Asian Economic and Financial Review
ISSN(e): 2222-6737
ISSN(p): 2305-2147
DOI: 10.55493/5002.v12i10.4631
Vol. 12, No. 10, 864-885.

URL: www.aessweb.com

AN INVESTIGATION OF THE IMPACT OF FINANCIAL INCLUSION ON ECONOMIC GROWTH: EVIDENCE FROM AFRICAN COUNTRIES

Muri Wole ADEDOKUN[1+]
Ahmed Oluwatobi ADEKUNLE[2]
Joseph Olorunfemi AKANDE[3]

[1]*Faculty of Business, Department of Accounting and Finance, University of Mediterranean Karpasia, Nicosia, TRNC, Mersin 10, Turkey.*
[1]*Email: muri.adedokun@akun.edu.tr*
[2,3]*Department of Accounting Science, Walter Sisulu University, Mthatha, South Africa.*
[2]*Email: aadekunle@wsu.ac.za*
[3]*Email: jakande@wsu.ac.za*

(+ Corresponding author)

Article History
Received: 30 December 2021
Revised: 6 September 2022
Accepted: 20 September 2022
Published: 17 October 2022

Keywords
Economic growth
Financial inclusion
Panel data
Principal component analysis.

JEL Classification:
C23; C43; G20; O10.

ABSTRACT

Financial inclusion has been recognized as a development policy priority and a key to economic growth in developing economies. Essentially, most Sub-Saharan African (SSA) countries have witnessed unstable economic growth over the last three decades. Financial inclusiveness is fundamental to sustainable growth for any economy. This study investigates the effects of financial inclusion on 41 Sub-Saharan African countries from 2004–2019, employing the generalized method of moments (GMM) method and a Granger causality analysis. The results show a positive relationship between financial inclusion and economic growth. The non-causality tests revealed bi-directional causality between the variables for the whole region and low-income and lower-middle-income countries. Furthermore, a unidirectional causality runs from financial inclusion to economic growth in upper-middle-income countries. The study concluded that financial inclusion positively affects the economic growth of SSA and recommends that policies and interventions be redefined in the financial system to achieve steady economic growth and sustainability.

Contribution/Originality: This study contributes to the existing theoretical and empirical investigation of financial inclusion and economic growth. It also attempts to capture the depth of financial inclusion in the African context by constructing a multidimensional time-varying index from an array of penetration, and the extent of the usage of and access to banking service variables using a principal component analysis.

1. INTRODUCTION

Financial inclusion is a crucial part of the strategies aimed at achieving inclusive growth; inclusive growth is fundamental in sustaining social and economic development, leading to stability in the financial system and stable economic growth. Moreover, it is an effective tool that encourages access financial services to reduce poverty and income inequality (Makina & Walle, 2019); (Demirgüç-Kunt & Levine, 2009). Globally, in 2008, about 2.5 billion adults were financially excluded from banking services, of which a significant percentage were from Africa, Asia and Latin America (CGAP & World Bank, 2010; Dobbs, Lund, & Schreiner, 2010; GPFI, 2011). However, in 2014 and 2017, it reduced to 2 billion and 1.7 billion, respectively (Demirgüç-Kunt, Klapper, Singer, & Oudheusden, 2015; Demirgüç-Kunt, Klapper, Singer, Ansar, & Hess, 2018; EFInA, 2019; WBG, 2017).

In the Sub-Saharan African (SSA) countries, about 80% of the working-age population do not have access to financial services, indicating that few have access to a basic bank account in formal financial institutions (CGAP, 2011; Demirgüç-Kunt & Klapper, 2013; Demirgüç-Kunt, Klapper, Singer, & Oudheusden, 2014). Remarkably, the exclusiveness of the majority in this region has caused a hindrance to economic development and growth, social exclusion, and inequality that pose significant challenges for governments and policymakers (Adedokun & Ağa, 2021). Therefore, what is pertinent are the efforts required to develop and implement appropriate policies and interventions that are suited to each country to have the necessary financial awareness and education to provide consumer protection at all levels (Bhaskar, 2013; Grohmann, Klühs, & Menkhoff, 2018; Koomson, Villano, & Hadley, 2020; Mende, Salisbury, Nenkov, & Scott, 2020).

The mounting uneasiness about access to affordable banking services worldwide, especially in developing countries, has worried policymakers, governments, agencies, and researchers. Mlachila et al. (2013) affirmed that the financial sector has contributed immensely to poverty reduction and improvement in economic growth through credit and other financial services provided to individuals and enterprises in emerging economies. However, they observed that some of the biggest hurdles to economic growth across developing countries, especially in the Sub-Saharan Africa (SSA) region, are access to affordable financial services by all members of society, and also banking systems are relatively small in size. However, Africa has recorded a significant and positive change in the expansion of mobile banking, new technologies, and inclusive regional banking groups (Chinoda & Kwenda, 2019a; Lenka & Barik, 2018).

Given that financial accessibility among low-income and disadvantaged people in SSA countries is at the lowest level among other economies, there has been substantial attention given to redefining financial inclusion and economic growth for economic sustainability in developing and developed countries. A significant number of previous studies mainly focused on access to banking services as an indicator to measure financial inclusion, with less attention given to the penetration of banking institutions (intermediaries) and the extent of the usage of banking services (Andrianaivo & Kpodar, 2012; Barbu, Boitan, Cioaca, & Obreja, 2017; Chinoda & Kwenda, 2019b; Cihák, Demirgüç-Kunt, Feyen, & Levine, 2012; Lenka & Sharma, 2017; Mbutor & Uba, 2013; Naceur, Barajas, & Massara, 2017; Olaniyi, 2015; Oruo, 2013; Sarma, 2012; Van & Nguyen, 2019; Varman, 2005). Therefore, more indicators are needed to measure and capture financial inclusion and economic growth by introducing new control variables. Hence, this study attempts to understand the depth of financial inclusion in African countries by constructing a multidimensional time-varying index based on financial inclusion variables from the penetration of banking institutions, the extent of the usage of banking services, and access to banking services in terms of bank branches and automated teller machines (ATMs), since such an index is consciously absent in previous studies in Africa as well as resolving the issue of serial correlations, heterogeneity, and simultaneity in the study countries. It provides an important benchmark to examine the relationship between financial inclusion, economic growth, trade, capital stock, labor force, human capital development, and good governance, and it explores how financial inclusion impacts economic growth based on income groups in the region with the use of more data over the period between 2004 and 2019.

The remainder of this research is organized as follows: Sections 2 contains the literature review of previous studies on financial inclusion and economic growth; Section 3 details the theoretical framework; Section 4 explains the methodology and data issues consisting of empirical techniques and variable definitions; Section 5 presents the empirical results and discussions; and Section 6 provides the policy analysis, general and practical policy implications, and a conclusion for the region.

2. LITERATURE REVIEW

Studies on economic growth and financial inclusion are prolific and have been recently identified as key factors for economic sustainability (Claessens, 2006; Claessens. & Perotti, 2007). For example, Akinboade and Kinfack (2014) have pointed out that improvements in the financial service sector result in efficient resource allocation, which leads to economic growth in South Africa and Cameroon. Also, a study conducted in India by Joseph and Varghese (2014)

concluded that financial inclusion contributed to economic development and found that there was a tendency to achieve inclusive growth.

Empirical evidence has shown that financial inclusion can facilitate the enhancement of entrepreneurial activities, increase the savings portfolio of financial systems, and lead to efficient resources allocation and the capacity to improve efficiency in financial intermediation, which ultimately lead to economic development, growth and sustainability (Hariharan & Marktanner, 2012; Huang & Zhang, 2020; Kouki, Abid, Guesmi, & Goutte, 2020; Sethi & Acharya, 2018; Wang'oo, 2008). In addition, financial inclusiveness creates employment opportunities for rural dwellers. Also, more people are involved in economic activities, and disposable income eventually increases as a result of deposits and savings, leading to poverty reduction and growth in the economy through the multiplier effect (Banerjee & Newman, 1993; Chinoda & Kwenda, 2019b; Dupas & Robinson, 2009; Khan, 2011; Kim, Yu, & Hassan, 2018; Lenka & Sharma, 2017).

Previous empirical studies have examined the interactions between financial inclusion and economic growth, such as Robinson (1953); Goldsmith (1969); Lucas (1988); Hariharan and Marktanner (2012); Oruo (2013); Wang'oo (2008); Michael and Sharon (2014); Onaolapo (2015); Sahay, Čihák, N'Diaye, and Barajas (2015); Sharma (2016); Okoye, Erin, and Modebe (2017); Hajilee, Stringer, and Metghalchi (2017); Mwaitete and George (2018); Kim et al. (2018); Van and Nguyen (2019). The study by Van, Vo, Nguyen, and Vo (2021) posits that financial inclusion positively impacts the economic growth in Vietnam's emerging markets. While the study of Nizam, Karim, Rahman, and Sarmidi (2020) revealed that in the high regime threshold level of financial inclusiveness, the impact of financial inclusion is positive and much stronger on economic development in countries with lower growth than higher growth.

Other studies show evidence that the supply-leading hypothesis of financial inclusion is critical to economic growth (Iqbala & Sami, 2017; Lenka. & Sharma, 2017; Okoye et al., 2017; Sharma, 2016). In comparison, studies by Babajide, Adegboye, and Omankhanlen (2015) and Olaniyi (2015) revealed that economic growth facilitates the demand-following hypothesis of financial inclusion. A study carried out in African countries by Makina and Walle (2019) demonstrated that access to financial services positively affects economic growth in the continent. The study suggested that redefining and reinforcing the financial inclusion plan is an effective tool to achieve inclusive growth in Africa. Research carried out by Apergis, Filippidis, and Economidou (2007); Gourène and Mendy (2019); Sethi and Acharya (2018); and Kim et al. (2018) displayed that a causal relationship exists between financial inclusion and economic growth. Some have concluded that financial inclusion impacts economic growth positively from the value creation of small-scale enterprises and the spillover effects on human capital indicators, such as education, health, and the reduction of poverty and inequality (Agnello, Mallick, & Sousa, 2012; Banerjee, Kearns, & Lombardi, 2015; Chibba, 2009; Ejiofor, Camillus, & Ubogu, 2020; Ibrahim, 2014; Nanda & Kaur, 2016; Peria & Shin, 2020). Others have argued that there is no relationship between financial inclusion and economic growth (Khalaf & Ali, 2015; Olaniyi & Alenoghena, 2017).

However, the study carried out by Makina and Walle (2019) in African countries only employed commercial bank branches per 100,000 adults as an indicator of financial inclusion, while this study contributes to empirical knowledge by employing eight indicators with three multidimensional index using principal component analysis (PCA) to address the multicollinearity challenges that may arise.

