JORMASS
Volume 9, Issue 1
June 2023
JOURNAL OF RESEARCH
IN MANAGEMENT AND SOCIAL SCIENCES
DOI: To be assigned

Digital Financial Services And Sub-Saharan Africa Economic Development – Panacea Or Placebo?

[1]Nwadike, Emmanuel C. and [2]Osuala, Alex E.
[1] Federal University of Technology Owerri, Imo – State.
[2.] Michael Okpara University of Agriculture, Umudike, Nigeria
Corresponding Author: chijioke.nwadike@futo.edu.ng

ABSTRACT:
This study investigated the effect of digital financial services on Sub-Saharan Africa (SSA) economic development. Economic development was proxied by human capital development index (HDI) while digital financial services was proxied by automated teller machine (ATM) volume transactions, point of sale (POS) volume of transactions, mobile banking service (MBS) volume of transactions, and number of ATMs available. Five SSA countries, namely, Nigeria, Ghana, Uganda, Cabo Verde and Kenya were chosen for the study. The data used for the study spanned from 2009 to 2020. The study was anchored on the Technology Acceptance Theory which is based on the belief that improvement in the economy is enhanced through using particular new technology and information system in business transactions. Panel unit root test carried out using different criteria showed that the data set were largely stationary at levels. Consequently, the fixed effects model was used for the analysis based on the outcome of the Hausman test. The results showed that the volume of ATM transactions and the number of ATMs had negative effect on HDI, implying that the higher the ATM usage and number of ATM available the lower economic development in SSA. The results also show that POS volume of transactions, and mobile banking volume of transactions had statistically significant effect on economic development in SSA. The study recommends that banks should ensure that ATMs provide convenience for customers by making them accessible and usable while also considering the rate charged for rendering such services. Consequently, the study concluded that digital financial services is a long road which SSA needs to travel and make the economy significantly successful.

KEYWORDS: *Digital financial services, economic development, Sub-Sahara.*

MANUSCRIPT TYPE:
Research Paper
PUBLICATION DETAILS:
Received: JAN 2023
Revised: MAR 2023
Accepted: MAR 2023

Publication of College of Management Sciences, Michael Okpara University of Agriculture, Umudike Nigeria

INTRODUCTION

Digital technologies have been developed to make it simpler for local citizens who cannot otherwise afford a bank account to access extra financial services, making them financially privileged. (Anarfo and Abor, 2020). Digital technologies are also said to be helpful for achieving sustainable development and for integrating the financial system. (Asongu *et al.*, 2021; Nchofoung &Asongu, 2022).

Policymakers and scholars have given digital financial inclusion a lot of attention in recent years (Ozili, 2018). It is regarded as a change agent with the potential to bring about a revolutionary advancement in the international financial industry.

Financial systems in developed and emerging nations have evolved as a result of digitization. (Chinoda and Kapingura, 2023). Financial inclusion is increasing as a result of fewer barriers in traditional financial systems, which is also recognized as a critical factor in reaching the 2030 Sustainable Development Goals (Kooli *et al.*, 2022; Allen *et al.*, 2016). It has been argued that nations with high levels of digital financial inclusion are better prepared to handle challenges associated with economic growth and development. (Khera *et al.*, 2021; Shen *et al.*, 2021; Thaddeus *et al.*, 2020). Therefore, increasing digital financial inclusion can benefit several people and organizations in those nations that may be impacted by economic downturns (Chinoda & Kapingura, 2023).

People in some nations cannot purchase financial services due to the high poverty rate, which makes living miserable. Digital technology ensures the affordability of financial services for those who are less privileged. The stability of digital financial services is not assured due to technological advancements and increased competition among financial institutions, which has led many people to question the regulatory impact of digitalization on the stability of the financial system. Digital financial services (DFS) are frequently seen as a productive approach to generate opportunities to enhance financial inclusion because they lower the cost of delivering these services. They lower transaction costs for businesses while promoting financial inclusion.

DFS use digital remote techniques to supply financial services from a wide variety of providers to a wide variety of receivers including e-money, mobile money, card payments, and electronic funds transfers. In addition to facilitating money transfers, DFS provide a safe place to store electronic money (sometimes referred to as mobile money or e-money) (Buckley *et al.*, 2016). Agur *et al.*, (2020) described digital financial services as financial services (such payments, remittances, and credit) available and provided through digital channels, such as mobile devices, the internet, web transactions, point of sale, etc. These include tried-and-true instruments (like debit and credit cards, which are often offered by banks), as well as innovative approaches based on digital platforms, cloud computing, and distributed ledger technology (DLT), which include peer-to-peer (P2P) applications, digital currency, and crypto-assets. Where and when DFS are applied profitably, they have implication for economic development.

Economic development is generally understood by Myint and Krueger (2016) and Panth (2021) to be the structural transformation of an economy through the use of more advanced and automated technologies in order to increase labor productivity, employment, incomes, and population growth. Economic development should be supported by changes to the institutional, economic, and political settings in order to permit the transformation of the economy. A country's attempts to fight poverty are regarded to be greatly aided by economic growth since it allows for higher incomes, more job possibilities, the delivery of better goods and services, and the use of cutting-edge industrial technologies. Audu (2012) stated that economic advancement leads to better self-esteem standards, freedom from persecution, and more possibilities. It is a process that results in long-term improvements in a country's political, social, and technological economic institutions as well as an increase in real national income. The ordinary person's real income increases as a result.

Banks make money from a range of transactions carried out at points of sale, on mobile banking platforms, and through automated teller machines. With an increase in transactions, the bank makes more money from each individual account. Lower transaction volume, however, can affect the withdrawals banks make from their customers' accounts, which will cut into their earnings.

In remote locations, it is exceedingly difficult to find commercial banks and automated teller machines. Banks are cautious about installing off-site automated teller machines (ATM) and opening branches in outlying areas. Security risks, poor internet access, insufficient power sources, and a poor road system are some of the significant challenges that banks face while maintaining off-site ATMs. When opening new bank branches, the majority of banks take into account the size of the local economy, the availability of markets that can support bank branches, operational costs, staffing, power supply, availability of road network, security concerns; and all of these make the people in the rural areas financially excluded.

This study which focused on five specific SSA countries, namely, Nigeria, Ghana, Cabo Verde, Kenya, and Uganda evaluated the effects of digital financial services on economic development in Sub Sahara Africa by analyzing specifically the effects of Automated Teller Machine (ATM) volume of transactions, the Mobile

Banking Services (MBS) volume of transactions, Point of Sale (POS) volume of transactions, and the availability of ATM per 100,000 adults, on economic development of selected Sub - Saharan African countries. The study aims to address the question of whether digital technology improves the SSA financial sector by allowing more people access to financial services or whether it makes it more vulnerable to attacks.

