics and the group statistics. All reject the null of no cointegration at the 1% level ($p \leq 0.0011$), which indicates a long-run relationship among the variables and justifies estimating the long-run model.

Correlation Matrix

Table 6: Correlation matrix (variables in logs)

	LRGDP	LMCT	LMMT	LFAC	LFTK	LRAD
LRGDP	1.000000	0.173304	0.154767	0.525009	0.336119	0.385919
LMCT	0.173304	1.000000	0.504531	0.423372	0.762921	0.162081
LMMT	0.154767	0.504531	1.000000	0.345580	0.422227	0.339926
LFAC	0.525009	0.423372	0.345580	1.000000	0.405074	0.454774
LFTK	0.336119	0.762921	0.422227	0.405074	1.000000	0.460876
LRAD	0.385919	0.162081	0.339926	0.454774	0.460876	1.000000

Source: Authors' computation (2026)

Table 6 shows that all digital finance proxies and RAD are positively correlated with LRGDP. The correlation is strongest for LFAC (0.525), moderate for LFTK (0.336) and LRAD (0.386), and weak for LMCT (0.173) and LMMT (0.155). The correlation between LMCT and LFTK is high (0.763), which signals possible multicollinearity; variance inflation factors. Correlation does not imply causation, and these figures are only a preliminary guide to the long-run results below.

Panel ARDL Long-Run Estimates

Table 7: Panel ARDL long-run estimates (dependent variable: LRGDP)

Variable	**Coefficient (elasticity)**	**Std. Error**	**t-Statistic**	**Prob.**	**Significant at 5%?**
LMCT	0.531050	0.519113	0.648323	0.5177	No
LMMT	0.112226	0.268816	0.417482	0.6769	No
LFAC	0.856919	0.229514	3.733623	0.0003	Yes (1% level)
LFTK	0.550336	0.282865	1.945579	0.0534	No (10% level only)
LRAD	0.092153	0.259127	0.355629	0.7226	No
C	23.56620	1.986258	11.86462	0.0000	Yes

Source: Authors' computation (2026). Number of observations: 170 (10 countries, 2007–2023).

Table 7 reports the long-run estimates. Because the variables are in logarithms, each coefficient is an elasticity: a 1% change in the regressor is associated with a change of (coefficient)% in real GDP, other things equal. Statistical significance is distinguished from the sign of the coefficient.

Financial accessibility by operators (LFAC) has an elasticity of 0.857 that is significant at the 1% level (p = 0.0003): a 1% increase in FAC is associated with a 0.86% increase in real GDP in the long run. Internet users conducting mobile transactions (LFTK) has an elasticity of 0.550, but its probability (p = 0.0534) is significant only at the 10% level and not at the 5% level.

Mobile cellular subscriptions (LMCT; 0.531, p = 0.5177) and mobile money operators per population (LMMT; 0.112, p = 0.6769) have positive signs, but neither is statistically distinguishable from zero. The LMMT coefficient means that a 1% increase in MMT is associated with a 0.112% (not 11.2%) change in real GDP, and even that estimate is not statistically significant. Research and development (LRAD; 0.092, p = 0.7226) is also insignificant.

DISCUSSION OF FINDINGS

The study examined the effect of digital finance on economic growth in ten African economies using a Panel ARDL approach. Pre-estimation tests point to a long-run relationship among the variables. The results do not support the proposition that all digital finance proxies drive growth: only financial accessibility (FAC) is statistically significant at conventional levels, internet-based transactions (FTK) are significant at the 10% level only, and mobile cellular subscriptions (MCT) and mobile money operators (MMT) are not statistically significant.

The strong FAC result is consistent with Ugwuanyi et al. (2022), who found that digital and conventional financial inclusion significantly raise growth across 29 Sub-Saharan African economies, and with the positive effects reported for China (Liu et al., 2021) and the Asia-Pacific region (Basnayake et al., 2024). It also accords with the Technology Acceptance Model and Diffusion of Innovation theory: benefits depend on whether services are accessible and used, not only on whether the technology exists. The weaker FTK result suggests that internet-based mobile transactions may matter for output, but the evidence is not conclusive at the 5% level.

The insignificant MCT coefficient contrasts with Gruber and Koutroumpis (2011), who report positive growth effects of mobile telecommunications. A plausible explanation, which this study has not tested, is that subscription counts measure connectivity rather than financial usage; they can exceed 100 per 100 people (Botswana: 179 in 2023) because individuals hold several SIM cards.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the long-run relationship between digital finance and economic growth in a balanced panel of ten African economies over 2007–2023 using Panel ARDL. The panel cointegration tests indicate a long-run relationship existence. The evidence is mixed across the digital finance proxies: financial accessibility by operators has a positive and statistically significant effect on real GDP (elasticity 0.857, 1% level), internet users conducting mobile transactions have a positive effect that is significant only at the 10% level (elasticity 0.550), and mobile cellular subscriptions and mobile money operators per population have no statistically significant effect. Digital finance therefore appears to support output mainly through financial access and, more tentatively, internet-based transactions, rather than through connectivity or mobile money provider density.

Recommendation:

Policy makers should prioritise expanding the accessibility of financial services through digital channels (for example agent networks, interoperable payment systems and affordable data) and promote actual use of these

services, not only mobile subscriptions. Governments and regulatory bodies should design frameworks that encourage financial innovation while ensuring security, consumer protection and stability, because trust in digital channels is a condition of use. Progress should be tracked with usage-based and access-based indicators rather than subscription counts alone.

Limitations and Future Research

Future research could interact digital finance proxies with governance indicators (from Worldwide Governance Indicators) to examine its relationship with economic growth and, also a reverse causality is possible, since richer economies may also develop digital finance faster; the estimates describe long-run association rather than proven causal effects.

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