3. THE THEORETICAL FRAMEWORK LINKAGE BETWEEN FINANCIAL INCLUSION AND ECONOMIC GROWTH

The theoretical framework for the finance–economic growth nexus in literature has established that financial access and development create a conducive environment for dynamic productivity and growth for the demand-following effect (growth facilitates the demand for financial services) and supply-leading effect (financial products increase growth). This theory also postulates that inaccessibility to financial products is responsible for income disparities and stagnant growth (Anand & Chhikara, 2013; Murinde & Eng, 1994; Nizam et al., 2020; Sethi & Sethy,

2019). The study by Wang (1999) examined the finance and growth nexus concerning the production function in Taiwan's economy. The results showed that there are more spillover effects in the financial sector than in the real fostering sector that influences financial development indicators and inclusiveness in Taiwan. The study conducted in 71 developing countries by Odedokun (1996) found that financial intermediation affects gross domestic product (GDP) growth by applying the production function model.

This study underpins the production function of the finance–growth nexus as the theoretical framework. In the production function, where output depends on capital and other factors of production such as labor, there is a possibility that an increase in financial inclusiveness could also affect and increase both capital accumulation and labor productivity (Robinson, 1953). In other words, increasing accessibility to financial services will likely facilitate savings and allocate resources to investors, leading to high productivity factors (Claessens, 2006).

A conventional production function may be expressed in a functional form as stated below:

$$\Upsilon = f(X_1, X_2, X_3, X_4, \ldots\ldots, X_n) \quad (1)$$

Where Υ is the output quantity, $X_1, X_2, X_3, X_4, \ldots\ldots X_n$ represent the quantities of production inputs (factors) such as labor, land, capital and raw materials). Equation 1 can also be expressed in a linear function form to make it relevant and useful for mode specification:

$$\Upsilon = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots\ldots\ldots + \beta_n X_n \quad (2)$$

Note that the parameters for the quantities of factors and inputs are $\beta_0, \ldots\ldots\ldots\ldots \beta_n$ for determined empirical on factors of production as shown in Equation 2.

There was no conventional theoretical framework standard that underpins the relation or role of finance on economic growth, or vice versa (Feder, 1983; Odedokun, 1996; Patrick, 1966), and most of the studies, especially the framework for the Granger causality test, only estimated the equation on regression as expressed below:

$$\text{Growth} = f(\text{financial development/intermediations}) \quad (3)$$

In most cases, these studies may have included one or more non-financial predictor variables in Equation 3.

This study adopted the econometric approach of Odedokun (1996) for the theoretical framework for the finance–economic growth nexus, which was based on the conventional neo-classical aggregate production function output from one sector for financial development and intermediations.

Odedokun (1996) proposed a framework with additional explanatory variables to the model in Equation 3. It should be noted that financial inclusion is an integral part of financial development, and Equation 4 constitutes an input for financial development and inclusiveness:

$$Y_t = f(K_t, L_t, F_t, W_t) \quad (4)$$

Where Υ is the real GDP (aggregate output), K represents capital stock, L represents the labor force, F is the indicator for financial inclusion, W represents other variables' inputs for the production process (aggregate input), and subscript $_t$ represents the time period in the model.

By making appropriate rearrangements of the differential of the growth rate in Equation 4, Equation 5 can be expressed as:

$$\dot{Y} = b\acute{L}, + c(1/Y), + d\dot{F}, e\acute{W}, \quad (5)$$

Where the mark on top of each of the variables indicates the growth rate form for the variables; $\dot{Y}$, $\dot{F}$, $\acute{L}$, and $\acute{W}$ are the growth rates for GDP, financial inclusion, labor force and other inputs for the production process, respectively; (1/Y) expresses the gross investment share (1) and the real gross domestic product (Y); the constant parameters are b, c, and d; while e is the vector/input for the parameter that is accorded within the neo-classical framework growth in Equation 5.

Therefore, from Equation 5, it is possible to arrive at the effect and direction of financial inclusion and growth when the intercept and disturbance terms are added to determine the statistical significance and magnitude sign of the estimation of d.

In this research, the element of the vectors or inputs is W for trade (% of GDP). Studies have shown that trade positively correlates with economic growth (Björk & Christensen, 1999; Kim et al., 2018; Makki & Somwaru, 2004). Thus, if trade is increasing (denoted by T in this model) both the constant or intercept and error/disturbance term is added to Equation 5, and this can be written in equation form in Equation 6 as follows:

$$\dot{Y}_t = \alpha + b\acute{L}_t + c(1/Y)_t + d\dot{F}_t + e\dot{T}_t + \mu_t \quad (6)$$

Where α is the constant term, the coefficient of trade growth is e, and the disturbance term is μ, which satisfies the model's usual assumptions.

However, in this manuscript, Equation 6 has established the time series estimates and estimation equations for each of the 41 countries in the SSA region.

This model is an improvement on the existing one, but the problem of measuring financial inclusion (F) is not the only predictor variable. Still, other non-financial indicators [trade ($\dot{T}$), share of gross investment (1/Y) and labor force ($\acute{L}$)] are included as explanatory variables, estimating C to be vulnerable to bias.

The Odedokun (1996) frameworks incorporated most of the macroeconomic variables used for this study, such as labor force, capital stocks and trade (see Equations 5 and 6).

The mode specification for this research was based on and developed from conventional neo-classics for the aggregate production function in one sector for financial development and intermediations. More indicators, such as financial inclusion, economic growth, human capital development, and good governance, were also added.

4. METHODOLOGY AND DATA

4.1. The Data

This study empirically examined the impact of financial inclusion on economic growth in the SSA region for the period from 2004 to 2019. All 48 SSA countries in the World Bank's development indicators were considered (World Bank, 2020a), but only 41 economies qualified and were considered for estimation due to data availability for the variables employed, providing the fundamental practical policy implications and addressing the research questions. These 41 countries were classified into three subgroups under the 2020 gross national income (GNI) per capita of the World Bank; 19 were grouped as low-income countries (LIC), 15 as lower-middle-income countries (LMIC), and seven as upper-middle-income countries (UMIC) [see Appendix 1.0] (World Bank, 2020b).

This study retrieved the data from the financial inclusion indicators sourced from the International Monetary Fund (IMF) Financial Access Survey database (IMF, 2019), and the GDP per capita (constant 2010 US$), trade (% of GDP) and labor force (population aged 15–64, total) were retrieved from the World Bank's development indicators (World Bank, 2020a).

The human capital index (human capital development) and capital stock [Capital stock at constant 2011 national prices (in millions of 2011US$)] were sourced from Feenstra, Inklaar, and Timmer (2015) World Penn Table Version 9.0., and good governance from the World Bank Governance Indicators (World Bank, 2020c). These variables were selected due to their importance in understanding the influence of financial inclusion on economic growth in a panel of countries. In selecting the data, the researchers were careful in dealing with the challenges that plagued most past studies that lacked some variables such as capital stock and good governance.

4.2. Methodological Structure

Figure 1 depicts the methodological structuring developed in this research:

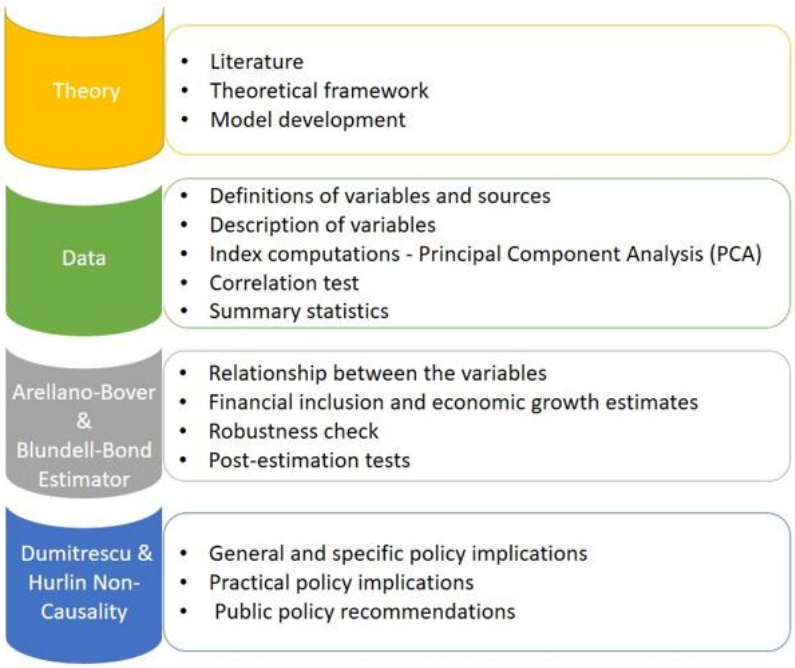

Figure 1. Methodological structure.

4.3. Empirical Technique

In this study, we accurately capture financial inclusion indicators by constructing a multidimensional index with eight variables of financial inclusion that accounted for time trend, financial access and intermediaries, which previous studies failed to acknowledge (Goel & Sharma, 2017; Gupte, Venkataramani, & Gupta, 2012; Neaime & Gaysset, 2018; Yorulmaz, 2018). However, the indicators used for this study are more comprehensive than those of Makina and Walle (2019) in selected African countries as they only measured financial inclusion with the number of commercial bank branches per 100,000 adults. In addition, good governance at the country level was measured with six indices, as per the study by Odugbesan and Rjoub (2019). In constructing the indexes for the financial inclusion and good governance variables, we employed the modern multivariate data analysis tool of principal component analysis (PCA). The PCA technique retains all available variations in the data, reduces the dimensionality of the data and resolves the likely multicollinearity that may arise among the variables (Jolliffe, 2002; Nizam et al., 2020). Using PCA, the indicators for each dimension are normalized to have values between zero (0) and one (1) to make the scale that they were measured immaterial. Afterward, the PCA extracts the common principal component of the variables or dimensions that capture different aspects of the inclusive financial sector and good governance indicators. Lockwood (2004) alluded to the idea that the selection of components for financial institutions with the weight is paramount for measuring the index of financial inclusion, and index apportions have very subjective weighting because of their sensitivity.

The studies examining the impact of financial inclusion on the economy's growth employ the ordinary least squares and two-stage least squares regression methods (Babajide et al., 2015; Michael & Sharon, 2014; Nwafor & Yomi, 2018; Oruo, 2013). However, these techniques have not been able to address the challenges of heteroscedasticity and endogeneity, and they do not provide robust and reliable results for panel data techniques in most cases (Andrianaivo & Kpodar, 2012; Kim et al., 2018; Sarma, 2012). Against this backdrop, these concerns were addressed in our study without sacrificing the robustness of our findings by employing a robust panel data technique propounded by Arellano and Bover (1995) and Blundell and Bond (1998).