REVIEW OF LITERATURE

According to Pazarbasioglu *et al.* (2020), Digital financial services refer to financial goods and services that make use of digital technologies. The features covered by these services include transaction accounts, payment processing, savings, loans, and insurance. Digital channels include, for example, ATMs (for fund transfers and bill payments), POS terminals, mobile wallets (for mobile money), internet banking (e-banking), and other digital systems. (Alliance for Financial Inclusion, 2016; Kambale, 2017). As opined Joki *et al.* (2019), one of the most important IT developments in financial services is mobile banking. Agur, *et al.* (2020) stated that digital payments are non-cash transactions carried out through digital channels.
Several scholars such as Gomber *et al.* (2017), Ozili (2018) and Al-Smadi (2022), opined that Digital Finance (DF) is a response to technological advancements in the financial sector. It is said to encompass all electronic financial products and services, including financing, investment, payment, insurance, and financial information delivered through digital channels. DF has numerous advantages for individuals, businesses, governments, and the economy as a whole. One significant benefit is that it provides the government with a platform to increase its overall expenditure and tax revenue, as a result of the growth of financial transactions. This is supported by Manyika, Lund, Singer, White and Berry (2016) and (Ozili 2018).

According to Roessler (2018), the digital economy has become a significant global driver of economic development and innovation in the twenty-first century. Faster data communication between individuals, businesses, networks, and systems has been made possible by digital technology, which encompasses software, hardware, and infrastructure. This has enhanced productivity, efficiency, and global economic integration. It is critical to guarantee access to inexpensive financial services in order to encourage the reduction of poverty and economic development (Rana *et al.*, 2018). Digital financial services (DFS) are defined by the World Bank as financial services that are provided and used via digital technology. Through digital payment systems, mobile devices, and electronic money models, DFS offers fundamental financial services to those with low incomes, lowering transaction costs and raising transaction speed, security, and transparency. This enables the underprivileged to gain access to more individualized financial services (Pazarbasioglu *et al.,* 2020).

However, despite the observed benefits of DFS, some scholars have argued that DFS can harm financial inclusion. Thaddeus *et al.,* (2020), noted that there are various ways in which the provision of digital finance can be biased. Geographical bias is one method, whereby digital finance companies may stop offering services to high-risk rural areas or communities that lack the infrastructure to support them. To allow the effective operation of digital financial services, some infrastructure, such as current mobile phones with the required software and applications, is required. Additionally, when providing digital financial services, educational bias may be introduced.

Theoretical Review

The theories that relate to the present study are: Technology Acceptance Theory, Diffusion of Innovation Theory, Financial Intermediation Theory, Theory of Financial Innovations, and Bank-led Theories.

The goal of Fred Davis's technology acceptance theory, which was developed in 1985, is to comprehend how people adopt and make use of information technology to drive economic development. It has been applied in information systems research to simulate the acceptance and adoption of new technologies. The Diffusion of Innovation Theory, which Gabriel and Rogers popularized in their book "Diffusion of Innovations" in 1962, describes how new concepts and technologies spread across cultures. According to this theory, diffusion is the process of a social system's members conveying innovation through time, and through certain channels.

Financial institutions' ability to combine deficit and surplus spending units is explained by the financial intermediation theory. Instead of lending directly to deficit units, this theory aims to explain why surplus funds are first transferred to banks, who subsequently lend to them. This theory, which offers comprehensive information about the financial system and economic development, is based on Raymond Goldsmith's work in 1969. It has been found that when the economy grows, the financial system advances more quickly than

national wealth. The efficient distribution of capital within the economy is ensured through financial intermediation, which fosters economic expansion.

The financial innovation theory, which Silber (1983) first proposed, contends that the development and extension of financial institutions are the main forces behind financial inclusion. Li and Zeng (2010)'s work on financial innovations was intended to address the flaws in the financial industry, such as information asymmetry, transaction costs, and administrative costs. To increase a company's liquidity and draw in new clients, financial innovations can either be completely original solutions or established practices that adopt cutting-edge technical improvements.

The bank-led hypothesis was created as a result of banks' efforts to create innovative methods for connecting with clients through agents. According to this idea, which is supported by Kiburi (2016) and Kendall (2012), licensed financial institutions, mostly banks, use retail agents to offer clients financial services. Banks produce financial goods and services and then hand them off to retail salespeople, who deal with all consumer contacts. Clients are required to keep an account with their primary bank since banks continue to be the major providers of financial services.

Empirical Review

Anane and Nie (2022), using a representative national dataset from Ghana, explored digital financial services adoption determinants. The study quantified the role played by each of the six incorporating factors and controlled four socio-demographic characteristics. The work also assessed the adoption level among key socio-demographic groups. The determinants of DFS were estimated using Logit specification, and average marginal effects method. The logit model indicated that effort expectancy, awareness, facilitating conditions, transaction cost, security and privacy, and self-efficacy positively influence DFS adoption and increase DFS adoption by 0.7%, 2.3%, 28.5%, 3%, 2.1%, and 2.4%, respectively. Additionally, the results indicated a significant disparity in adoption levels across key socio-demographic variables, including education level, gender, urban and rural residence, and administrative regions of Ghana. They came to the conclusion that DFS offers affordable, practical, and secure financial services with the ability to considerably help those living in poverty. However, obstacles to the implementation of DFS include a lack of infrastructure, poor financial awareness, and regulatory restrictions. In order to encourage the adoption of DFS and financial inclusion in developing economies, the study suggested addressing these issues.

Mulungula and Nimubona (2022) examined digital financial inclusion and trade openness in Africa. The objective of the study was to test the impact of digital financial inclusion on trade openness using a panel of 16 African countries observed over a 17-year period from 2002 to 2018. The study employed a methodology based on static panel estimates using the generalized least squares (GLS) method. The results obtained revealed that only one variable (logGDP) out of the five retained has a statistically significant influence on trade openness at the 1% level ($p > t = 0.06$) with a coefficient opposite to the predicted sign of (−0.2371655). (ATMs) was found to have negatively and statistically significant influence on trade openness at the 1% level.

Ifediora *et al.* (2022) examined the effect of financial inclusion on economic growth using panel data collected from 22 SSA nations between the years of 2012 and 2018. They discovered, using the system Generalized Method of Moments (GMM) that the financial inclusion dimensions of availability, penetration, and composite have a significant and positive impact on economic growth, whereas the financial inclusion dimension of usage has a small but positive impact on economic growth. Also, whereas outstanding deposits have a negative impact on economic growth, bank branches and ATMs have a positive and large impact. Results for mobile money indicators from 2012 to 2018 showed that while mobile money agents hinder economic growth, mobile money accounts and transactions promoted it.

