

Digital financial inclusion and economic growth in Sub-Saharan Africa: the role of institutions and governance

Economic
growth in Sub-
Saharan Africa

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Tough Chinoda

*Department of Economics, University of Fort Hare - East London Campus,
East London, South Africa, and*

Forget Mingiri Kapingura

*Department of Economics, University of Fort Hare East London Campus,
Alice, South Africa*

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Abstract

Purpose – This study examines the role of institutions and governance on the digital financial inclusion and economic growth nexus in Sub-Saharan Africa (SSA) from 2014 to 2020.

Design/methodology/approach – This study adopts the generalised method of moments technique which controls for endogeneity. The authors employed four main variables namely, index of digital financial inclusion, gross domestic product per capita growth, institutions and governance.

Findings – The results suggest a significant positive effect of institutional quality and governance on the digital financial inclusion-economic growth nexus in SSA. Furthermore, the authors find that effect of trade and population growth on economic growth was significantly positive while inflation reduces economic growth in the region.

Research limitations/implications – This study also ignored the effect of digital financial inclusion on environmental quality. Future researches should focus on addressing these drawbacks and replicating the study in Africa as a whole and other developing countries across the world that are experiencing digital financial inclusion and economic growth challenges. The results from the study imply that a positive relationship between digital financial inclusion and economic growth. It is important to note that the study was carried out on the premise that institutions play a pivotal role in enhancing economic growth in SSA.

Practical implications – The results confirm the significance of policies that enhances institutional quality and governance which are other avenues the authorities can pursue to enhance economic growth in SSA.

Social implications – The paper documents the importance of institutions in boosting economic growth which impacts on social life rather than digital financial inclusion only.

Originality/value – The paper makes a contribution through analysing the role of institutions and governance on the digital financial inclusion-economic growth nexus rather than the traditional financial inclusion-economic growth nexus which is common to the majority of the available empirical studies.

Keywords Digital financial inclusion, Economic growth, Institutional quality, System GMM

Paper type Research paper

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1. Introduction

Digital financial inclusion has in recent decades received much attention from researchers and policymakers (Ozili, 2018). It is viewed as a change agent that can result in a revolutionary development in the global financial sector. Regarding the concept, digital financial inclusion is the proportion of individuals and firms that access and use formal financial services through digital platforms. Digitalisation has transformed financial systems in developing and developed countries (Wysokińska, 2021). Barriers in traditional financial systems continues to fall (Kooli *et al.*, 2022), leading to an increase in financial inclusion which is also recognised as a key enabler for achieving the 2030 Sustainable Development Goals (Allen *et al.*, 2016). It has been argued that countries with high digital financial inclusion levels are better able to withstand economic growth challenges (Khera *et al.*, 2021; Shen *et al.*, 2021; Thaddeus *et al.*, 2020). Therefore enhancing digital financial inclusion can have significant positive effects on many individuals and organisations in those countries that can be affected by economic downturns.

Sub-Saharan African (SSA) countries are making tremendous progress in improving their governance and institutional environment. Several economists have defended the notion that “institutions matter” citing institutional reform as a crucial accelerator for economic growth and social advancement (Acemoglu *et al.*, 2005; Rodrick *et al.*, 2004; Asadullah and Savoia, 2018). These economists propose the concept of extractive institutions, examining countries with weak political institutions in the form of distortionary policies, insecure property rights and document that countries with better institutions achieve higher economic growth. Thus, institutional failures constitute sources of market inefficiency, market exclusion and misallocation of resources, leading to a reduction in economic growth (Webb *et al.*, 2020). Institutions are groups or organisations that operate in the public sector and conduct governmental duties, such as ministries and courts. Governance is a set of procedures that determines how those bodies or entities are managed, how successfully they execute their mandate and how well they resultantly assist households and businesses.

Many economies in SSA lack the level of financial inclusion necessary to reap the benefits, in spite of many advantages that come with it. The region is the most economically excluded in the world (World Bank, W, 2018) as portrayed in Table 1 which summarises the indicators of regional financial inclusion. The results demonstrate that, with the exception of mobile money penetration, SSA underperformed the world average on all measures of financial inclusion among the six regions. Lower levels of digital financial inclusion are a deterrent to

Global regions	Population (millions.)	Fin. Inst. Acct	Account ownership	Digital payment	Mobile money	Credit	Savings
East Asia and Pacific	628.8	70.3	70.6	58	1.3	21.5	30.6
Latin America and Caribbean	454.7	53.5	54.4	45.1	5.3	20.8	12.2
Europe and Central Asia	331.6	65.1	65.3	60.4	3.2	24.2	14.4
South Asia	1248.7	68.4	69.6	27.8	4.2	7.8	17.2
Middle East and North Africa	256.7	43	43.5	33.3	5.8	9.6	10.8
<i>Sub-Saharan Africa</i>	<i>590</i>	<i>32.8</i>	<i>42.5</i>	<i>34.4</i>	<i>20.9</i>	<i>8.4</i>	<i>14.9</i>
Global Average	751.8	55.5	57.7	43.2	6.8	15.4	16.7