Therefore, from the theoretical framework and empirical review of financial inclusion and economic growth studied by Adu, Marbuah, and Mensah (2013); Hajilee and Niroomand (2019); Odedokun (1996); Sethi and Sethy

(2019) and Wang (1999), we have expatiated the empirical model specification that captures the effect of financial inclusion on economic growth. Furthermore, this study adopted the theoretical frameworks used by Odedokun (1996) on conventional neo-classics for aggregate output in the production function on financial development and intermediations. This is expressed in Equation 7 below:

$$Y_t = \alpha + bL_t + c(1/Y)_t + dF_t + eW_t + \mu_t \quad (7)$$

Where α is the intercept term, and Y, F, L and W are the growth rates for GDP, financial inclusion, labor force and other inputs for the production process, respectively. The parameters are *b*, *c*, and *d*, while the parameter input is *e* and the error term is μ. However, Equation 7 is established on time series estimates, and this study examined how financial inclusion impacts economic growth and other controllable indicators.

The model specification was derived from Equation 7. Therefore, the general or reduced form for panel data time series can be derived from Equation 7 more compactly and stated as:

$$Y = \beta_0 + \beta_1 X_{it} + \beta_2 X_{it} + \beta_3 X_{it} + \beta_4 X_{it} \ldots + \beta_n X_n + \mu_t \quad (8)$$

Where Y is the vector of the dependent indicator; X is the vector of the explanatory indicators; β_0 is the intercept of the dependent variable; β_1 to β_n represent the coefficients for the explanatory indicators; μ stands for the error term, i represents the cross-sections of the countries; and t is the time series.

The mode specification for this study was on the reduced form model of improved Arellano and Bover (1995) and Blundell and Bond (1998) econometric techniques and is specified as follows:

$$\Delta GDP_{i,} = \beta_i \Delta GDP_{i,-1} + \beta_i 1 \Delta FII_{i,t} + \beta_i 2 \Delta TRA_{i,t} + \beta_i 3 \Delta CAP_{i,t} + \beta_i 4 \Delta LAB_{i,t} + \beta_i 5 \Delta HCI_{i,t} + \beta_i 6 \Delta GGI_{i,t} + \Delta \mu_{i,t} \quad (9)$$

Where GDP is gross domestic product per capita, $GDP_{i,-1}$ is the first lag of gross domestic product per capita, FII represents the financial inclusion index, TRA shows trade (as a percentage of GDP), CAP is capital stock, LAB is the labor force, HCI shows the human capital development index, GGI is the good governance indicators, μ explains the error or disturbance term, and Δ is the first difference operator. Equation 9 is the exact representation of the classified income group countries in the region.

Equation 9 reveals a linear relationship between the variables. The first lag of the dependent variable is incorporated to deal with heterogeneity in line with the dictates of Alonso-Borrego and Arellano (1999). In the same vein, the issues of serial correlations, heterogeneity, and simultaneity are resolved by the incorporation of the lag of the dependent variable in the estimation technique. According to Arellano and Bover (1995), a panel GMM estimation technique may yield weak outputs if the proportion of changes in the country and period effects is more significant than the disturbance term's variability. In this regard, our research employed the panel system GMM technique to reduce these issues and achieve robustness, as mooted by Blundell and Bond (1998). This study considered data on 41 Sub-Saharan African countries from 2004 to 2019 by employing a robust system panel GMM technique propounded by Arellano and Bover (1995) and Blundell and Bond (1998).

4.4. Post-Estimation Tests

In addressing estimates devoid of bias, post-estimation tests were conducted with the Sargan test, Hansen test, Arellano–Bond test for AR(2), and Wald tests. The Sargan test was carried out to determine the validity of overriding restrictions and instrument validity, while the Hansen test was conducted to ascertain the instrument's validity in the model. Further, the Arellano–Bond test for AR(2) displayed whether the differenced disturbance term in the first order (AR1) and second order (AR2) are serially correlated (Poveda, 2011). It was used to test the existence of serial correlation in the model to determine AR(1) and AR(2) autocorrelation tests. Last, a Wald test was conducted to ascertain if the explanatory or predictor variables are significant in the model.

4.5. Dumitrescu–Hurlin Non-Causality Test

In achieving robust public policy implications in the Sub-Saharan African region, especially in the subgroups, this study employed the Dumitrescu and Hurlin (2012) non-causality technique. This technique takes into account

cross-section dependencies and differences in causal relations. It also differences in the estimation technique to ascertain the causality of the relationship between financial inclusion, economic growth, trade, capital stock, labor force, human capital development, and good governance (Kónya, 2006; Lopez & Weber, 2017). Furthermore, the technique is easy to implement. Monte Carlo simulation techniques revealed that the results from this technique are robust, even in situations where the samples are very small; there are no particular panel estimations required and the technique can be deployed for both unbalanced and balanced panel data. This non-causality technique is shown below:

$$y_{i.t} = \mu_i + \sum_{n=1}^{K} \text{∄}^{(n)}{}_i y_{i.t-n} + \sum_{n=1}^{K} \delta^{(n)}{}_i \, x_{i,t-n} + \epsilon_{i,t} \quad (10)$$

In Equation 10, the observable variables are x and y show our variables observed for the N countries in the model, while the time frame is T, and $\delta_1 = (\delta^{(1)}{}_i, \ldots\ldots, \delta^{(N)}{}_i)$ and country effects μ_i do not change with time changes.

Dumitrescu and Hurlin (2012) proposed the following procedure in running the N individual regressions implicitly enclosed in Equation 10 and F tests were performed for the K linear hypotheses $\delta_1 = (\delta^{(1)}{}_i, \ldots\ldots, \delta^{(N)}{}_i$ to retrieve the individual Wald statistics. The Wald statistics assume that the (W) are independently and identically distributed across individuals.

However, we compute the average Wald statistic W, as shown in Equation 3, below in Equation 11.

$$\mathrm{W} = \frac{1}{N} \sum_{i=1}^{N} W\, i \quad (11)$$

Also, the test is designed to detect causality at the panel level; rejecting H_0 does not exclude non-causality for some individuals. Finally, using Monte Carlo simulations, the Dumitrescu and Hurlin (D–H) test shows that W is asymptotically well behaved and can be used to determine panel causality.

In the Dumitrescu and Hurlin (2012) non-causality test, the null hypothesis assumes that there is no causality among the cross-sections. On the other hand, it believes that a minimum of a single causality exists among our cross-sections. There is no criterion for choosing the length of the lags under this non-causality technique.

5. RESULTS AND DISCUSSION

5.1. Descriptive Statistics

Table 1 presents the descriptive analysis/statistics of the variables/indicators employed in this research for the whole group (Sub-Saharan African economies).

Table 1. Descriptive statistics for FII, GDP, HCI, TRA, CAP, GGI and LAB.

Variables	(1)	(2)	(3)	(4)	(5)
	Observations	Mean	Standard Deviation	Minimum	Maximum
FII	656	0.358	0.151	0.013	1.110
GDP	656	2.447	3.483	208.1	20.334
HCI	656	49.381	306.201	1.011	2.391
TRA	656	76.670	34.272	19.101	246.001
CAP	656	261927.301	584103.512	5601.846	3115442
GGI	656	0.405	0.228	0.077	0.957
LAB	656	11141688	16412938	2386.872	107654967
lnGDP	656	7.126	1.080	5.338	9.920
lnLAB	656	15.370	1.537	7.778	18.490
lnCAP	656	11.285	1.414	8.631	14.951

Note: Financial inclusion index (FII), Economic growth (GDP), Human capital development (HDI), Trade (TRA), Capital stock (CAP), Good governance (GGI) and Labor (LAB).

5.2. Pairwise Correlation Test

Table 2 represents the pairwise correlation test results for the dependent and explanatory variables of interest.

Table 2. Pairwise correlation test results for GDP, FII, TRA, CAP, LAB, HCI and GGI.

Variables	GDP	FII	TRA	STO	LAB	HCI	GGI
GDP	1.0000						
FII	0.486	1.0000					
TRA	0.538	0.352	1.0000				
CAP	0.127	0.054	-0.200	1.0000			
LAB	-0.148	-0.112	-0.384	0.769	1.0000		
HCI	-0.069	-0.067	-0.058	-0.066	-0.105	1.0000	
GGI	0.337	0.703	0.269	-0.009	-0.172	-0.088	1.0000

The pairwise correlation test indicates that the dependent variable (GDP per capita) has a positive relationship with the financial inclusion index, trade, capital stock and good governance index but an adverse relation with labor and human capital development. It should be noted that when the correlation coefficient is more than 80%, it shows a multicollinearity challenge among the regressors (Grewal, Cote, & Baumgartner, 2004). The GMM technique can resolve this problem; therefore, this study adopts the technique of Arellano and Bover (1995) and Blundell and Bond (1998) to estimate the dynamic panel model.

5.3. Graphical Illustration of the Relationship Between GDP and Financial Inclusion (FII)

Figure 2 shows the relationship between GDP per capita and the financial inclusion index (FII) for the entire sample of Sub-Saharan Africa in 2004 (beginning of the sample period) and 2019 (end of the sample period). The graph indicates a positive relationship between GDP and FII in both years. This implies that higher levels of GDP are associated with higher levels of FII, and vice versa. For instance, countries such as Mauritius, Seychelles and South Africa, which have high financial inclusion, recorded higher levels of GDP per capita, while countries such as Angola, Nigeria, and the Republic of Congo with low financial inclusion are associated with low income per capita. However, the relationship became stronger in 2019, indicating the increasing connection between GDP and financial inclusion in recent times. A similar relationship pattern between the two variables (GDP and FII) is observed for the case of low-income and lower-middle-income African countries, as displayed in Figure 3 and Figure 4, respectively. However, upper-middle-income African countries (see Appendix) show that the relationship between GDP per capita and FII was negative in 2004 but became positive in 2019 (see Figure 5). This portrays the increasing heterogeneity in the relationship between GDP and financial inclusion in the continent. This makes the current study imperative as it evaluates the impact of financial inclusion on economic growth in Sub-Saharan Africa.