Kouladoum *et al.* (2022) examined the relationship between digital technology and financial inclusion in 43 countries in Sub-Saharan Africa. The methodologies used were the Generalized Method of Moment (GMM) to take care of double causality and country heterogeneity and IV-Tobit to take into account the limited range in the dependent variables. They found that, as measured by ICT indicators, digital technology has a positive, significant impact on financial inclusion. They also discovered that as digital technologies advance, the rate of financial inclusion in Sub-Saharan Africa rises. As a result, more investments in human capital development, financial infrastructure development, and technological infrastructure advancement are required, as financial literacy can play a significant role in fostering financial stability and inclusive finance in Africa.

Sawadogo and Semedo (2021) applied a finite mixture model to a sample of 28 sub-Saharan African countries to analyze the impact of financial inclusion on income inequality between 2004 and 2016. Theyopined that the effect of financial inclusion on income inequality differs across groups of countries with similar but unobserved characteristics. They found that the impact of financial inclusion on income inequality varies across two distinct classes of countries. Furthermore, they proved that countries with high institutional quality are more likely to be in the class where financial inclusion reduces income inequality. The results pass a battery of robustness checks. The findings highlight the need for sub-Saharan African countries to develop better democratic environments and institutions if they expect to reap the benefits of financial inclusion.

In most of the earlier studies, majority of the authors concentrated on a single nation,using for instance, Indian nation (Dahiya and Kumar, 2020; Sethi and Sethy, 2020; Sethy, 2016); China (Huang and Zhang, 2019; Shen *et al.,* 2018); Nigeria nation (Babarinde *et al.,* 2021; Aribaba*et al.,* 2020; Ifere &Okosu, 2019; Nwude& Nnaji, 2018; Ezenwakwelu, 2018; Bertram *et al.,* 2016; Abdu *et al.,* 2015; Abimbola *et al.,* 2015); Poland (Stezelecka, 2020); Ethiopia (Desalegan &Yemataw, 2017); Pakistan (Raza *et al.,* 2019); Indonesia (Saraswati, 2020; Shofawati, 2019), and Ghana (Anane & Nie, 2022); with only a few studies covering multiple countries in Sub-Saharan Africa. The present study attempted to close the knowledge gap by regressing digital financial services and financial inclusion proxies on economic development in Sub-Saharan African countries using the human development index as the of economic development variable. For digital financial services this study used three independent variables namely automated teller machines volume of transactions, mobile banking services volume of transactions and point of sale volume of transactions while two variables were employed as a measure of financial inclusion such as number of ATMs per 100,000 adults and the number of commercial banks per 100,000 adults were employed in the study.

METHODOLOGY

A quantitative longitudinal research design was used for this investigation. A longitudinal design measures the same people' characteristics across time on at least two occasions, but ideally more. Each variable is measured over two or more different time periods. This enables the researcher to track how variables change over time. The World Development Indicators (WDI) and Central Bank databases of the chosen nations were used as the primary sources of the secondary data for this study, which covered the years 2009 to 2020.

Model Specification

The technology acceptance theory, which contends that ICT promotes economic development, served as the foundation for the model employed for this study. As demonstrated in equation 3.1, this study employed the Thaddeus, Ngong, and Manasseh (2020) model in accordance with the technological adoption theory.

$$GDPGR_{it} = \beta_0 + \beta_1 ATM_{it} + \beta_2 CBB_{it} + \beta_3 LOS_{it} + \beta_4 \text{MOMO}_{it} + \mu_{it} \quad 1$$

Where,

GDPGR	= growth rate of GDP per capita
ATM	= Automated Teller Machines (ATMs) per 100,000 adults
CBB	= Commercial Bank Branches Per 100,000 Adults
LOS	= Outstanding loans per 1,000 adults
MOMO	= Mobile money transactions per 100,000 adults

The above model was modified by dropping GDPGR and LOS to suit the objectives of this study. GDPGR was replaced by HDI since this study discusses economic development which can be measured by HDI. LOS was also dropped because it was used as a control variable in the Thaddeus *et al.,* (2020) model and is not a component of digital financial services and the volume of POS transactions included instead.

This study was based on five independent variables namely the volume of ATM transactions, POS transactions, mobile transactions, number of ATM machines and the number of commercial banks while human capital development was used as the dependent variable. A logarithm of ATM, POS and MBS was taken to standardize the variables (NATM and NCOB). The functional form of the model is as displayed in Equation below:

$$\text{HDI} = f(\text{ATM, POS, MBS, NATM, NCOB}) \quad 2$$

The econometric form of the model was specified as follows:

$$HDI_{it} = \beta_0 + \beta_1 LOG(ATM)_{it} + \beta_2 LOG(POS)_{it} + \beta_3 LOG(MBS)_{it} + \beta_4 NATM_{it} + \beta_5 \text{NCOB}_{it} + \mu_{it} \quad 3$$

Where,
HDI = human development index
ATM = volume of ATM transactions
POS = volume of POS transactions
MBS = volume of mobile transactions
NATM = number of ATM machines/100,000 adults
NCOB = number of commercial banks/100,000 adults
LOG = logarithmic notation
β_0 = intercept
$\beta_1 - \beta_5$ = is the parameter of explanatory variables
μ_{it} = the disturbance terms
i = number of countries
t = 2009 – 2020 (sampled period)

Description and justification of model variables
The variables were chosen based on their utilization in prior studies, their theoretical relationships among them.

Dependent variable
Human capital development index (HDI)
One of the key indices for assessing economic development is the human capital development index (HDI), which takes into account three factors: life expectancy, education (adult literacy), and the standard of living. It is a method for raising labor performance. The HDI evaluates a nation's capacity to mobilize the economic and professional potential of its people in order to increase their level of productivity.

Independent variables
ATM: This variable is assessed by the number of transactions carried out at automated teller machines (ATMs) 100,000 adults. It is anticipated that an increase in the number of ATMs will lead to an increase in financial accessibility among citizens and rise economic development.

POS: This determined the number of Point-of-Sale (POS) transactions carried out by POS agent businesses for every 100,000 adults. A higher POS is achieved with the addition of more outlets not only makes financial transactions simpler but also promotes broader financial inclusion, which in turn encourages economic development and the growth of human capital.

MBS: The mobile variable, which stands for mobile transaction volume per 100,000 adults using personal electronic devices, is denoted by the abbreviation MBS. Because mobile transactions may be completed whenever it is convenient for the customer, this has the effect of making financial transactions simpler, which should lead to an increase in HDI.