Table 1.
Regional indicators of financial inclusion

Note(s): The values in italics are for the Sub-Saharan Africa region which is our case study. They have been italicised for comparison purposes with other regions

Source(s): Authors' computation based on World Bank (2021)

economic progress (Ahmad *et al.*, 2021; Banna *et al.*, 2020; Banna and Alam, 2021; Khera *et al.*, 2021; Shen *et al.*, 2021; Thaddeus *et al.*, 2020). Therefore, it is critical to take practical action to increase the reach of formal financial services. We argue that deliberate government intervention could increase access to finance by the poor in SSA and subsequently spark economic growth. The Indian government is a case in point. Due to a strong central government decision to promote account ownership through the implementation of biometric identification cards, the gap between males and women's account ownership in India fell from 20% in 2014 to 14% in 2018. (World Bank, W, 2018).

Literature is replete with studies examining the relationship between economic growth and digital financial inclusion (Ahmad *et al.*, 2021; Banna *et al.*, 2020; Banna and Alam, 2021; Khera *et al.*, 2021; Shen *et al.*, 2021; Thaddeus *et al.*, 2020). However, there is dearth of studies linking institutions, governance, digital financial inclusion and economic growth. We contend that institutions and governance can influence the benefits of digital finance for boosting economic growth. Because economic recession encompasses multiple dimensions that originate in various institutional failures, we contend that it should be addressed from multi-institutional perspective. Access and use of digital technology, such as search engines, mobile phones, or robotics for banking purposes depends on the quality of institutions and governance. Thus we explore the role of institutions and governance on the interplay between digital financial inclusion and economic growth using the system generalised method of moments (S-GMM) model. By examining the effects of institutions and governance on digital financial inclusion and economic growth in SSA, a topic that, to the best of our knowledge, has not yet been addressed—our study contributes to the literature on economic growth and neo-institutionalisation. Second, our study investigates a yet-to-be-examined potential causal relationship between the variables. Finally, by creating a variable for digital financial inclusion, we theoretically contribute to the research. Section 2 of our study investigates pertinent theories and empirical literature, Section 3 deals with methodological concerns, Section 4 provides the findings and discusses them, and Section 5 summarises the study and offers recommendations and conclusions.

2. Literature review

2.1 Digital financial inclusion and economic growth

The link between financial inclusion and economic growth has been acknowledged in previous studies, but in this paper, we focussed on digital financial inclusion and economic growth. Using the generalised method of moments which account for heterogeneity issues, Van *et al.* (2021) investigated the link between financial inclusion and economic growth using international evidence. The findings of the study reveals a positive relationship between financial inclusion and economic growth. The relationship was stronger for countries with low income and a relatively lower financial inclusion degree. These findings were also affirmed by Khan *et al.* (2022) who suggested a positive effect of financial inclusion on economic growth, poverty, sustainability and financial efficiency for G20 countries using the generalised method of moments and the autoregression distribution lag. However these studies did not consider institutional controls in their growth models. Countries with different institution frameworks may target different financial inclusion levels and thus, it may affect the magnitude of the financial inclusion-economic growth nexus. It is therefore essential to include institutional factor in the analysis. Our study seeks to close this gap by analysing the role of institutions and governance on the digital financial inclusion–economic growth nexus.

Literature is replete with studies examining the nexus between digital financial inclusion and economic growth for developing and developed countries (Ahmad *et al.*, 2021; Banna and Alam, 2021; Khera *et al.*, 2021; Shen *et al.*, 2021; Thaddeus *et al.*, 2020), with each study providing insights into the subject matter. Using the fixed effect regression approach, Ahmad

et al. (2021) have probed into the digital financial inclusion-economic growth nexus and concluded a positive impact of digital financial inclusion on economic growth in China. This supports the studies conducted by *Shen et al.* (2021) and *Khera et al.* (2021) who used the spatial dependence model and the cross-sectional instrument variable procedure respectively and concluded a significant positive effect of digital financial inclusion on economic growth. These studies have their own limitations. *Ahmad et al.* (2021) has used time series data which cannot be generalised in all countries whilst, *Shen et al.* (2021) and *Khera et al.* (2021) have failed to consider heterogeneity of spatial dependency and to cater for the speed of adjustment respectively. These studies have also failed to consider the effect of institutions and governance on the relationship, the gap which this study seeks to close. Our study used two-step system generalised method of moments on a balanced panel data and also considered institutions and governance.