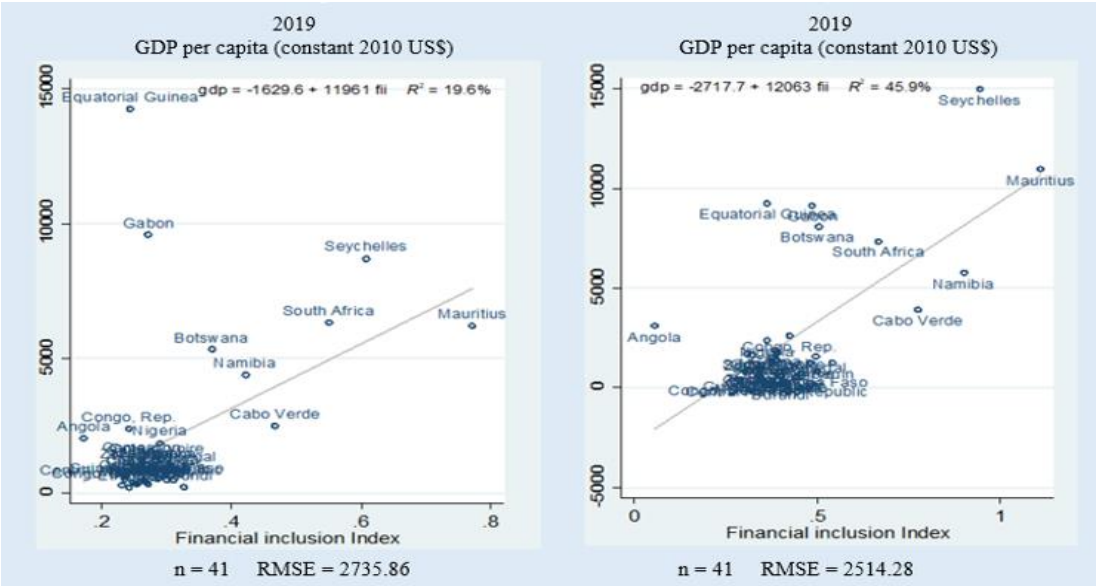

Figure 2. Relationship between GDP and financial inclusion (FII) for SSA.

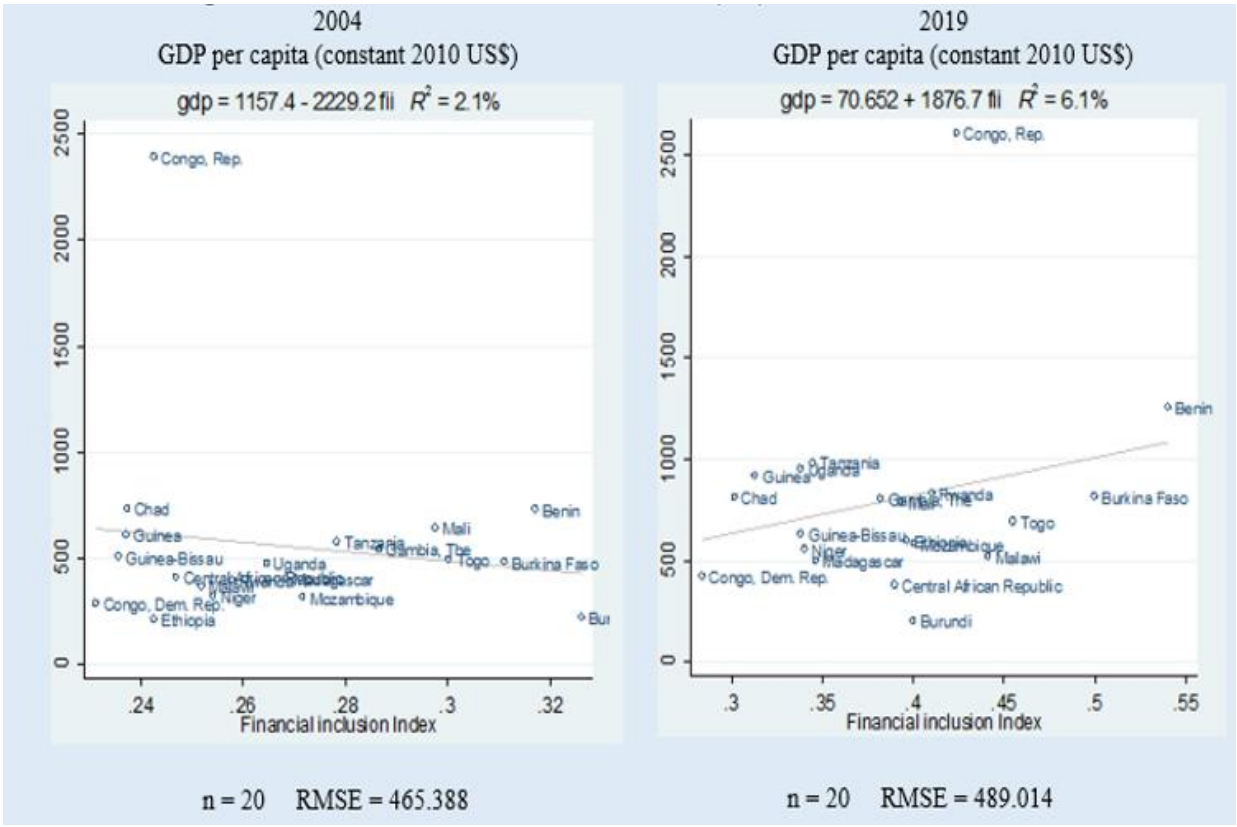

Figure 3. Relationship between GDP and financial inclusion (FII) for the low-income group of African countries

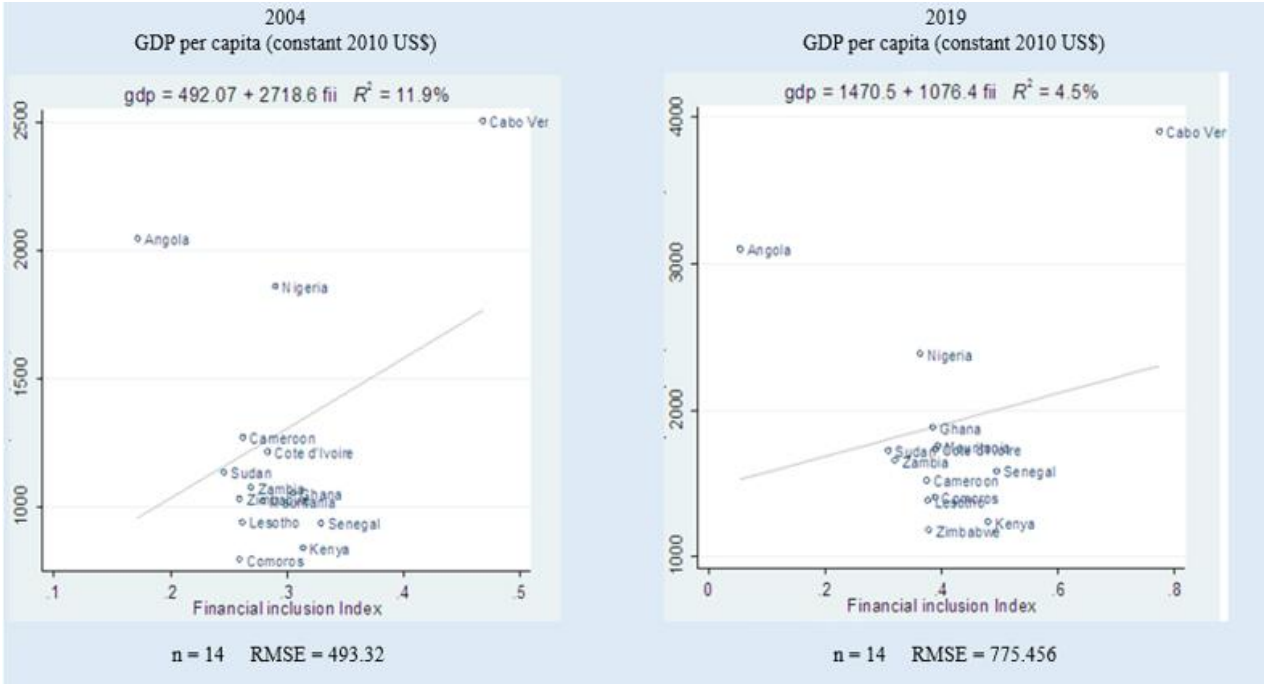

Figure 4. Relationship between GDP and financial inclusion (FII) for the lower-middle income group of African countries

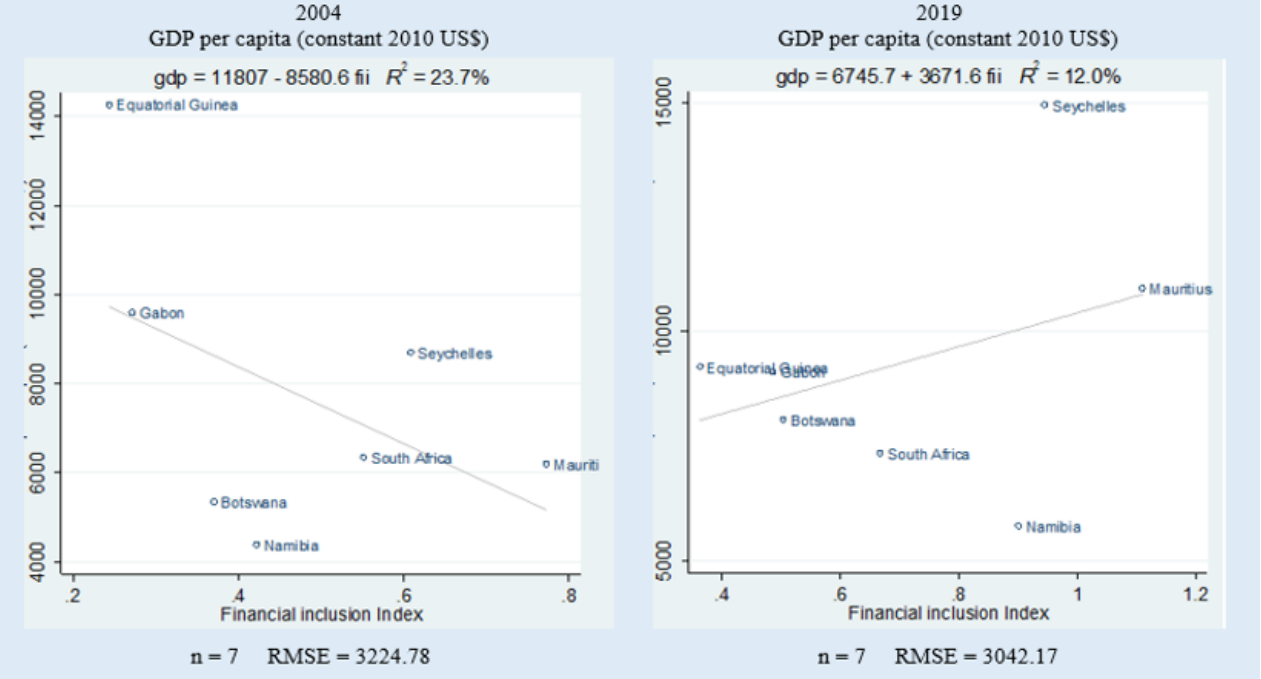

Figure 5. Relationship between GDP and financial inclusion (FII) for the upper-middle-income group of African countries.