NATM: stands for the number of automated teller machines that are present for every 100,000 adults. This evaluates the degree to which the availability of ATMs contributes to HDI, which in turn influences economic development. It is anticipated that keeping all other factors constant, expanding access to automated teller machines (ATMs) to a greater population will result in an acceleration in financial inclusion and efficiency thus leading to an increase in the HDI level.

NCOB: This quantifies the extent to which the proliferation of commercial bank branches helps to facilitate a growth in HDI and signifies the number of commercial bank branches that exist for every 100,000 adults. It is anticipated that a rise in the number of commercial banks will result in an increase in the availability of financial services and an increase in HDI over time.

Sample size
The study employed purposeful criterion sampling method to select the SSA countries to be included in the study. Criterion sampling involves searching for cases or individuals who meet certain criteria. The criteria used in the sample were that the countries that rank among the top bank penetration in the last 13 years and

availability of requisite data for such countries. Only five (5) met these criteria, hence the sample size was five (5) out of the forty-six (46). The study used annual panel data for years from 2009 to 2020 of each country. The period 2009 to 2020 constituted the period with the latest data and therefore most relevant to the current study. Therefore, there were a total of 60 observations in the regression analysis. A twelve-year panel data analysis was used to examine the relationship between HDI and digital financial services and financial inclusion.

Techniques of data analysis

Descriptive statistics

Descriptive statistics are brief informational coefficients that summarize a given data set, which can be either a representation of the entire population or a sample of a population. Descriptive statistics are broken down into measures of central tendency and measures of variability (spread). The descriptive statistics was used to examine the socio –economic characteristics of the individual variables collected and used for the analysis for the countries of study and then pooled together in the same manner to observe the impact of the explanatory variables on the selected countries in Sub – Saharan Africa.

Stationarity tests

This study applied the panel least squares estimation technique due to the nature of data involved in the study. Prior to the estimation proper, a test for stationarity of data was carried out. Stationarity is a property of an underlying stochastic process and not the observed data such the joint distribution of a set of n consecutive random variables, in a series, is the same, regardless of where in the series it is chosen (Kendall and Stuart, 1983). A stationary series is one with a mean value which will not vary with the sampling period. In contrast, non-stationarity can simply be defined as processes that are not stationary and that have statistical properties that are deterministic functions of time (Kendall and Stuart, 1983).

Fixed Effects (FE) and Random Effects (RE) models

The FE model assumes that each group (SSA countries), is associated with a non-stochastic group-specific factor to the dependent variable, industrial value added. In other words, the FE's assumption is that specific individual effect is correlated with the explanatory variable(s) while RE is based on the assumption that individual specific effects are not correlated with the explanatory variables. The FE equation is as specified in Equation (3.4):

$$Y_{it} = \alpha_i + \beta . X_{it} + \mu_{it} \qquad 4$$

where α_i is the country FE, that is individual intercepts fixed for a given N and the model captures no overall intercept. The random disturbance term is denoted by μ_{it}. Under the FE model, consistency do not demand that the individual intercepts whose coefficients are $\alpha_i's$ and μ_{it} are not correlated. In this case, only $E(X_{it}\mu_{it})$ must hold. The variables are defined as follows:

Y_{it} = value of the dependent variable, HDI
X_{it} = value of the independent variables, LOG(ATMVOL), LOG(POSVOL), LOG(MBSVOL), NATM and NCOB for the i^{th} country for t^{th} time period.
t = 2009 – 2020
i = 1 – 13

The inclusion of error term (μ_{it}) in the model is a way of controlling for unobservable influences on HDI but these unobservable influences could be random (i.e. stochastic). To deal with this problem, the RE (random effects) model becomes relevant. The RE model is expressed as:

$$Y_{it} = \alpha_i + \beta . X_{it} + V_i + \mu_{it} \qquad 5$$

where,
$V_i \sim iid(0, \sigma_\alpha^2)$
$\mu_{it} \sim iid(0, \sigma_\alpha^2)$

where$V_i$is unobserved country specific effects. The V of diverse individual SSA countries are independent, with zero mean, and they are assumed not to be too far from normality. The overall mean is captured in α. $V_i$is expected to be homoscedastic and time invariant across individual countries. For both FE and RE, t-test is applied to test the significance of variables' coefficient while F-test is used to ascertain whether the coefficients are simultaneously or jointly significant.

Hausman test
Hausman test is used to decide whether to use fixed or random effects model.
The Hausman test basically tests whether the unique errors (μ_i) are correlated with the regressors; the null hypothesis is they are not.

Specifically, the null and alternative hypotheses of the Hausman test are presented as follows:
Ho: RE model is appropriate.
H_1: FE model is appropriate.
If the p-value of the Hausman test is greater than 0.05, the RE model is preferred. On the other hand, the FE model is alied if the p-value is less than 0.05.

RESULTS AND DISCUSSIONS
The data analysis began with a summary of the dataset's essential properties in Table 1. The mean, maximum and lowest values, standard deviation, skewness, and Kurtosis are among these characteristics.

Table 1: Descriptive statistic

	HDI	LOG(ATM)	LOG(POS)	LOG(MBS)	NATM	NCOB
Mean	0.572600	16.17642	15.50859	15.92360	16.39867	0.758267
Median	0.573500	15.71993	15.23003	16.81756	9.840000	0.500000
Maximum	0.674000	20.69119	19.89913	21.98371	52.07000	2.910000
Minimum	0.482000	13.19114	12.27880	10.04377	3.360000	0.007000
Std. Dev.	0.053294	2.177495	1.686441	1.632495	1.555585	0.818077
Skewness	0.176651	0.705660	0.645947	0.132250	0.324090	0.217532
Kurtosis	1.998305	2.495363	3.104674	1.593036	3.114824	3.231858
Jarque-Bera	2.820537	5.616199	4.199863	5.123769	4.056510	4.915823
Probability	0.244078	0.060320	0.122465	0.077159	0.081153	0.092565
Observations	60	60	60	60	60	60

Source: Author's computations using EViews 10.0

From the descriptive statistics, it is seen that the average HDI for the selected countries was 0.572600 which happens to be far from the 0.8 benchmark stipulated by the United Nations. The range of values for the HDI was 0.482000 to 0.674000, indicating a poor human capital development in SSA. This is attributed to the low funding of human capital sectors such as education and health sectors in the region.
In general, this is one of the assumptions of normal distribution, the mean and median of most variables were averagely of the same value. Furthermore, the standard deviation values, which assess the series' dispersion from the mean, indicated that all of the series in the distribution were sparsely scattered from the mean. This showed that the series might have normal distribution characteristics. This was corroborated by the skewness findings, which show that virtually all of the skewness values are within the average of the threshold (0), indicating that the series in the distribution are slightly skewed either positively or negatively but are otherwise normal. Additionally, the -value of the Jarque-Bera test, a test for normality; because all -values are larger than the significant level of 5%, the null hypothesis that the series are normally distributed cannot be rejected. Finally, the standard deviation, skewness, and Jacque-Bera findings supported the normality of the series in the distribution.