Using the vector error correction model and the granger causality test, *Thaddeus et al.* (2020) finds a unidirectional causality running from economic growth to digital financial inclusion in the long run for 22 SSA countries using quarterly data for the period 2011–2017. On the other hand, *Banna and Alam* (2021) conclude that digital financial inclusion brings banking stability and economic development using 574 banks from seven emerging Asian countries for the period 2011 to 2018. These studies however did not compute an index of digital financial inclusion to comprehensively define the concept but rather used single indicators to proxy digital financial inclusion. This study seeks to address these gaps. We constructed an enhanced digital financial inclusion index which is different from the traditional financial inclusion index using a three-stage principal component analysis (PCA).

Using the pooled ordinary least squares, two stage least squares and GMM approaches, *Ozturk and Ullah* (2022) examined the impact of DFI on economic growth and environmental sustainability in 42 One Belt and Road Initiative (OBRI) countries for the period 2007 to 2019. Findings of the study reveals that DFI has a positive effect on economic growth and a negative effect on quality of the environment through carbon dioxide emissions. *Myovella et al.* (2020) toed the line when they suggested a positive effect of digitalisation on economic growth, for SSA and OECD countries using the GMM approach. *Ozturk and Ullah* (2022) however used only two proxies such as ATMs and debit cards to measure DFI. Our study used several aspects of DFI to comprehensively define the concept.

2.2 Institutions, governance, digital financial inclusion and economic growth

The words “institutions” and “governance” are at times used interchangeably, but they actually refer to different ideas most of the time. For instance, institutions and governance are both sometimes thought to be aspects of one another. In this study, we considered institutions as the framework or structure (the skeleton) and governance as the means by which the framework or structure is operated (the muscles), a description that may be evocative of *Williamson’s* (1998). Even though they are still distinct elements of an economy’s structure, the two ideas are crucially intertwined and intrinsically related; one cannot exist without the other. It has been debated for decades how finance and economic growth are related. Since the seminal work of *North* (1991), which noted that institutions play a significant role in forming advanced economies and are important, potentially positive or negative, drivers of real economic change, the significance of institutions has been acknowledged in the literature. As a result, institutions should be taken into account when modelling the subject. Another significant contribution was done by *Acemoglu et al.* (2005) who researched on the role of institutions from various perspectives and consideration of historical evidence, particularly on the causes of the significant institutional variation across nations.

According to *Bosma et al.* (2018), political and economic institutions are the most significant variables in determining how different economies grow. Furthermore, in order to properly

enforce property rights and other institutions based on the free market and promote economic progress, a strong and trustworthy legal system is essential (Baklanova *et al.*, 2020). The rule of law is a crucial institution proxy that has a solid reputation in the literature. Legal frameworks and history may have a favourable impact on economic growth and digital finance in an indirect manner (Platteau, 2015). The legal system plays a crucial role in fostering digital financial inclusion since its enforcement protects investors, which encourages further capital allocation and investment (Beck and Levine, 2002). The comprehension of how economic institutions affect digital financial inclusion and the implications for growth, however, is still far from perfect.

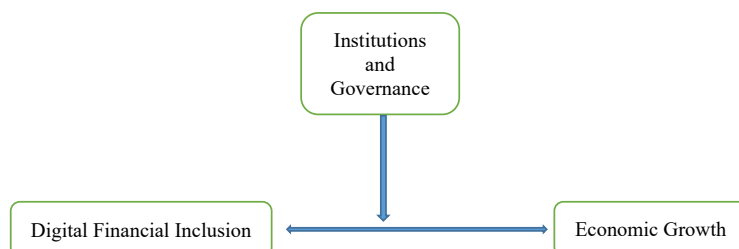
Yiadom *et al.* (2021) examines the role of institutions on the long-run effect of financial inclusion on poverty and economic growth in Africa over the 2011–2018. Using dynamic panel regression of 42 economies, they reported a positive effect of countries with strong institutions on financial inclusion through poverty reduction and improved per capita GDP. The study however did not include an index of digital financial inclusion which is comprehensive. Our study therefore examine the effects of institutions and governance independently and determine whether they influence the digital financial inclusion–economic growth nexus.

2.3 Conceptual framework

Since there are no empirical studies that have examined the role of institutional quality and governance on digital financial inclusion and economic growth, the conceptual framework in Figure 1 indicates the relationship between the variables under study. Institutions and governance are the moderating factors whilst digital financial inclusion and economic growth are the dependent and independent variables.