5.4. Pesaran's Cross-sectional Dependence [Covariate-Augmented Dickey–Fuller (CADF) Unit Root Test]

The study used Pesaran's CADF unit root test to measure the stationarity of the variables before proceeding to the main analysis (Pesaran, 2004; Pesaran, 2007). This is required for estimation techniques, particularly the Dumitrescu–Hurlin causality test, and is appropriate for the time dimension with less than the cross-sectional dimension panel (Ofosu-Mensah, Attah-Botchwey, Osei-Assibey, & Barnor, 2021). The results of the test are presented in Table 3 and show that all the variables are stationary at first difference. The variables are integrated of order one I(1), implying that the effect of shocks on the variables is persistent. This connotes the possibility of a causal relationship between the variables.

Table 3. Pesaran's CADF unit roots (Stationarity) test.

Variables	Levels		1st Difference	
	Z[t-bar]	P-value	Z[t-bar]	P-value
FII	1.466	0.929	-7.441***	0.0000
GDP	3.280	0.999	-4.152***	0.0000
HCI	1.579	0.943	-3.450***	0.0000
TRA	1.677	0.953	-6.752***	0.0000
CAP	3.580***	0.005	-8.041***	0.0000
GGI	-1.080	0.140	-5.486***	0.0000
LAB	-2.357***	0.009	-7.069***	0.0000

Note: 5% critical value = -2.110 (without trend) and -2.620 (with trend), while *** denotes the 1% level of significance.

5.5. The Generalized Method of Moments (GMM) Results

The results in Table 4 indicate the elasticity estimates for economic growth in Sub-Saharan Africa.

The results in Table 4 reveal that the lag of GDP has a positive and significant impact on current economic growth. Policymakers should continually put policies in place to ensure that inclusive financial products are provided and at a reduced cost to enhance economic growth in SSA countries.

Table 4 indicates a positive and significant relationship between financial inclusion and economic growth in the SSA region. This means that an increase in financial inclusivity within the region will lead to improved economic prospects due to increasing accessibility and improvement in financial resources. Likewise, financial inclusivity

increases saving habits and lending and investment, positively affecting an economy's growth. This result is consistent with the studies by Afolabi (2020); Adedokun and Ağa (2021); and Chatterjee (2020).

Table 4. Arellano–Bover/Blundell–Bond system: GMM results for the effect of financial inclusion on economic growth.

Variables	(1) Overall	(2) LIC	(3) LMIC	(4) UMIC
L.lnGDP	0.792*** (0.050)	0.984*** (0.023)	0.778*** (0.077)	1.414** (0.713)
FII	0.353** (0.183)	0.514*** (0.151)	0.736*** (0.241)	4.466** (2.121)
TRA	0.002* (0.001)	-0.001 (0.001)	0.001** (0.001)	-0.021 (0.013)
lnCAP	0.152*** (0.034)	0.074*** (0.017)	0.153*** (0.050)	-15.612** (7.421)
lnLAB	-0.200*** (0.040)	-0.056*** (0.016)	-0.088** (0.043)	8.272** (3.781)
HCI	-0.001*** (0.001)	-0.311*** (0.070)	-0.001* (0.001)	25.401** (12.200)
GGI	-0.900*** (0.310)	0.111 (0.080)	-0.242* (0.140)	4.380 (2.761)
Constant	3.010*** (0.640)	0.561*** (0.190)	-1.100* (0.620)	0 (0)
Observations	615	285	225	105
Number of Countries	41	19	15	7
Number of Instruments	23	23	23	22

Note: Standard errors and P-values are in ( ), while ***, ** and * denote 1%, 5% and 10% levels of significance, respectively.

The study also found a positive and significant relationship between economic growth and trade in the SSA region. This means that the economy in the region grows when trade increases. The main reasons for this occurrence are the trade relations, associations and agreements within the subgroup in the region, such as Common Market for Eastern and Southern Africa (COMESA), Community of Sahel-Saharan States (CEN-SAD), East African Community (EAC), Economic Community of Central African States (ECCAS), Economic Community of West African States (ECOWAS) and Southern African Development Community (SADC), among others, which exhibit a favorable relation between trade and economic growth. Unfortunately, most of these countries still have a pact with some developed countries or their colonies. For trade to flourish and expand, the African Development Bank (AfDB) and other agencies should redefine policies and channel resources toward human capital development and investments in productive sectors of the economy to trigger economic growth in the SSA region. Our result is in line with the study by Kim et al. (2018) on Organization of Islamic Cooperation (OIC) countries but contradicts Adedokun & Ağa (2021), who found a negative relationship between trade and economic growth in African countries.

Our analysis revealed a positive and significant relationship between capital stock and economic growth in the SSA region. Further findings show that the stock market supports economic growth in the region, indicating that strengthening capital market institutions and leveraging foreign direct investment could benefit the region. The reason behind the positive relationship in the region is attributed to the emerging and development of new capital and asset markets, the introduction of financial reforms, and the floating of exchange rate systems that attracted the attention of foreign investors to SSA countries. The importance of the capital market to economic activities cannot be overemphasized, promoting financial inclusion and real capital accumulation. Furthermore, the capital stock market allows financial institutions and investors to diversify their investment portfolios across the countries in the SSA region and beyond. This is similar to the result found in the studies by Hajilee and Niroomand (2019); Herd (2020); Osiobe (2020); Santiago, Koengkan, Fuinhas, and Marques (2020) and Hajilee, Stringer, and Hayes (2021).

In our findings, there is a negative relationship between labor and economic growth in SSA, indicating that the large labor size results in a fall in economic growth. This could be a result of low labor productivity and inefficiency. Furthermore, a large proportion of the labor in SSA is unskilled (Heshmati & Rashidghalam, 2018; Yakubu, Akanegbu, & Jelilov, 2020); thus, this may inhibit economic growth. Also, the negative and significant relationship between these two variables is directly linked to the possibility of improved investments in modern technologies, which have replaced labor with modern machinery in both agriculture and industrial manufacturing activities, as well as the service sectors. These results are consistent with Kim et al. (2018) and Adedokun and Ağa (2021), who found the same result as this study but contradict Hanushek, Dennis, & Kimko (2000), who found that the labor force has a strong influence on economic growth.

Meanwhile, our analysis also revealed a negative and significant relationship between the region's economic growth and human capital development. This is an indication of the poor quality of human capital development. This result means that when the economy grows, human capital development will fall in the region, and vice versa. This suggests that more viable policy implications should be implemented to yield desired effects and positively influence the growth and development of the region. The adverse relationship between human capital development and economic growth in the SSA region is attributed to the inability to have a skilled and mentally trained work force in education, health and nutrition. This manifests in the quality of human capital in the region, revealing that it is not pro-economic growth. Individual governments in the region should build a strong human capacity to improve and finance initiatives designed to capacitate the citizens and enhance their inclusivity in the mainstream economy. Our finding was not in line with the studies by Peria and Shin (2020) and Ofosu-Mensah et al. (2021), who demonstrated in their studies that human capital development positively and significantly impacts economic growth in 18 selected emerging economies and 121 selected countries, respectively.

Our estimation reveals that the good governance index (GGI) shows a negative and statistically significant relationship with economic growth. It indicates that the two variables are adversely related. This research was a deviation from the study by Chinoda and Kwenda (2019c), which found that institutional quality and governance positively affects financial inclusion within African regions. The quality of good governance in a country will generate trust among individuals and corporate bodies in governance and policies, contributing significantly to financial inclusion and economic activities. Policymakers and governments should implement the necessary policies, redirection and good governance, such as effective government programmes and regulations, better political will, rule of law, fighting of corruption, and accountability, among others, to impact governance positively.

Finally, the constant term revealed a positive and significant effect on economic growth.

5.6. Checking for Robustness of the Analysis

The SSA region was split into three subgroups – low-income countries (LIC), lower-middle-income countries (LMIC) and upper-middle-income countries (UMIC) (World Bank, 2020b) for analysis and comparison. In Table 4, the estimation results for the lag of the dependent variable (GDP) show that both the group (SSA region) and the three subgroups indicate a positive and significant effect on the current economic growth. The result suggests that the model used was dynamic, and the previous effect on the dependent variable influences the economy's current growth in the SSA region. The results also revealed a positive and significant correlation between the financial inclusion index and economic growth in all income groups and the whole region. Such a result testifies that FII increases economic growth in SSA economies.

Trade as a macroeconomic factor in the study reveals that in the whole group (SSA) and LMIC is positive and significantly related to economic growth, while in LIC and UMIC it is adversely related and not significant. It was also revealed that capital stock has a positive and significant effect on economic growth in the SSA region. On the other hand, all the classified income countries except UMIC are negative and significant.

Labor force in the whole region, low-income countries and lower-middle-income countries had a negative coefficient and is significant to economic growth but is significant and positively related to the growth of the economy in upper-middle-income countries. Another interesting result concerning human capital development revealed a negative relationship and a significant impact on economic growth in the whole sample. The results are similar to those in low-income countries and lower-middle-income countries. In contrast, the results for the upper-middle-income countries are positive and statistically significant.

A negative and significant result was exhibited between the good governance index and economic growth in the SSA sample and lower-middle income countries. In contrast, low-income and upper-middle-income countries have positive but non-significant relationships with economic growth.

In the same vein, the constant term had a positive and significant relationship with economic growth in the whole sample and low-income countries; however, this was different from the negative and significant results for lower-middle income countries.

5.7. Post-Estimation Tests Result

The Sargan test was carried out to determine the validity of overriding restrictions and instrument validity, while the Hansen test was conducted to ascertain the instrument's validity in the model. Further, the Arellano–Bond test for AR(2) was used to test the existence of serial correlation in the model to determine AR(1) and AR(2). Lastly, a Wald test was conducted to ascertain whether the model's explanatory or predictor variables are significant. In Table 5, the Sargan test results reveal that our model is robust since the null hypothesis on overriding restrictions is valid. In the Hansen test, we accept the null hypothesis confirming the instrument's validity in the model. The post-estimation in the Arellano–Bond test indicates that our model has no higher-order autocorrelation. Hence, the null hypothesis of no autocorrelation is not rejected for the case of AR2. The Wald test reveals that predictor variables are significant in the model. Therefore, the post-estimation tests confirm that our model is robust to make this useful for formulating sound financial inclusion policies on economic growth and policy implication for the Sub-Saharan African region.

Table 5. Post-estimation test results.

Test	Group	LIC	LMIC	UMIC
Sargan Test	2.61 [0.37]**	18.02 [0.261]**	21.94 [0.109]**	9.69 [0.821]*
Hansen test	17.6 [0.284]**	11.46 [0.720]*	3.89 [0.998]*	15.32 [0.873]*
Arellano–Bond test for AR(2)	-1.14 [0.252]**	0.36 [0.719]*	0.21 [0.831]*	0.62 [0.532]*
Wald test	384339.55 [0.0000]***	1920000.00 [0.0000]***	8720000.00 [0.0000]***	269882.34 [0.0000]***

Note: Standard errors and P-values are in ( ) and [ ], respectively, while ***, ** and * denote 1%, 5% and 10% levels of significance, respectively.