Unit root test
Before starting the regression analysis, all of the variables were tested for stationarity. The study used the Levin, Lin, and Chu; Breitung t-stat; and Fisher Chi-square tests to do the investigation. The results of unit root testing are shown in Table 2.

Table 2: Summary of panel unit root test

Variable	Levin, Lin & Chu T	Breitung t-stat.	ADF-Fisher Chi-square	–Fisher Chi-square	Status	Remark
HDI	-1.74739** (0.0403)	-2.20368** (0.0344)	8.15009 (0.6142)	23.3148*** (0.0096)	I(0)	Stationary
LOG(ATM)	-5.16296*** (0.0000)	-2.94308*** (0.0016)	16.8125 (0.0786)	62.9586*** (0.0000)	I(0)	Stationary

LOG(POS)	-20.2005***	-1.88323	30.2332***	56.0029***	I(0)	Stationary
	(0.0000)	(0.9702)	(0.0008)	(0.0000)		
LOG(MBS)	-3.55144***	-3.55144	21.0868**	48.9640***	I(0)	Stationary
	(0.0002)	(0.3857)	(0.0335)	(0.0000)		
NATM	-1.95521**	-1.84431	25.5931**	20.5333**	I(0)	Stationary
	(0.0253)	(0.9674)	(0.0182)	(0.0246)		
NCOB	-7.17419***	-2.51006***	24.5949**	6.43876	I(0)	Stationary
	(0.0000)	(0.0060)	(0.0214)	(0.7772)		

Source: Author's computations using EViews 10.0

.

Panel Regression Estimation

The study applied the three regression approaches used for the panel least squares: the pooled, fixed effects, and random effects as presented in Tables 3 to 5 below.

Pooled model

In pooled regression, all observations are simply pooled and the grand regression is estimated, ignoring the data's cross-section and time series characteristics, in which case the error term represents everything. Because the observations in this model were pooled together, the heterogeneity or uniqueness that exists between the variables is hidden (Hills et al., 2007). Table 3 displays the results of the pooled regression.

Table 3: Panel regression (Pooled)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ATM)	-0.004981	0.002399	-2.076283	0.0426
LOG(POS)	0.001662	0.004604	0.361055	0.7195
LOG(MOBILE)	-0.002826	0.002381	-1.187047	0.2404
NATM	0.001410	0.000628	2.245881	0.0288
NCOB	0.023240	0.008961	2.593436	0.0122
C	0.631649	0.043541	14.50700	0.0000
R-squared	0.639842	Mean dependent var		0.572600
Adjusted R-squared	0.606494	S.D. dependent var		0.053294
S.E. of regression	0.033432	Akaike info criterion		-3.863995
Sum squared resid	0.060354	Schwarz criterion		-3.654561
Log likelihood	121.9199	Hannan-Quinn criter.		-3.782074
F-statistic	19.18682	Durbin-Watson stat		1.128966
Prob(F-statistic)	0.000000			

Source: Author's computations using EViews 10.0

The pooled regression results may not be suitable for the estimation when compared to the Fixed and Random Effects models, hence it may not be reliable though its coefficient of determination denoted by the R-squared and Adjusted R-squared appears to be quite moderate at 0.639842 and 0.606494, respectively to show a good fit. Although, the F-statistic (19.18682) and its associated probability value (0.00000) showed that the explanatory variables collectively and significantly explained the variations in the dependent variable, but the Durbin-Watson statistics of 1.128966 suggested presence of significant positive autocorrelation which indicates that the model could be spurious and not suitable for the analysis. Hence, the study proceeded with other panel regression approaches based on the fixed effects and random effects techniques of panel least squares.

Fixed effects model

Because the fixed-effects model accounts for all time-invariant variations between individuals, the estimated coefficients of the fixed-effects models cannot be affected by missing time-invariant attributes. According to Stock and Watson (2003), if the unobserved variable does not vary over time, any changes in the dependent variable must be attributed to sources other than the fixed features.

Table 4The fixed effects estimation result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ATM)	-0.006572	0.002754	-2.386347	0.0363
LOG(POS)	0.006119	0.002451	2.496600	0.0159
LOG(MBS)	0.006677	0.002268	2.944644	0.0049

NATM	-0.000462	0.001160	-0.397923	0.6924
NCOB	0.008538	0.003978	2.146184	0.0367
C	0.381735	0.030472	12.52734	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.968071	Mean dependent var		0.572600
Adjusted R-squared	0.962324	S.D. dependent var		0.053294
S.E. of regression	0.010345	Akaike info criterion		-6.153697
Sum squared resid	0.005351	Schwarz criterion		-5.804639
Log likelihood	194.6109	Hannan-Quinn criter.		-6.017161
F-statistic	168.4427	Durbin-Watson stat		1.873639
Prob(F-statistic)	0.000000			

Source: Author's computations using EViews 10.0

The fixed effects results shows that the overall estimated model was good as it has an R-squared and Adjusted R-squared of 0.968071 and 0.962324, respectively. It implies that, in the fixed effects model, the independent variables accounted for approximately 96% of total variation in the dependent variable (HDI). Similarly, the F- statistic value of 168.4427 and its associated probability value of 0.000000 showed that the overall model was statistically significant at 5% level of significance. Durbin-Watson statistics is 1.873639, which is approximately 2; therefore, it can be concluded that there was absence of serious autocorrelation in the fixed effects model. As such, the fixed effects model is more reliable when compared to the pooled regression. However, the study proceeded with the random effects model to compare its results with the fixed effects model.

Random effects

The random effects model is based on the assumption that the individual-specific impact or variation among entities is a random variable that is uncorrelated with the predictor/explanatory factors. Table 5 displays the results of the random effects model.

The random effects estimates displayed in Table 5 displayed some degree of stability as shown by the coefficient of determination, F-statistic and Durbin-Watson statistic. The coefficients of determination as shown by the R-squared and Adjusted R-squared were 0.763308 and 0.741392, implying that the independent variables explained roughly 74% of the variations in the dependent variable. The F-statistic (34.82890) and its associated probability value of 0.000000 indicated that the random effects model was stable and well-specified. Also, the Durbin-Watson statistic of 1.795369 is less than the threshold of 2 but approximately 2, implying presence of minimal autocorrelation in the model.