3. Methodology

Studies that examined the nexus between digital financial inclusion and economic growth have employed the ordinary least squares-fixed effect (Ahmad *et al.*, 2021), the spatial dependence model and the cross-sectional instrument variable (Shen *et al.* (2021), fractional logit and random effects empirical estimation (Khera *et al.*, 2021). However, these techniques have not been able to address the challenges of heteroskedasticity and endogeneity, and they do not provide reliable and robust results for panel data techniques in most cases (Kim *et al.*, 2018). We therefore addressed these concerns without sacrificing the robustness of our findings by employing the S-GMM system estimator by Arellano and Bover (1995) which is a robust panel data technique to examine the role of institutions and governance on the digital financial inclusion-economic growth nexus in SSA. We formulated our research models as follows:



Source(s): Author (2022)

Figure 1.
Conceptual framework

$$DFI_{i,t} = \beta_0 + \beta_{1i}DFI_{i,t-1} + \beta_{2i}GDPPCG + \beta_{3i}INSTIT_{i,t} + \beta_{4i}GOV_{i,t} + \beta_{5i}INTERACTION_{i,t} + \beta_{6i}CONTROL_{i,t} + \epsilon_{it} \quad (1)$$

$$GDPPCG_{i,t} = \beta_0 + \beta_{1i}GDPPCG_{i,t-1} + \beta_{2i}DFI_{i,t} + \beta_{3i}INSTIT_{i,t} + \beta_{4i}GOV_{i,t} + \beta_{5i}INTERACTION_{i,t} + \beta_{6i}CONTROL_{i,t} + \epsilon_{it} \quad (2)$$

where: DFI is the digital financial inclusion index; GDPPCG is Gross domestic product per capita growth (Economic growth), $GDPPCG_{i,t-1}$ is the lag of GDPPCG, $DFI_{i,t-1}$ is the lag value of $DFI_{i,t}$, $INSTIT_{i,t}$ denotes institutional quality; INTERACTION denotes the interaction term between economic growth and institutional quality ($GDPPCG_{i,t} * INSTIT_{i,t}$) and digital financial inclusion and institutional quality ($DFI_{i,t} * INSTIT_{i,t}$) and the same applies to governance. β signifies the independent variables long run coefficients, $\epsilon_{i,t}$ is the error term where i and t represent the country and time, respectively. CONTROL _{i,t} denotes control variables which include: TRADE (the log of net export); EDU (the log of primary school enrolment); POPG (the growth rate of the population) and INFL (the inflation rate).

3.1 Variables description and data

Data for this study was sourced from the World Development Indicators (WDI) and Worldwide Governance Indicators (WGI) databases. The data cover 25 countries across the SSA continent for the period between 2014 and 2020. The countries were selected based on data availability. These countries include Angola, Botswana, Cameroon, Comoros, Congo Rep, Cape Verde, Egypt, Ghana, Guinea, Guinea-Bissau, Lesotho, Kenya, Madagascar, Malawi, Mali, Morocco, Namibia, Nigeria, Rwanda, Seychelles, Eswatini, South Africa, Uganda, Zimbabwe and Zambia.

We employed gross domestic product per capita growth, institutions, governance and digital financial inclusion as the main variables. Trade, population growth, inflation and education were also included as control variables. Following [Khera et al. \(2021\)](#) we constructed an enhanced digital financial inclusion index which is different from the traditional financial inclusion index which was used by most scholars. The indices consist of access, penetration and usage indicators provided by digital financial services including fintech companies, mobile money operators and other new entrants in the financial sector, sourced from the World Bank WDI. We used four indicators of digital financial inclusion (Percentage population with access to Internet, Mobile subscription per 100 people, Number of registered mobile money agents per 100,000 adults and Number of active mobile money accounts per 1 000 adults) as suggested by the upgraded G20 Financial Inclusion Indicator System to compile a comprehensive digital financial index. In constructing the digital financial inclusion index variable, we employed the PCA which is a modern multivariate data analysis tool. The PCA technique retains all variations that will be available in the data, reduces data dimensionality and resolves the possible multicollinearity that may arise among the variables ([Nizam et al., 2020](#)). Using the PCA, we normalised all the indicators for each dimension to have values between zero (0) and one (1) to make immaterial the scale that they were measured. Thereafter, the PCA extracts the common principal component of the dimensions that capture various aspects of the inclusive financial sector. Following [Tandelilin and Hanafi \(2021\)](#), we compiled data on institutions and governance from World Bank's WGI. Six different indicators make up the WGI, each of which focusses on a different component of institutions and governance.

We employed the indicators such as voice and accountability, political stability and lack of violence and government effectiveness to represent the aspect of institutions (the framework or structure), and regulatory quality, rule of law and control of corruption to represent the aspect of governance (how the institutions are run). [Figure 2](#) reflects how the various WGI are related to the summary statistics in this study and how they can be compared to alternative

measures. We considered government effectiveness in terms of laws, quality of regulations and rule of law concerning the transfer/repatriation of funds abroad. Usually when the funds obtained from these digital services remain in the economy it improves liquidity but if the funds are repatriated then there is a “sieve” draining funds. This is likely to have a negative effect on economic growth.