5.8. Dumitrescu–Hurlin Causality Test for SSA Countries

This study used the Dumitrescu–Hurlin causality test to make sound policy implications; the results are presented in Table 6.

The results in Table 6 reveal there was one-way causality running from (a) financial inclusion to trade, (b) financial inclusion to the good governance index, (c) GDP per capita to trade, (d) GDP per capita to the good governance index, and (e) human capital development to trade. In addition, the causality results also revealed bidirectional causality relationships between (a) financial inclusion and GDP per capita, (b) financial inclusion and capital stock, (c) financial inclusion and labor, (d) financial inclusion and human capital development, (e) GDP per capita and capital stock, (f) GDP per capita and labor, (g) GDP per capita and human capital development, (h) trade and capital stock, (i) trade and labor, (j) trade and the good governance index, (k) capital stock and labor, (l) capital

stock and human capital development, (m) capital stock and the good governance index, (n) labor and human capital development, (o) labor and the good governance index, and (p) human capital development and the good governance index.

Table 6. Dumitrescu–Hurlin causality test results for the Sub-Saharan Africa (SSA) region.

Unidirectional	Bidirectional
FII → TRA	FII ↔ GDP
FII → GGI	FII ↔ CAP
GDP →TRA	FII ↔ LAB
GDP → GGI	FII ↔ HCI
HCI → TRA	GDP ↔ CAP
	GDP ↔ LAB
	GDP ↔ HCI
	TRA ↔ CAP
	TRA ↔ LAB
	TRA ↔ GGI
	CAP ↔ LAB
	CAP ↔ HCI
	CAP ↔ GGI
	LAB ↔ HCI
	LAB ↔ GGI

Note: → indicates unidirectional causality and ↔ indicates bidirectional causality.

Also, to provide specific and sound financial inclusion policies and economic growth recommendations for the low-income, lower-middle-income and upper-middle-income countries, the D–H non-causality results in Table 7 were used to achieve our objectives.

Table 7. Dumitrescu–Hurlin causality test results for LIC, LMIC and UMIC.

LI Countries		LMI Countries		UMI Countries	
Unidirectional	**Bidirectional**	**Unidirectional**	**Bidirectional**	**Unidirectional**	**Bidirectional**
FII → TRA FII → GGI TRA → GDP GDP → GGI LAB → TRA HCI → TRA TRA → GGI CAP → GGI	FII ↔ GDP FII ↔CAP FII ↔ LAB FII ↔ HCI GDP ↔ CAP GDP ↔ LAB GDP ↔ HCI TRA ↔ CAP CAP ↔ LAB CAP ↔ HCI LAB ↔ HCI LAB ↔ GGI HCI ↔ GGI	FII → TRA LAB → FII FII → GGI GDP → TRA CAP → TRA LAB → TRA HCI → TRA LAB → GGI HCI → GGI	FII ↔ GDP FII ↔ CAP FII ↔ HCI GDP ↔ CAP GDP ↔ LAB GDP ↔ HCI GDP ↔ GGI TRA ↔ GGI CAP ↔ LAB CAP ↔ HCI CAP ↔ GGI LAB ↔ HCI	FII → GDP CAP → FII FII → HCI HCI → GDP GGI → GDP CAP → TRA HCI → TRA TRA → GGI CAP → GGI LAB → GGI HCI → GGI	FII ↔ LAB GDP ↔ CAP GDP ↔ LAB CAP ↔ LAB CAP ↔ HCI LAB ↔ HCI

Note: → indicates unidirectional causality and ↔ indicates bidirectional causality.

First, Table 7 displays the results for the unidirectional causality test for the low-income countries. Unidirectional causality was found between financial inclusion and trade; financial inclusion and the good governance index; trade and GDP per capita; GDP per capita and the good governance index; labor and trade; human capital development and trade; trade and the good governance index; and capital stock and the good governance index.

The results for unidirectional causality in lower-middle-income countries are presented in Table 7 as follows: financial inclusion and trade; labor and financial inclusion; financial inclusion and the good governance index; GDP per capita and trade; capital and trade; labor and trade; human capital development and trade; trade and the good governance index; and human capital development and the good governance index.

The results for upper-middle-income countries in the D–H causality test are also presented in Table 7. A unidirectional causality relationship runs from financial inclusion to GDP per capita; capital stock to financial inclusion; financial inclusion to human capital development; human capital development to GDP per capita; the good governance index to GDP per capita; capital stock to trade; human capital development to trade; trade to the good governance index; capital stock to the good governance index, labor to the good governance index; and human capital development to the good governance index.

6. CONCLUSION, RECOMMENDATIONS AND POLICY IMPLICATIONS

6.1. Conclusion

This study examined the relationship between financial inclusion and economic growth, and a multidimensional variables financial inclusion index was constructed for 41 countries in the SSA region. A panel data analysis was carried out using the Arellano–Bover/Blundell–Bond GMM and Granger causality (Dumitrescu & Hurlin, 2012) methods on data from 2004 to 2019. The panel dynamics model results revealed that SSA countries' financial inclusion index and economic growth are significant and positively related. Also, the non-causality tests displayed a bidirectional causal relationship between economic growth and financial inclusion in the SSA region as a whole, and the low-income and lower-middle-income countries. Unidirectional causality runs from financial inclusion to economic growth in the upper-middle-income group of countries in the region. Therefore, inclusiveness and efficiency in the financial system for the privileged and weaker sections is a pathway to alleviating inequality and boosting economic growth.

6.2. Recommendations and Policy Implications

Based on the findings, the study suggests that since the vast majority of the populace in the SSA region comprises rural dwellers with idle cash/monies, policymakers should develop policies that will involve the disadvantaged in the formal financial system. These policies should allow the less privileged to access financial services, such as reduced operational costs, availability, and institutional regulations to harness untapped resources into productive and economic activities, which have a spillover effect on the economy.

More so, policymakers should focus on long-term financial reforms and policies that target the effective financial sector, especially in the capital and money markets, promoting inclusiveness for growth and sustainability. Thus, specific policy implications for each group are given as follows:

Firstly, for low-income countries, policymakers should provide enabling business environments and awareness for the vast majority to participate in financial activities at an affordable price. This will enhance trading and improve human capital development and well-being to strengthen economic growth.

Secondly, the lower-middle income countries should have regulatory reforms in the trading system to allow a free trade flow and improve the quality and accessibility of financial institutions to foster economic growth. In addition, governance levels and freedom in economic activities should be minified to promote financial system activities to facilitate economic growth, development and sustainability.

Thirdly, the upper-middle-income countries' policymakers should strengthen economic capacity and human capital reforms that can assist in creating access innovations and efficient financial services and products to have a positive multiplier effect on economic growth. Also, the policymakers in UMI countries, as a matter of urgency, should increase the financial inclusiveness level and efficient capital market, improve the quality and accessibility of

financial institutions to increase purchasing power, and annex trading opportunities to increase economic activity and growth.

Finally, the regional policymakers and governments should review the policies on economic activities, e.g., increase government spending and income per capita. Also, human capital accumulation requires more attention that could facilitate access to financial services and products, leading to effective trade among the countries in the region. The study suggests that human capital policies and reform programmes, such as education and training, should be strengthened to foster financial inclusiveness, economic growth, trade expansion and labor in the SSA region.

In the future, the focus of research should replicate the study in Africa as a whole and other developing countries around the world that are lacking financial inclusion and economic growth. Also, more financial inclusion indicators should be included, such as Fintech (digital financial technology) indicators, financial intermediary Self-Help Group (SHGs) variables, and microfinance institutions (MFIs) variables.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study.

REFERENCES

Adedokun, M. W., & Ağa, M. (2021). Financial inclusion: A pathway to economic growth in Sub-Saharan African economies. *International Journal of Finance & Economics*, 1-17.Available at: https://doi.org/10.1002/ijfe.2559.

Adu, G., Marbuah, G., & Mensah, J. T. (2013). Financial development and economic growth in Ghana: Does the measure of financial development matter? *Review of Development finance*, *3*(4), 192-203.Available at: https://doi.org/10.1016/j.rdf.2013.11.001.

Afolabi, J. O. (2020). Impact of financial inclusion on inclusive growth: An empirical study of Nigeria. *Asian Journal of Economics and Empirical Research*, *7*(1), 8-14.Available at: https://doi.org/10.20448/journal.501.2020.71.8.14.

Agnello, L., Mallick, S. K., & Sousa, R. M. (2012). Financial reforms and income inequality. *Economics Letters*, *116*(3), 583-587.Available at: https://doi.org/10.1016/j.econlet.2012.06.005.

Akinboade, O. A., & Kinfack, E. C. (2014). Financial sector development indicators and economic growth in Cameroon and South Africa. *Social Indicators Research*, *115*(2), 813-836.Available at: https://doi.org/10.1007/s11205-013-0236-8.

Alonso-Borrego, C., & Arellano, M. (1999). Symmetrically normalized instrumental-variable estimation using panel data. *Journal of Business & Economic Statistics*, *17*(1), 36-49.Available at: https://doi.org/10.1080/07350015.1999.10524795.

Anand, S., & Chhikara, K. S. (2013). A theoretical and quantitative analysis of financial inclusion and economic growth. *Management and Labor Studies*, *38*(1-2), 103-133.Available at: https://doi.org/10.1177/0258042x13498009.

Andrianaivo, M., & Kpodar, K. (2012). Mobile phones, financial inclusion, and growth. *Review of Economics and Institutions*, *3*(2), 1-30.Available at: https://doi.org/10.5202/rei.v3i2.75.

Apergis, N., Filippidis, I., & Economidou, C. (2007). Financial deepening and economic growth linkages: A panel data analysis. *Review of World Economics*, *143*(1), 179-198.Available at: https://doi.org/10.1007/s10290-007-0102-3.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29-51.Available at: https://doi.org/10.1016/0304-4076(94)01642-d.

Babajide, A. A., Adegboye, F. B., & Omankhanlen, A. E. (2015). Financial inclusion and economic growth in Nigeria. *International Journal of Economics and Financial Issues*, *5*(3), 629-637.

Banerjee, R., Kearns, J., & Lombardi, M. J. (2015). (Why) Is investment weak? Bank for International Settlements (BIS) Quarterly Review March 2015. 67-82. Available at SSRN: https://ssrn.com/abstract=2580278.

Banerjee, A. V., & Newman, A. F. (1993). Occupational choice and the process of development. *Journal of Political Economy*, *101*(2), 274-298.Available at: https://doi.org/10.1086/261876.

Barbu, T. C., Boitan, I., Cioaca, S. I., & Obreja, C. (2017). A multi-dimensional approach to the financial inclusion in EU countries. *Romanian Journal of Economics*, *44*(1 (53)), 130-144.