Table 5: Random effects

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ATM)	-0.001207	0.002657	-0.454256	0.6515
LOG(POS)	0.005719	0.002401	2.381955	0.0208
LOG(MBS)	0.006653	0.002218	2.998958	0.0041
NATM	0.000197	0.001059	0.186235	0.8530
NCOB	0.007181	0.003867	1.856821	0.0688
C	0.388807	0.044832	8.672454	0.0000
Effects Specification				
			S.D.	Rho
Cross-section random			0.075210	0.9814
Idiosyncratic random			0.010345	0.0186
Weighted Statistics				

R-squared	0.763308	Mean dependent var	0.022717
Adjusted R-squared	0.741392	S.D. dependent var	0.020306
S.E. of regression	0.010326	Sum squared resid	0.005758
F-statistic	34.82890	Durbin-Watson stat	1.795369
Prob(F-statistic)	0.000000		

Source: Author's computations using EViews 10.0

Choosing the best model

We related the random effects model to the fixed effects models using the Hausman's test, and the results are reported in Table 6. The most significant practical distinction between fixed and random effects is that random effects are calculated using partial pooling whereas fixed effects are not. Partial pooling indicates that if a group has few data points, the group's effect estimate will be relied in part on more abundant data from other groups (Seddigi and Lawler, 2000). The null hypothesis states that the chosen model has random effects, whereas the alternative hypothesis states that the model has fixed effects.

Table 6: Hausman test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.810564	5	0.0070

Source: Author's computations using EViews 10.0

Table 4.6 demonstrates that the test's Prob (Chi-Sq. Statistic) is less than 5%. (0.0070). As a result, we are unable to reject the null hypothesis that the proper model is the fixed-effects model. In comparison to the random effect model, the fixed effects model is more suited to describing the effects of digital financial services, and economic development in SSA.

Heterogeneity in digital financial services, among the SSA countries using correlation

The contribution of ATMV was significantly large in all the countries except Kenya, which could imply that Kenya is yet to prioritize ATM usage when compared to Nigeria, Ghana, Uganda and Cabo Verde. This could also imply that the level of transactions carried with the ATMs in Kenya were lower than those of to Nigeria, Ghana, Uganda and Cabo Verde. Ranking the level of ATM usage based on the correlation coefficients across the country shows that Cabo Verde came first followed by Nigeria, Uganda, Ghana and Kenya.

Regarding the POSV, it was observed that the value of POS transactions across the countries were significantly large, implying that POS usage was prioritized in the countries under review and were probably available for usage. Going by the correlation coefficients, it was found that POS was used the most in Cabo Verde followed by Uganda, Kenya, Ghana and Nigeria. This could be attributed to the population differences of those who require the use of ATM machines across the countries under review.

MBSV shows that the value of mobile banking services differed across the countries. The potency was highly seen in Kenya followed by Uganda, Ghana, Nigeria and Cabo Verde. This implies that mobile banking infrastructure may not have been well fitted in Cabo Verde when compared with Kenya, Uganda, Ghana and Nigeria.

Table: Heterogeneity and contribution of digital financial services, financial inclusion among the SSA countries using correlation

Variables	Nigeria	Ghana	Uganda	Cabo Verde	Kenya
ATMV	0.891699	0.809690	0.872890	0.936264	-0.242507
	0.0001***	0.0014***	0.0002***	0.0000***	0.4476
POSV	0.778654	0.856719	0.923179	0.941714	0.903371
	0.0028***	0.0004***	0.0000***	0.0000***	0.0001***
MBSV	0.697155	0.809312	0.941612	0.351078	0.984267
	0.0117**	0.0014***	0.0000***	0.2632	0.0000***
NATM	0.852119	0.940089	0.225309	0.875420	-0.008309
	0.0004***	0.0000***	0.4814	0.0002***	0.9796
NCOB	-0.604096	0.341696	0.898940	0.962041	0.945715

	0.0375**	0.2770	0.0001***	0.0000***	0.0000***

Source: Authors computation using e-views.
The table above represents the contribution of each variable on HDI across the countries.
Note: *** and ** denote significance at 1% and 5% respectively

Looking at NATM, it was observed that Ghana and Cabo Verde had more ATMs per 100,000 persons than Nigeria, Uganda and Kenya. This could be explained by the population differences of the countries. For instance, a highly populated country like Nigeria would require more ATMs than less populated countries like Ghana, Kenya, etc. NCOB shows that the number of commercial banks per 100,000 persons contributes more in Cabo Verde, Kenya and Uganda.

Discussion of findings
The findings of the fixed effects coefficients are summarized in equation 4.1 below:

$$\boldsymbol{HDI = 0.381735 - 0.006572ATM + 0.006119POS + 0.006677MBS - 0.000462NATM + 0.008538NCOB} \quad 4.1$$

In line with the Fixed Effects output, there are divergent views on how digital financial services affect economic development. The results showed that some digital financial service platform like ATM turned out negative while POS and mobile transactions turned out positive. However, it is generally agreed that digitalization enhances financial transactions and the well-being of an economy but could be inhibited due to poor infrastructures, poor banking system, insecurity, etc. (Kouladoum *et al.*, 2022; Rosmah *et al.* 2020). Also, comparing the results with prior studies, the differences in the findings were associated with geography, methodology, date and variables used.

The findings showed that the volume of ATM transactions (ATM) had a negative and significant effect on HDI in SSA. The coefficient of ATM indicates that a percentage increase in the volume of ATM transactions resulted in approximately 0.66% decrease in HDI. This is not in tandem with the postulation of the technology acceptance theory which is constructed on the foundation that technology brings about efficient use and ease of financial transactions. This implies that the higher the ATM the lower economic development probably due to poor ATM services in terms of areas covered and the availability of services. Also, the incessant cases of ATM frauds such as card theft, PIN fraud, etc. could account for the low level of ATM transactions in Nigeria which is currently hindering economic development. Empirical studies such as Anane and Nie (2022); Mulungula and Nimubona (2022); Mahboub (2018) lend credence to the negative and significant effect of ATM on HDI, which is said could be due to high level of financial illiteracy, usage of ATM for menial transactions like purchases for consumption and lack of access to such digital payment platforms.

The POS turned out positive and statistically significant. The positive coefficient indicates that HDI increased by approximately 0.61% when POS usage increased by 1%. This shows that the usage of POS has helped economic development by improving HDI. This is in line with the Technology Acceptance Theory that increase in technology aids economic advancement. This can be attributed to the fact that POS machines are very portable and can be moved to rural areas with ease where other forms of digital services like ATMs are not available.

The positive and statistically significant coefficient of mobile banking volume entails that higher mobile banking volume triggers economic development. The coefficient implies that economic development (measured by HDI) increased by approximately 0.67% due to a percentage increase in mobile banking transaction. This is a clear indication that mobile banking transactions are very potent in improving HDI in SSA.