In addition, we included control of corruption since the issue of governance linked to corruption is connected to the type of government in place, whether it is democratic, military, or authoritarian and these type of government systems have an effect on the relationship under study. Bad institutional quality in the form of widespread corruption, weak enforcement of property rights, political instability, poor bureaucratic quality, unaccountable leadership and poor corporate governance cripples financial institutions performance, and hence increases financial exclusion. It may dampen people from depositing their funds in formal banks, due to fear of financial losses, thus increasing financial exclusion. In order for us to have summary measures on institutions and governance, we created indicators for the averages across the three indicators. This assisted us in the assessment of the overall impact and the relative importance of governance and institutions. However, it should be highlighted that institutions and governance are highly intertwined, and the methodology used here offers data on how governance and institutions function across a nation while stating very little about the impact of specific institutions working in an economy.

The summary statistics for the main and control variables are indicated in Table 2. On average, digital financial inclusion in SSA is very low at 39%, the minimum and maximum values being 2 and 68%, respectively. This implies that the SSA continent has serious digital financial inclusion discrepancies consistent with Mehrotra and Yetman (2015). 95% of the adult population in SSA had subscribed to mobile phones and 29% uses Internet thereby increasing the chances of bringing on board the unbanked. Moreover, institutional quality and governance in SSA is fragile as portrayed by mean values of -0.46 and -0.50 respectively. Inflation was 11.78% with the minimum and maximum values of -17.59 and 558%, the maximum being witnessed in Zimbabwe.

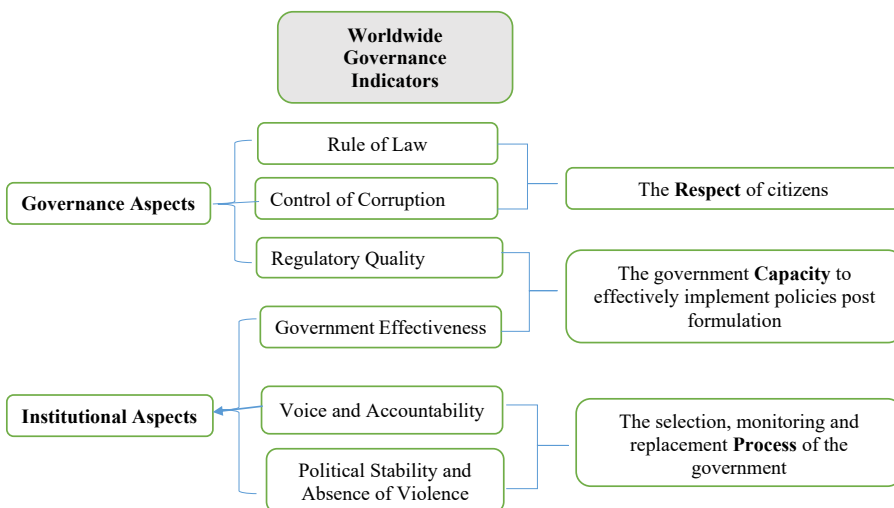


Figure 2. Worldwide governance indicators

Variable	Obs	Mean	Std. Dev	Min	Max
Mob. subs per 100 people (<i>Access</i>)	175	95	36.7	32	198
MM agents per 100,000 adults (<i>Access</i>)	175	435	481	1	2,160
Active MM accounts per 1000 adults- <i>Penetration</i>	175	339	338	1	1,250
Internet usage (% of population)- <i>Use</i>	175	29	17.5	3	79
DFII	175	0.39	0.18	0.02	0.68
Control of corruption	175	-0.49	0.74	-1.58	1.42
Government effectiveness	175	-0.59	0.62	-1.79	0.73
Rule of law	175	-0.48	0.57	-1.53	0.66
Regulatory quality	175	-0.53	0.52	-1.89	0.76
Political stability	175	-0.41	0.76	-2.2	1.11
Voice and accountability	175	-0.39	0.67	-1.48	0.97
Respect	175	-0.48	0.64	-1.54	0.85
Process	175	-0.40	0.63	-1.43	0.93
Capacity	175	-0.56	0.55	-1.59	0.63
Institutions	175	-0.46	0.57	-1.35	0.72
Governance	175	-0.50	0.58	-1.58	0.71
Economic growth (GDPPCGR %)	175	0.09	3.99	-15.71	8
Trade (%)	175	73.58	35.44	20.72	188.88
Inflation (%)	175	11.78	53.71	-17.59	558.58
Education	175	3.32	5.06	0	38.04
Population growth (%)	175	2.2	0.77	0.03	3.83

Table 2.
Summary statistics

Source(s): Authors (2022)

3.2 Correlation analysis

Table 3 displays the correlation between the variables under study, giving an insight into the nature and strength of the relationships and the probability of multicollinearity. The study reveals a significant positive association between digital financial inclusion and variables such as institutions, governance, trade and education. In addition, economic growth had a significant positive association with education and governance and an inverse relationship with institutions, trade and inflation. The association between population growth and variables such as digital financial inclusion, institutions, governance and trade is negative and significant at 5% level. The correlation coefficients are less than 0.8 suggesting no serious multicollinearity issues among other estimation variables with the exception of institutions and governance. We also conducted Sargan-Hansen test to check for instrumental variables validity.