Bhaskar, P. V. (2013). Financial inclusion in India an assessment, speech at the MFIN and access-assist summit. *New Delhi*, *10*.

Björk, T., & Christensen, B. J. (1999). Interest rate dynamics and consistent forward rate curves. *Mathematical Finance*, *9*(4), 323-348.Available at: https://doi.org/10.1111/1467-9965.00072.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115-143.Available at: https://doi.org/10.1016/S0304-4076(98)00009-8.

CGAP. (2011). *Consultative group to assist the poor, 2011. Global standard-setting bodies and financial inclusion for the poor: Toward proportionate standards and guidance. A white paper prepared by CGAP on behalf of the G-20's Global Partnership for Financial Inclusion.* Washington, DC: CGAP.

CGAP, & World Bank. (2010). *Financial access 2010: The state of financial inclusion through the crisis.* Washington, DC: Consultative Group to Assist the Poor/The World Bank Group.

Chatterjee, A. (2020). Financial inclusion, information and communication technology diffusion, and economic growth: A panel data analysis. *Information Technology for Development*, *26*(3), 607-635.Available at: https://doi.org/10.1080/02681102.2020.1734770.

Chibba, M. (2009). Financial inclusion, poverty reduction and the millennium development goals. *The European Journal of Development Research*, *21*(2), 213-230.Available at: https://doi.org/10.1057/ejdr.2008.17.

Chinoda, T., & Kwenda, F. (2019a). Do mobile phones, economic growth, bank competition and stability matter for financial inclusion in Africa? *Cogent Economics & Finance*, *7*(1), 1622180.Available at: https://doi.org/10.1080/23322039.2019.1622180.

Chinoda, T., & Kwenda, F. (2019b). Financial inclusion condition of African countries. *Journal of the Danube University. Economic*, *15*(3), 242-266.

Chinoda, T., & Kwenda, F. (2019c). The impact of institutional quality and governance on financial inclusion in Africa: A two-step system generalized method of moments approach. *Journal of Economic and Financial Sciences*, *12*(1), 1-9.

Cihák, M., Demirgüç-Kunt, A., Feyen, E., & Levine, R. (2012). Benchmarking financial systems around the world. World Bank Policy Research Working Paper, No. (6175).

Claessens, S. (2006). Access to financial services: A review of the issues and public policy objectives. *The World Bank Research Observer*, *21*(2), 207-240.Available at: https://doi.org/10.1093/wbro/lkl004.

Claessens, S., & Perotti, E. (2007). Finance and inequality: Channels and evidence. *Journal of Comparative Economics*, *35*(4), 748-773.Available at: https://doi.org/10.1016/j.jce.2007.07.002.

Demirgüç-Kunt, A., & Klapper, L. (2013). Measuring financial inclusion: Explaining variation in use of financial services across and within countries. *Brookings Papers on Economic Activity*, *2013*(1), 279-340.Available at: https://doi.org/10.1353/eca.2013.0002.

Demirgüç-Kunt, A., Klapper, L., Singer, D., & Oudheusden, P. V. (2014). The global findex database 2014: Measuring financial inclusion around the world. World Bank Policy Research Working Paper, (7255). The World Bank, Washington, DC.Retrieved from: https://openknowledge.worldbank.org/bitstream/handle/10986/21865/WPS7255.pdf.

Demirgüç-Kunt, A., Klapper, L., Singer, D., & Oudheusden, P. V. (2015). The global findex database 2014: Measuring financial inclusion around the world.

Demirgüç-Kunt, A., & Levine, R. (2009). Finance and inequality: Theory and evidence. *Annual Review of Financial Economics*, *1*(1), 287-318.Available at: https://doi.org/10.1146/annurev.financial.050808.114334.

Demirgüç-Kunt., A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The global findex database 2017: Measuring financial inclusion and the fintech revolution.* Washington, DC: World Bank.

Dobbs, R., Lund, S., & Schreiner, A. (2010). How the growth of emerging markets will strain global finance. *The McKinsey Quarterly*.

Dumitrescu, E.-I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic Modelling*, *29*(4), 1450-1460.Available at: https://doi.org/10.1016/j.econmod.2012.02.014.

Dupas, R., & Robinson, J. (2009). Savings constraints and microenterprise deveiopment: Evidence from a field experiment. NBER Working Paper Series, No. (14693).

EFInA. (2019). Enhancing financial innovation and access [EFInA], access to financial services in Nigeria 2018 survey. Retrieved from https://www.efina.org.ng/wp-content/uploads/2019/01/A2F-2019-Key-Findings-11_01_19.pdf.

Ejiofor, E., Camillus, O. N., & Ubogu, F. E. (2020). Effects of financial inclusion on the growth of cottage firms in Nigeria. *American Research Journal of Humanities and Social Science*, *3*(1), 6-14.

Feder, G. (1983). On exports and economic growth. *Journal of Development Economics*, *12*(1-2), 59-73.

Feenstra, R. C., Inklaar, R., & Timmer, M. P. (2015). The next generation of the Penn world table. *American Economic Review*, *105*(10), 3150-3182.Available at: https://doi.org/10.1257/aer.20130954.

Goel, S., & Sharma, R. (2017). Developing a financial inclusion index for India. *Procedia Computer Science*, *122*, 949-956.Available at: https://doi.org/10.1016/j.procs.2017.11.459.

Goldsmith, R. W. (1969). *Financial structure and development*. New Haven, CT (No. HG174 G57): Yale University Press.

Gourène, G. A. Z., & Mendy, P. (2019). Financial inclusion and economic growth in WAEMU: A multiscale heterogeneity panel causality approach. *Theoretical Economics Letters*, *9*(3), 477-488.Available at: https://doi.org/10.4236/tel.2019.93033.

GPFI. (2011). *Global partnership for financial inclusion: SME finance policy guide*. Washington, DC: IFC.

Grewal, R., Cote, J. A., & Baumgartner, H. (2004). Multicollinearity and measurement error in structural equation models: Implications for theory testing. *Marketing Science*, *23*(4), 519-529.Available at: https://doi.org/10.1287/mksc.1040.0070.

Grohmann, A., Klühs, T., & Menkhoff, L. (2018). Does financial literacy improve financial inclusion? Cross country evidence. *World Development*, *111*, 84-96.Available at: https://doi.org/10.1016/j.worlddev.2018.06.020.

Gupte, R., Venkataramani, B., & Gupta, D. (2012). Computation of financial inclusion index for India. *Procedia-Social and Behavioral Sciences*, *37*, 133-149.Available at: https://doi.org/10.1016/j.sbspro.2012.03.281.

Hajilee, M., & Niroomand, F. (2019). On the link between financial market inclusion and trade openness: An asymmetric analysis. *Economic Analysis and Policy*, *62*, 373-381.Available at: https://doi.org/10.1016/j.eap.2018.10.001.

Hajilee, M., Stringer, D. Y., & Hayes, L. A. (2021). On the link between the shadow economy and stock market development: An asymmetry analysis. *The Quarterly Review of Economics and Finance*, *80*, 303-316.Available at: https://doi.org/10.1016/j.qref.2021.02.011.

Hajilee, M., Stringer, D. Y., & Metghalchi, M. (2017). Financial market inclusion, shadow economy and economic growth: New evidence from emerging economies. *The Quarterly Review of Economics and Finance*, *66*, 149-158.Available at: https://doi.org/10.1016/j.qref.2017.07.015.

Hanushek, E. A., Dennis, D., & Kimko, D. D. (2000). Schooling, labor-force quality, and the growth of nations. *The American Economic Review*, *90*(5), 1184-1208.Available at: https://doi.org/10.1257/aer.90.5.1184.

Hariharan, G., & Marktanner, M. (2012). The growth potential from financial inclusion. *ICA Institute and Kennesaw State University*, *2*(5), 1-12.

Herd, R. (2020). Estimating capital formation and capital stock by economic sector in China: The implications for productivity growth. The World Bank. Retrieved from https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-9317.

Heshmati, A., & Rashidghalam, M. (2018). Labor productivity in Kenyan manufacturing and service industries. In Determinants of Economic Growth in Africa (pp. 259-286). Cham: Palgrave Macmillan.

Huang, Y., & Zhang, Y. (2020). Financial inclusion and urban–rural income inequality: Long-run and short-run relationships. *Emerging Markets Finance and Trade*, *56*(2), 457-471.Available at: https://doi.org/10.1080/1540496x.2018.1562896.

Ibrahim, S. S. (2014). Does rural financial development spur economic growth? Evidence from Nigeria. In Umar, M.Z., Abubakar, S.D., Dankani, I.M., Baba, Y.T. & Okoko, N.C. (Eds.), Contemporary issues in Nigeria's national development (pp. 257–266). Sokoto: Usmanu Dan Fodiyo University Press.

IMF. (2019). International Monetary Fund [IMF]. Financial access survey database for financial inclusion indicators. Retrieved from https://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C.

Iqbala, B. A., & Sami, S. (2017). Role of banks in financial inclusion in India. *Accounting and Administration*, *62*(2), 644-656.

Jolliffe, I. T. (2002). *Principal component analysis* (2nd ed.). New York: Springer-Verlag.

Joseph, J., & Varghese, T. (2014). Role of financial inclusion in the development of Indian economy. *Journal of Economics and Sustainable Development*, *5*(11), 6–15.

Khalaf, A. H., & Ali, A. H. (2015). Financial inclusion and economic development in Iraq. *International Journal of Science and Research*, *78*(96), 1758-1767.

Khan, H. (2011). Financial inclusion and financial stability: Are they two sides of the same coin. Address by Shri HR Khan, Deputy Governor of the Reserve Bank of India, at BANCON 2011, 1-12. RBI Monthly Bulletin March 2012.

Kim, D.-W., Yu, J.-S., & Hassan, M. K. (2018). Financial inclusion and economic growth in OIC countries. *Research in International Business and Finance*, *43*, 1-14.Available at: https://doi.org/10.1016/j.ribaf.2017.07.178.

Kónya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach. *Economic Modelling*, *23*(6), 978-992.Available at: https://doi.org/10.1016/j.econmod.2006.04.008.

Koomson, I., Villano, R. A., & Hadley, D. (2020). Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multidimensional measure of financial inclusion. *Social Indicators Research*, *149*(2), 613-639.Available at: https://doi.org/10.1007/s11205-019-02263-0.

Kouki, I., Abid, I., Guesmi, K., & Goutte, S. (2020). Does financial inclusion affect the African banking stability. *Economics Bulletin*, *40*(1), 863-879.

Lenka, S. K., & Barik, R. (2018). Has expansion of mobile phone and internet use spurred financial inclusion in the SAARC countries? *Journal of Financial Innovation*, *4*(1), 1-19.Available at: https://doi.org/10.1186/s40854-018-0089-x.