The positive and statistically insignificant coefficient of indicates that the number of ATMs (NATM) has a dismal effect on economic development in SSA. The statistically non-significant effect of NATM shows that the number of ATMs available only had a marginal effect on HDI. However, the positive coefficient of NATM shows that an increase in the number of ATM machines did not result in the expected level of economic development. This has been attributed to the situation where sufficient ATMs are distributed across a country with only few functioning optimally due to poor power supply and efficient management, hence people resort to cash delivery and lack of usage due to financial illiteracy (Mulungula& Nimubona, 2022; Anane & Nie, 2022; Saraswati *et al.*, 2019).

The coefficient shows that a percentage increase in NCOB resulted in an increase in HDI. The result indicates that the higher the number of commercial banks' (NCOB) the higher economic development. This implies that an increase in the number of commercial banks would help extend banking services to the unbanked through digital financial platforms. According to prior studies that lend credence to this finding, a plausible reason is the fact that commercial banks, when located in rural areas would mobilize savings and extend credit to small scale business people in the area (Ifediora *et al.*, 2022; Sawadogo & Semedo, 2021; Salah, 2021; Nyimbiri, 2021). Truly, the positive effect of NCOB was justified on the grounds that it provides a source of funding for productivity ventures among the rural populace. On the other hand, some studies have shown that commercial banks do not extend credit sufficient enough to drive rural productivity even when the number of branches increase (Amoah *et al.*, 2020; Ouechtati, 2020; Rosmah *et al.*, 2020).

CONCLUSION AND RECOMMENDATIONS

The study objectively examined the effect of digital financial services and financial inclusion on economic development in SSS from 2009 to 2020.The findings of the panel regression study based on the fixed effects model showed that:

1) The volume of ATM transactions has a negative and statistically significant effect on economic development in SSA.
2) The volume of POS transactions had a favourable and statistically significant effect on economic development in SSA.
3) The volume of mobile banking transactions has a statistically significant favourable effect on economic development in SSA.
4) The number of ATMs in the SSA nations studied has a negative and statistically insignificant impact on economic development.
5) In the selected SSA countries, the number of commercial banks had a favourable and statistically significant effect on economic development.

There is a paucity of studies investigating the effect of digital financial services, financial inclusion and economic development when the human capital development index (HDI) is used to quantify economic development. The few known studies are country specific, hence in order to econometrically investigate how digital financial services and financial inclusion affect economic development in SSA, this study employed World Bank panel data from 2009 to 2020 for five (5) SSA nations. The empirical findings of the study show that the components of digital financial services and financial inclusion (independent variables) explained nearly 96% of the overall fluctuations in HDI and were statistically. The study also found that there was a positive correlation between the volume of POS transactions, mobile banking transactions, and the number of commercial banks and financial inclusion which drives an increase in the level of economic development measured by HDI. Based on these findings, the study concluded that POS transactions, mobile banking transactions, and the number of commercial banks are powerful tools for driving economic development through digitalization in SSA, while there is room for improvement in the utilization and viability of ATMs. In summary, digital financial services which enhances financial inclusiveness represent a significant opportunity for SSA to achieve complete economic success, but this will require sustained effort and investment over the long term.

The study recommends that banks should ensure that ATMs provide convenience for customers by making them accessible and usable while also considering the rate charged for rendering such services.

REFERENCES

Abdu M., Buba, A., Adamu, I., & Muhammad, T. (2015). Drivers of financial inclusion and gender gap in Nigeria. *The Empirical Econometrics and Quantitative Economics Letters,* 4(4), 186-199. https://www.ivoungeconomist.com

Abimbola, A., Olokoyo, F.O., Babaloa, O. & Farouk, E. (2018). Financial inclusion as a catalyst for poverty reduction in Nigeria. *International Journal of Scientific Research and Management* (IJSRM) 06(06) 481-490|

Agur I, Peria S M, & Rochon C (2020) Digital Financial Services and the Pandemic: O ortunities and Risks for Emerging and Developing Economies. International Monetary Fund Research work

Al -Smadi M.O. (2022). The impact of digital finance on the Jordanian economy. *International Journal of Business and Social Science Research*, 3(1), 16 -25

Amoah, A., Korle, K.,&Asiama, R. K. (2020). Mobile money as a financial inclusion instrument: what are the determinants? *International Journal of Social Economics*. 47(10) 0306-8293. 1283-1297.

Anane, I & Nie, F (2022) Determinants Factors of Digital Financial Services Adoption and Usage Level: Empirical Evidence from Ghana, *International Journal of Management Technology*, 9(1) 26-47

Anarfo, E. B., & Abor, J. Y. (2020). Financial regulation and financial inclusion in Sub-Saharan Africa: Does financial stability play a moderating role? *Research in International Business and Finance*, 51, (10). 4-19

Aribaba, F.O., Adedokun, J.O., Oladele, R., Babatunde, A.D., Ahamodu, A.O. &Olassehinde, S. A. (2020). Financial Inclusion Scheme and Poverty Alleviation in Nigeria; ACTA UNIVERSITATIS DANUBIUS. 16 (4). 220- 233

Asongu, S. A., Biekpe, N., &Cassimon, D. (2021). On the diffusion of mobile phone innovations for financial inclusion. Technology in Society, 65, 145 -187

Audu, N.P. (2012). The impact of fiscal policy on the Nigeria economy. *International review of Social Science and Humanities*, (4).142 – 150

Babarinde, G. F., Gidigbi, M.O., Ndaghu, J.T. & Abdulmajeed, I.T. (2020). Digital Finance and the Future of Nigerian Banking System: A Review. *Nile Journal of Business and Economics.* http://journal.nileuniversity.edu.ng/index.php/NileJBE/indexhttp://dx.doi.org/10.20321/nilejbe.v6i16.02. 9-15.