3.3 Regression results

In this section, are two major results presented in two separate tables. Table 4 shows the results from the S-GMM on the role of institutions and governance on the impact of digital financial inclusion on economic growth. Table 5, on the other hand, reveals the results of the role of institutions and governance on the impact of economic growth on digital financial inclusion.

3.3.1 Digital financial inclusion and economic growth: does institutional quality and governance matter?. From the results in Table 4, we test the raw effect of digital financial inclusion on economic growth in the absence of institutions and governance. The findings show that the effect of digital financial inclusion on economic growth was significant and positive at 10% level. This show that all other things being equal a unit increase in digital financial inclusion increases economic growth by 17.27 units. This finding supports the popular opinion that digital financial inclusion by itself enhances economic growth in line with various scholars (Ahmad *et al.*, 2021; Banna and Alam, 2021; Khera *et al.*, 2021; Shen *et al.*, 2021).

Variable	dfii	gdppcgr	Institutions	Governance	Trade	popgrowth	Inflation	Education
dfii	1.000							
gdppcgr	0.017	1.000						
Institutions	0.706*	-0.007	1.000					
Governance	0.749*	0.111*	0.886	1.000				
Trade	0.403*	-0.114	0.509*	0.421	1.000			
popgrowth	-0.561*	0.075*	-0.513*	-0.413	-0.504*	1.000		
Inflation	-0.044	-0.189*	-0.134**	-0.169	-0.029	-0.072	1.000	
Education	0.054*	0.031*	-0.046*	0.166	0.038*	0.317	-0.02	1.000

Note(s): * ** denotes significance at 5 and 10% level respectively
Source(s): Authors (2022)

Table 3.
Correlation analysis

Table 4.
System-GMM
results -*GDPPCGR*

Variable	(1) <i>GDPPCGR</i>	(2) <i>GDPPCGR</i>	(3) <i>GDPPCGR</i>	(4) <i>GDPPCGR</i>	(5) <i>GDPPCGR</i>
<i>L.GDPPCGR</i>	0.348 (0.076)***	0.367 (0.065)***	0.344 (0.081)	0.295 (0.122)	0.203 (0.279)
<i>DfII</i>	17.27 (0.084)***	19.51 (0.058)***	17.035 (0.095)	22.910 (0.026)**	26.208 (0.010)*
<i>INSTITUTION</i>		-2.840 (0.007)*	-1.091 (0.856)	5.922 (0.181)	-11.740 (0.060)**
<i>GOVERNANCE</i>					43.304 (0.004)*
<i>INTERACTION</i>					-0.022 (0.003)*
<i>INFLATION</i>	-0.019 (0.018)**	-0.017 (0.034)**	-0.019 (0.017)*	19.357 (0.042)*	6.579 (0.011)*
<i>POPGROWTH</i>	7.628 (0.005)*	7.372 (0.007)*	7.682 (0.005)**	6.899 (0.009)*	6.579 (0.011)*
<i>EDUCATION</i>	-0.243 (0.121)	-0.230 (0.147)		-0.244 (0.118)	-0.278 (0.063)***
<i>TRADE</i>	0.190 (0.000)*	0.186 (0.000)*	0.193 (0.000)*	0.185 (0.000)*	0.197 (0.000)*
Constant	-9.627 (0.578)	-8.412 (0.631)	-0.239 (0.130)	-5.478 (0.589)	-9.428 (0.579)
Observations	125	125	125	125	125
Number of countries	25	25	25	25	25
Number of instruments	21	22	22	23	23
Wald χ^2	38.89	39.90	39.06	45.58	56.73
Prob. > χ^2	0.000	0.000	0.000	0.000	0.000