Lenka, S. K., & Sharma, R. (2017). Does financial inclusion spur economic growth in India? *The Journal of Developing Areas*, *51*(3), 215-228.Available at: https://doi.org/10.1353/jda.2017.0069.

Lockwood, B. (2004). How robust is the foreign policy-Kearney globalization index? *The World Economy*, *27*(4), 507–523.Available at: https://doi.org/10.1111/j.0378-5920.2004.00611.x.

Lopez, L., & Weber, S. (2017). Testing for Granger causality in panel data. *The Stata Journal*, *17*(4), 972-984.Available at: https://doi.org/10.1177/1536867x1701700412.

Lucas, J. R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22*(1), 3-42.

Makina, D., & Walle, Y. M. (2019). Chapter – 9: Financial inclusion and economic growth: Evidence from a panel of selected African countries. *Extending Financial Inclusion in Africa*, 193-210.Available at: https://doi.org/10.1016/B978-0-12-814164-9.00009-8.

Makki, S. S., & Somwaru, A. (2004). Impact of foreign direct investment and trade on economic growth: Evidence from developing countries. *American Journal of Agricultural Economics*, *86*(3), 795-801.Available at: https://doi.org/10.1111/j.0002-9092.2004.00627.x.

Mbutor, M. O., & Uba, I. A. (2013). The impact of financial inclusion on monetary policy in Nigeria. *Journal of Economics and International Finance*, *5*(8), 318-326.Available at: https://doi.org/10.5897/jeif2013.0541.

Mende, M., Salisbury, L. C., Nenkov, G. Y., & Scott, M. L. (2020). Improving financial inclusion through communal financial orientation: How financial service providers can better engage consumers in banking deserts. *Journal of Consumer Psychology*, *30*(2), 379-391.Available at: https://doi.org/10.1002/jcpy.1103.

Michael, O. B., & Sharon, O. O. (2014). Financial system, financial inclusion and economic development in Nigeria. *International Journal of Management Sciences*, *2*(3), 139-148.

Mlachila, M., Dykes, D., Zajc, S., Aithnard, P.-H., Beck, T., Ncube, M., & Nelvin, S. (2013). *Banking in Sub-Saharan Africa: Challenges and opportunities, regional studies and roundtables*. Luxembourg: European Investment Bank (EIB).

Murinde, V., & Eng, F. S. (1994). Financial development and economic growth in Singapore: Demand-following or supply-leading? *Applied Financial Economics*, *4*(6), 391-404.Available at: https://doi.org/10.1080/758518671.

Mwaitete, C. P., & George, L. A. (2018). Financial inclusion and economic growth a regression analysis. *Imperial Journal of Interdisciplinary Research (IJIR) Peer Reviewed–International Journal*, *4*(1).

Naceur, B. S., Barajas, A., & Massara, A. (2017). *Chapter 9: Can Islamic banking increase financial inclusion?. In Handbook of Empirical Research on Islam and Economic Life*. Cheltenham, UK: Edward Elgar Publishing.

Nanda, K., & Kaur, M. (2016). Financial inclusion and human development: A cross-country evidence. *Management and Labor Studies*, *41*(2), 127-153.Available at: https://doi.org/10.1177/0258042x16658734.

Neaime, S., & Gaysset, I. (2018). Financial inclusion and stability in MENA: Evidence from poverty and inequality. *Finance Research Letters*, *24*, 230-237.Available at: https://doi.org/10.1016/j.frl.2017.09.007.

Nizam, R., Karim, Z. A., Rahman, A. A., & Sarmidi, T. (2020). Financial inclusiveness and economic growth: New evidence using a threshold regression analysis. *Economic Research*, *33*(1), 1465-1484.Available at: https://doi.org/10.1080/1331677x.2020.1748508.

Nwafor, M. C., & Yomi, A. I. (2018). Impact of financial deepening in Nigeria. *International Journal of Science and Research*, *6*(11), 1156-1161.

Odedokun, M. O. (1996). Alternative econometric approaches for analysing the role of the financial sector in economic growth: Time-series evidence from LDCs. *Journal of Development Economics*, *50*(1), 119-146.Available at: https://doi.org/10.1016/0304-3878(96)00006-5.

Odugbesan, J. A., & Rjoub, H. (2019). Relationship among HIV/AIDS prevalence, human capital, good governance, and sustainable development: Empirical evidence from Sub-Saharan Africa. *Sustainability*, *11*(5), 1348.Available at: https://doi.org/10.3390/su11051348.

Ofosu-Mensah, A. J., Attah-Botchwey, E., Osei-Assibey, E., & Barnor, C. (2021). Financial inclusion and human development in frontier countries. *International Journal of Finance & Economics*, *26*(1), 42-59.Available at: https://doi.org/10.1002/ijfe.1775.

Okoye, L. U., Erin, O., & Modebe, N. J. (2017). Financial inclusion as a strategy for enhanced economic growth and development. *The Journal of Internet Banking and Commerce*, *22*(S8), 1-14.

Olaniyi, E. (2015). The effects of economic and financial development on financial inclusion in Africa. *Review of Economic and Development Studies*, *1*(1), 21-32.Available at: https://doi.org/10.26710/reads.v1i1.113.

Olaniyi, E., & Alenoghena, O. (2017). Financial inclusion and GDP per capita in Africa: A Bayesian VAR model. *Journal of Economics & Sustainable Development*, *8*(18), 44-57.

Onaolapo, A. (2015). Effects of financial inclusion on the economic growth of Nigeria (1982-2012). *International Journal of Business and Management Review*, *3*(8), 11-28.

Oruo, J. (2013). *The relationship between financial inclusion and GDP growth in Kenya*. Doctoral Dissertation, University of Nairobi.

Osiobe, E. U. (2020). Human capital, capital stock formation, and economic growth: A panel Granger causality analysis. *Journal of Economics and Business*, *3*(2), 569-582.Available at: https://doi.org/10.31014/aior.1992.03.02.221.

Patrick, H. T. (1966). Financial development and economic growth in underdeveloped countries. *Economic Development and Cultural Change*, *14*(2), 174-189.Available at: https://doi.org/10.1086/450153.

Peria, M. S. M., & Shin, M. Y. (2020). *Financial inclusion and human development: Oxford Research Encyclopedia of Economics and Finance*: Oxford University Press.

Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels. Working Papers in Economics No. 0435. Cambridge: University of Cambridge.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265-312.Available at: https://doi.org/10.1002/jae.951.

Poveda, A. C. (2011). Economic development, inequality and poverty: An analysis of urban violence in Colombia. *Oxford Development Studies*, *39*(4), 453-468.Available at: https://doi.org/10.1080/13600818.2011.620085.

Robinson, J. (1953). *The generalization of the general theory, in the rate of interest and other essays*. London: MacMillan.

Sahay, R., Čihák, M., N'Diaye, P., & Barajas, A. (2015). Rethinking financial deepening: Stability and growth in emerging markets. *Journal of Institutional Economics*, *17*(33), 73-107.

Santiago, R., Koengkan, M., Fuinhas, J. A., & Marques, A. C. (2020). The relationship between public capital stock, private capital stock and economic growth in the Latin American and Caribbean countries. *International Review of Economics*, *67*(3), 293-317.Available at: https://doi.org/10.1007/s12232-019-00340-x.

Sarma, M. (2012). *Index of financial inclusion–a measure of financial sector inclusiveness.* Delhi, India: Centre for International Trade and Development, School of International Studies Working Paper Jawaharlal Nehru University.

Sethi, D., & Acharya, D. (2018). Journal of financial economic policy. *Policy, 10*(3), 369-385.

Sethi, D., & Sethy, S. K. (2019). Financial inclusion matters for economic growth in India: Some evidence from cointegration analysis. *International Journal of Social Economics, 46*(1), 132-151.Available at: https://doi.org/10.1108/ijse-10-2017-0444.

Sharma, D. (2016). Nexus between financial inclusion and economic growth. *Policy, 8*(1), 13-36.Available at: https://doi.org/10.1108/jfep-01-2015-0004.

Van, D. T. T., & Nguyen, H. L. (2019). The impacts of financial Inclusion on economic sevelopment: Cases in Asian-Pacific countries. *Comparative Economic Research, 22*(1), 7-16.Available at: https://doi.org/10.2478/cer-2019-0001.

Van, L. T.-H., Vo, A. T., Nguyen, N. T., & Vo, D. H. (2021). Financial inclusion and economic growth: An international evidence. *Emerging Markets Finance and Trade, 57*(1), 239-263.

Varman, M. (2005). Impact of self-help groups on formal banking habits. *Economic and Political Weekly, 40*(17), 1705-1713.

Wang, E. C. (1999). A production function approach for analyzing the finance-growth nexus: The evidence from Taiwan. *Journal of Asian Economics, 10*(2), 319-328.Available at: https://doi.org/10.1016/s1049-0078(99)00023-8.

Wang'oo, E. W. (2008). *The relationship between financial inclusion and economic development in Kenya.* Unpublished MBA Thesis. University of Nairobi.

WBG. (2017). World Bank Group. The global findex database 2017. Retrieved from https://globalfindex.worldbank.org/.

World Bank. (2020a). World Bank development indicator. World Bank Publications. Retrieved from https://databank.worldbank.org/source/world-development-indicators.

World Bank. (2020b). World Bank list of economies. Retrieved from https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

World Bank. (2020c). World Bank governance indicators. Retrieved from www.govindicators.org.

Yakubu, M. M., Akanegbu, B. N., & Jelilov, G. (2020). Labor force participation and economic growth in Nigeria. *Advances in Management and Applied Economics, 10*(1), 1-14.

Yorulmaz, R. (2018). An analysis of constructing global financial inclusion indices. *Borsa Istanbul Review, 18*(3), 248-258.Available at: https://doi.org/10.1016/j.bir.2018.05.001.

APPENDIX

1.0 Classification of Income Groups in 41 Sub-Saharan African countries.

Our samples are limited to 41 Sub-Saharan African countries for which survey data are available.

This is made up of classified income group countries.

- Low-Income Countries (19 countries)
  Benin, Burkina Faso, Burundi, Central African Republic, Chad, Democratic Republic of the Congo, Ethiopia, Gambia, Guinea, Guinea-Bissau, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Tanzania, Togo, Uganda.
- Lower-Middle-Income Countries (15 countries)
  Angola, Cabo Verde, Cameroon, Comoros, Republic of Congo, Côte d'Ivoire, Ghana, Kenya, Lesotho, Mauritius, Nigeria, Senegal, Sudan, Zambia, Zimbabwe.
- Upper-Middle-Income Countries (7 countries)
  Botswana, Equatorial Guinea, Gabon, Mauritius, Namibia, Seychelles, South Africa.