Buckley R, Malady L, Stanley R and Tsang C (2016**).** Digital financial services in the Pacific, Experiences and Regulatory issues. Asian Development Bank. 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Phili ines. www.adb.org; openaccess.adb.org, 1-34

Chinoda, T. and Kapingura, F.M. (2023). Digital financial inclusion and economic growth in Sub-Saharan Africa: the role of institutions and governance", *African Journal of Economic and Management Studies*, Vol. ahead-of-print No. ahead-of print. 1-16

Dahiya, S., & Kumar, M. (2020). Linkage between financial inclusion and economic growth: An empirical study of emerging Indian economy. *Vision: The Journal of Business Perspective,* 1-10

Desalegn, G. &Yemataw, G. (2017). Financial Inclusion in Ethiopia, Using LSMS (Ethiopia Socioeconomic Survey).*Ethiopian Economics Association/Ethiopian Economic Policy Research Institute Macro Division,* 31- 58

Ezenwakwelu, G.C. (2018). Effects of financial inclusion on selected macroeconomic variables in Nigeria. *Global Journal of A lied, Management and Social Sciences,* 15, 259-271. https://www.gojamss.net

Gomber, P., Koch, J.-A., & Siering, M. (2017). Digital Finance and FinTech: Current research and future research directions. *Journal of Business Economics*, 87(5), 537–580

Huang, Y., & Zhang, Y. (2019). Financial inclusion and urban-rural income inequality: Long-run and short-run relationships. *Emerging Markets Finance and Trade,* 1-15

Ifediora, C., Kenechukwu, O.O., Eze, F., EboselumeAgeme, E.A., Ibe, G.I. & Onwumere, J. (2022). Financial inclusion and its impact on economic growth: empirical evidence from sub-Saharan Africa.*Cogent Economics and Finance,* 10:1 1-19

Ifere, E.O &Okosu, N. D (2017).Can Optimal Digital Innovation and Financial Inclusion Drive Poverty Reduction in the Niger Delta Region of Nigeria? *International Journal of Economics and Financial Issues, Econjournals,* 7(1): 539-546

Jokić, S., Cvetković, A. S., Adamović, S., Ristić, N., &Spalević, P. (2019). Comparative analysis of cryptocurrency wallets vs traditional wallets. *Ekonomika, 65*(3), 65-75.

Kambale, L, (2017) Digital financial services: A case of Malawi. Malawi Communication Regulatory authority. Retrieved July 30, 2021 from https://www.itu.int/en/ITUD/Capacity Building? Documents/IG_workshop_August2018? Presentations/Session8_Lindakambale.pdf, 1-19

Kendall, S. (2012). *Bank-led or Mobile-led Financial Inclusion?* CGAP

Khera, P., Ng, M.S.Y., Ogawa, M.S. & Sahay, M.R. (2021), Is Digital Financial Inclusion Unlocking Growth? *International Monetary Fund*, Washington, DC.1 -30

Kiburi, M. M. (2016). *Assessment of factors determining the performance of bank-led agent bank businesses in Kenya: case of Kiambu County* (Doctoral dissertation, Strathmore University).

Kouladoum, J, Wirajing, M A K &Nchofoung T N (2022) Digital technologies and financial inclusion in Sub-Saharan Africa, journal homepage: www.elsevier.com/locate/telpol

Li, X. & Zeng, S. (2010). Finance innovation model literature review. Beijing University.

Mahboub, J.A. (2018). The impact of information and communication technology investments on the performance of Lebanese banks. *European Research Studies Journal, 21*(4), 435-458

Mulungula, A.M. & Nimubona, F. (2022). Digital financial inclusion and trade openness in Africa. *Open Journal of Business and Management,* 10, 744-777.

Myint H, & Krueger A. O (2016) Economic development. https://www.britannica.com/topic/economic-development. Accessed 25 July 28, 2022

Nchofoung, T. N., &Asongu, S. A. (2022 a). ICT for sustainable development: Global comparative evidence of globalization thresholds. *Telecommunications Policy*, 46(5), 102296. 1 -36

Nyimbiri, B. A. (2021). The Impact of Mobile Money on the Peoples' Use of Financial Services in Sub-Sahara Africa. *Management Dynamics in the Knowledge Economy. 9*(1)137-146.

Ouechtati, I. (2020). The contribution of financial inclusion in reducing poverty and income inequality in developing counties. *Asian Economic and Financial Review,* 10(9), 1051-1061

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. Borsa Istanbul Review, 18(4), 329-340.

Panth P. (2021), Economic Development: Definition, Scope, and Measurement. Department of Economics. Hyderabad, India: Osmania University.

Pazarbasioglu, C., Mora, A.G., Uttamchandani, M., Natarajan, H., Feyen, E., & Saal, M. (2020). *Digital Financial Services.* World Bank Group, Washington D.C. https://www .worldbank.org CECC, Retrieved August 01, 2021 from http://pubdocs.worldbank.org/en/230281588169110691/Digital-Financial-Services.pdf

Rana, N. P., Luthra, S., Rao, H. R. (2018). Developing a Framework using Interpretive Structural Modeling for the Challenges of Digital Financial Services in India. In *PACIS* (p. 53). https://aisel.aisnet.org/pacis2018/53

Raza, M.S., Tang, J., Rubab, S. & Wen, X. (2019), 'Determining the nexus between financial inclusion and economic development in Pakistan', *Journal of Money Laundering Control*,22(2),195-209 Available at: https://doi.org/10.1108/JMLC-12-2017-0068.

Roessler, P., (2018). The mobile phone revolution and digital inequality: scope, determinants and consequences. *Prosperity Commission Background Paper Series. Oxford, U.K.: Pathways for Prosperity Commission*

Rosmah, N., Zulkefly, A.K., Aisyah, A.R., & Tamat, S. (2020). Financial inclusiveness and economic growth: New evidence using a threshold regression analysis. *Economic Research-Ekonomska Istrazivanja,* 33(1) 1465-1484

Salah, A. (2021) Impact of financial inclusion on inflation rate in emerging nations. International *Journal of Economics and Financial Issues* | 11(1)

Saraswati, B. D., Maski, G., Kaluge, D., & Sakti, R. K. (2020). The effect of financial inclusion and financial technology on effectiveness of the Indonesian monetary policy. *Business: Theory and Practice*, *21*(1), 230-243

Sawadogo, R & Semedo, G, (2021). "Financial inclusion, income inequality, and institutions in sub-Saharan Africa: Identifying cross-country inequality regimes," International Economics, Elsevier, 167(C), 15-28

Seddigi, H. &Lawler, K.A. (2000). *Econometrics: a practical a roach*. New York: Routledge

Sethy, S. (2016). The link between financial inclusion and economic growth. *Indian Journal of Economics and Development,* 12(3), 565-573

Shen, Y., Hu, W. &Hueng, C.J. (2021). Digital financial inclusion and economic growth: A Cross-country study. Procedia Computer Science 187, 218-223

Shofawati, A. (2019). The role of digital finance to strengthen financial inclusion and the growth of SME in Indonesia. Paper presented at the 2nd International Conference on Islamic Economics, Business and Philanthropy (ICIEBP) 389–407

Strzelecka, A.M. (2020) Financial self – exclusion: Why do households give up activity on the market of financial services and products, Sustainable economic development and advancing education excellence in the era of global pandemic

Thaddeus, K., Ngong, C. & Manasseh, C. (2020), "Digital financial inclusion and economic growth: evidence from Sub-Saharan Africa (2011-2017). *International Journal of Business and Management*, 8(4) 212-217.