Note(s): * $p < 0.01$; ** $p < 0.05$; *** $p < 0.1$; parentheses

Variable	(1) <i>DFII</i>	(2) <i>DFII</i>	(3) <i>DFII</i>	(4) <i>DFII</i>	(5) <i>DFII</i>
<i>LDFII</i>	0.710 (0.000)*	0.694 (0.000)*	0.705 (0.000)*	0.622 (0.000)*	0.620 (0.000)*
<i>GD PPC GR</i>	0.002 (0.001)*	0.002 (0.001)*	0.002 (0.001)*	0.002 (0.001)*	0.003 (0.000)*
<i>INSTITUTION</i>		-0.002 (0.585)		-0.019 (0.618)	
<i>GOVERNANCE</i>			-0.013 (0.775)		-0.008 (0.859)
<i>INTERRACTION</i>				0.003 (0.009)*	0.003 (0.005)**
<i>INFLATION</i>	0.001 (0.519)	0.0000 (0.506)	-0.000 (0.513)	-0.000 (0.594)	-0.000 (0.478)
<i>POP GROWTH</i>	0.037 (0.076)**	0.037 (0.076)**	0.038 (0.074)**	0.032 (0.112)	0.032 (0.128)
<i>EDUCATION</i>	0.002 (0.069)**	0.002 (0.073)**	0.002 (0.065)**	0.002 (0.097)**	0.002 (0.098)
<i>TRADE</i>	0.005 (0.234)	0.005 (0.215)	0.001 (0.224)	0.001 (0.157)	0.000 (0.107)
Constant	-0.266 (0.056)**	-0.270 (0.046)*	-0.278 (0.052)**	-0.218 (0.107)	-0.219 (0.115)
Observations	125	125	125	125	125
Number of countries	25	25	25	25	25
Number of instruments	21	22	23	23	23
Wald χ^2	96.39	96.25	96.57	107.98	109.44
Prob > χ^2	0.000	0.000	0.000	0.000	0.000

Note(s): * $p < 0.05$; ** $p < 0.10$; parentheses

Table 5.
System-GMM
results -*DFII*

We, also introduced institutions and governance and retest whether institutions and governance matter in explaining the effect of digital financial inclusion on economic growth. The results shown in Table 4 column (2) and column (3) suggest that poor institutional quality significantly reduces economic growth in SSA implying that institutional quality is good for economic growth. Institutions recorded a coefficient of -2.84 indicating that if the institutional quality is strengthened by at least one percentage point, an economy is likely to experience a significant recession of about 2.84%. This could have been caused by prevailing poor bureaucratic quality, quality of law and order and governance in these nations, which also affects the selection, monitoring and replacement process of the government and the government capacity to effectively implement policies post formulation. This result however contradicts Heras Recuero and Pascual González (2019) who concluded a positive effect of institutional quality on economic growth in middle income countries. Moreover, we introduced an interaction term between digital financial inclusion (*DFII*) and institutional quality (*INSTITUTIONS*) to test whether the impact of digital financial inclusion goes through institutional quality.

The results shown in column (4) and column (5) of Table 4 reveals that the interaction term (*INTERACTION*) recorded a positive significant coefficient of 19.36 and 43.30, respectively. The results suggest that economic growth in SSA is greater when institutions and governance are of higher quality, even when other factors increasing economic growth are accounted for. This shows that the combined effect of institutional quality and governance on digital financial inclusion significantly increase economic growth. Although SSA is characterised by widely weak institutions and fragile digital financial inclusion condition as confirmed by the descriptive statistics in Table 2, an interaction between institutions and digital financial inclusion and that of governance and digital financial inclusion has the potential to increase economic growth in SSA.

For the control variables, inflation (*INFLATION*), net trade (*TRADE*) and population growth (*POPGROWTH*) were all significant in the five models shown in Table 4 and maintained their respective expected signs consistent with theory. Trade and population growth rate promoted economic growth. Inflation significantly reduces economic growth implying that inflation hurts the economic growth process causing uncertainty in SSA in line with Ifediora *et al.* (2022).

That means high inflation rate creates price instability in the economies, which negatively influences economic growth in the studied region. The result is consistent with the study by Nawaz *et al.* (2014).

3.3.2 Economic growth on digital financial inclusion: does institutional quality and governance matter?. The results in column (1) of Table 5 indicate that economic growth (*GDPPCGR*) is relevant in explaining digital financial inclusion dynamics in SSA. This means that a 1% point increase in economic growth significantly increases digital financial inclusion by 0.2. % points. This is in line with documented empirical literature (Thaddeus *et al.*, 2020). This implies that a growth in the economy would cause people to buy digital gadgets and use Internet which increases financial inclusion. We introduced institutional quality and governance into the economic growth-digital financial inclusion nexus and presents the results in column (2) and column (3) of Table 5. The results show that both institutions and governance are weak in the interrelationship between the two variables despite maintaining the expected negative sign. This result indicates that as a stand-alone institutions and governance do not matter in the economic growth-digital financial inclusion nexus. We interact economic growth (*GDPPCGR*) with institutions and governance to determine whether the impact of economic growth on digital financial inclusion is contingent on the host nation's institutional quality and governance.

The results shown in columns (4) and (5) of Table 5 reveals that the interaction term (*INTERACTION*) recorded a significant positive coefficient of 0.003 for both indicators. The results suggest that digital financial inclusion conditions in SSA is greater when institutions and governance are of higher quality. This shows that the combined effect of

institutional quality and economic growth and that of governance and economic growth significantly increase digital financial inclusion conditions in SSA. Although SSA is characterised by widely weak institutions and fragile digital financial inclusion condition as confirmed by the descriptive statistics shown in [Table 2](#), an interaction between institutions and economic growth and that of governance and economic growth has the potential to increase digital financial inclusion conditions in SSA.

The level of education and population growth had a significant positive effect on digital financial inclusion at 10% level. For example, an educated resident is more likely to benefit from the financial system by having a registered account and so does the population growth.

3.4 Post-estimation test and robustness of results

The Hansen test for over identification restriction shown in [Table 4](#) attests that the S-GMM instrumental variables are valid and contemporaneously exogenous. We also diagnose the presence of autocorrelation in the S-GMM model. Theoretically, if the calculated p -value is greater than the significant level of 0.05 we fail to reject the null hypothesis of no autocorrelation among the residuals. The findings from the study are robust to the digital financial inclusion index.

4. Discussion and conclusion

An increasing trend of pursuing the strategy of digital financial inclusion in recent years in several parts of the world has attracted numerous scholars. Although the influence of digital financial inclusion on economic growth have been acknowledged in the literature, empirical studies on the role of institutions and governance on this relationship has been scanty. This paper is conducted to give better insights into the link between digital financial inclusion and economic growth and the role of institutions and governance. It follows several seminal papers documenting the importance of framework conditions for economic growth. The work in those studies and this one suggests that SSA countries can easily reap economic benefits by ratcheting up their efforts directed at framework conditions, and our study suggests that digital financial inclusion is a good candidate for this, especially if flanked by proper institutions and governance. First, we find that there exists a bi-directional causality between economic growth and digital financial inclusion. This outcome however contradicts [Thaddeus et al. \(2020\)](#) who supported the supply-leading hypothesis by concluding a unidirectional causality from economic growth to digital financial inclusion. Second, the results suggest that economic growth and digital financial inclusion in SSA are greater when institutions and governance are of higher quality. The result provides strong evidence to suggest that a country benefits from digital financial inclusion depending on the quality of available institutions and governance. This suggests that the efforts to improve institutional quality combined with increased digital financial inclusion can boost economic growth to a large extent than the improvement of institutional quality alone. We find that governments should not solely depend on financial reforms; rather, they should simultaneously target both institutional areas. Unfortunately, SSA does not have the adequate institutional quality to reap the dividend associated with digital financial inclusion. We also report that economic growth boosts digital financial inclusion if a country has sufficient institutional quality. We advise that SSA countries take financial economic growth and digital financial inclusion as a central government direct responsibility and strengthen institutional quality. Deliberate policies should also be made to ensure that digital financial access is extended to the poor. One way of doing so is to ensure governments effectiveness in terms of laws, quality of regulations and rule of law concerning the transfer/repatriation of funds abroad. Usually when the funds obtained from the digital services remain in the economy it improves liquidity

but if the funds are repatriated then there is a “sieve” draining funds. This is likely to have a negative effect on economic growth.

Our study recommends that institutional quality and governance should be the focus of the policy makers in SSA so as to enhance economic growth in these economies. To enhance digital financial inclusion, policy makers should interact institutional quality and governance with economic growth policies. Governments should be very serious in terms of control of corruption since the issue of governance linked to corruption is connected to the type of government in place, whether it is democratic, military, or authoritarian and these type of government systems have an effect on the relationship under study. Bad institutional quality in the form of widespread corruption, weak enforcement of property rights, political instability, poor bureaucratic quality, unaccountable leadership and poor corporate governance cripples financial institutions performance, and hence increases financial exclusion. It may dampen people from depositing their funds in formal banks, due to fear of financial losses, thus increasing financial exclusion. Policies options to improve regulatory and bureaucratic quality, law and order situations, and political stability must be prioritised by policymakers. Besides, digital financial inclusion should be another target of policy makers to accelerate the pace of economic growth in SSA.

We also find that rising levels of inflation constitutes a drag that leaks out and diminishes the growth benefits of digital financial inclusion in SSA. In terms of implications for research, practice and/or society, our research is helpful for policy makers in recommendations on ease of access to funds from digital inclusion. Based on these results, we conclude that policies that promotes institutions and governance are imperatively important in promoting the digital financial inclusion and growth of economies in SSA. Future studies can include digital financial inclusion indicators, such as microfinance institutions and financial literacy variables and also compare performance in SSA against other developed nations. Our study also ignored the effect of DFI on environmental quality. Researches in the future should focus on addressing these drawbacks and replicating the study in the whole African region and other developing countries across the world that are experiencing digital financial inclusion and economic growth challenges.

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Corresponding author

Tough Chinoda can be contacted at: toughchinoda@gmail.com

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