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

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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 (Akedokun & Ağı, 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, 2015; Grehmann, 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 (Andrianaina & Kpodar, 2012; Barbu, Boitan, Cioaca, & Obreja, 2017; Chinoda & Kwenda, 2019b; Čihák, 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, Alid, 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 (Iqbal & Sami, 2017; Lenka. & Sharma, 2017; Okoye et al., 2017; Sharma, 2016). In comparison, studies by Babajide, Adegbeye, 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, & Uboagu, 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, 2015; Murinde & Eng, 1994; Nizam et al., 2020; Sethi & Sethy,
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:

\[ Y = f(X, X_s, X, X_3, \ldots, X_n) \]  \hspace{1cm} (1)

Where \( Y \) is the output quantity, \( X, X_s, X, X_3, \ldots, X_n \) 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:

\[ Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \ldots + \beta_nX_n \]  \hspace{1cm} (2)

Note that the parameters for the quantities of factors and inputs are \( \beta_0, \ldots, \beta_n \) 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:

\[ \text{Growth} = f(\text{financial development/intermediations}) \]  \hspace{1cm} (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:

\[ Y_t = f(K_t, L_t, F_t, W_t) \]  \hspace{1cm} (4)

Where \( Y \) 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:

\[ \dot{Y} = \dot{K} + \epsilon (1/Y) + \Delta F + \epsilon W \]  \hspace{1cm} (5)

Where the mark on top of each of the variables indicates the growth rate form for the variables; \( \dot{Y}, \dot{F}, \dot{L}, \) and \( \dot{W} \) 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 \( \dot{b}, \dot{c}, \) and \( \dot{d} \); while \( \epsilon \) 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 \( \dot{d} \).
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 3, and this can be written in equation form in Equation 6 as follows:

\[ \hat{Y}_t = \alpha + b_{lc} + c(1/Y)_t + dT_t + \mu_t \]  

(6)

Where \( \alpha \) is the constant term, the coefficient of trade growth is \( c \), and the disturbance term is \( \mu_t \) 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 \((\text{trade } (T), \text{share of gross investment } (1/Y) \text{ and labor force } (L_i))\) 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 2011 US$)] 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:
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:

\[ Y_t = \alpha + \beta L_t + \epsilon(1/Y) \epsilon + \delta W_t + \mu_i \]  

Where \( \alpha \) 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 \( h, c \) and \( d \), while the parameter input is \( \epsilon \) and the error term is \( \mu \). 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:

\[ Y = \beta_0 + \beta_1 X_{it} + \beta_2 X_{it} + \beta_3 X_{it} + \ldots + \beta_i X_{it} + \mu_i \]  

Where \( Y \) is the vector of the dependent indicator; \( X \) is the vector of the explanatory indicators; \( \beta_1 \) to \( \beta_i \) represent the coefficients for the explanatory indicators; \( \mu \) 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:

\[ \Delta GDP_t = \beta_1 \Delta GDP_{t-1} + \beta_2 \Delta FII_{t} + \beta_3 \Delta TRA_{it} + \beta_4 \Delta CAP_{it} + \beta_5 \Delta LAB_{it} + \beta_6 \Delta HIC_{it} + \beta_7 \Delta GGI_{it} + \Delta \mu_{it} \]  

Where GDP is gross domestic product per capita, GDP\(_{t-1}\) 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, HIC shows the human capital development index, GGI is the good governance indicators, \( \mu \) explains the error or disturbance term, and \( \Delta \) 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:

\[ y_{lt} = \mu_i + \sum_{n=1}^{K} \delta^{(n)}_{l} y_{l,t-n} + \sum_{n=1}^{\tau} \delta^{(n)}_{i} x_{l,t-n} + \epsilon_{lt} \quad (10) \]

In Equation 10, the observable variables are \( x \) and \( y \) our variables observed for the \( N \) countries in the model, while the time frame is \( T \), and \( \delta_1 = (\delta^{(1)}_1, \ldots, \delta^{(N)}_1) \) and country effects \( \mu_i \) 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 \( \delta_1 = (\delta^{(1)}_1, \ldots, \delta^{(N)}_1) \) 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.

\[ W = \frac{1}{N} \sum_{i=1}^{N} W_i \quad (11) \]

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).

| Variables | (1) | (2) | (3) | (4) | (5) |
|-----------|-----|-----|-----|-----|-----|
| FII | 656 | 0.358 | 0.151 | 0.013 | 1.11 |
| GDP | 656 | 2.447 | 3.483 | 208.1 | 2033.4 |
| HCI | 656 | 49.381 | 306.201 | 1011 | 2391 |
| TRA | 656 | 76.670 | 34.272 | 19.101 | 246.001 |
| CAP | 656 | 261927.301 | 354303.512 | 5601846 | 3153442 |
| GGI | 656 | 0.405 | 0.228 | 0.077 | 0.957 |
| LAB | 656 | 11141688 | 16412938 | 2386.872 | 107654987 |
| 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 3. Relationship between GDP and financial inclusion (FII) for the low-income group of African countries

\[ \text{GDP per capita (constant 2010 US$):} \]
\[ \text{gdp} = 1157.4 - 2229.2 \text{fii; } R^2 = 2.1\% \]
\[ n = 20 \quad \text{RMSE} = 465.388 \]

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

\[ \text{GDP per capita (constant 2010 US$):} \]
\[ \text{gdp} = -462.07 + 2718.8 \text{fii; } R^2 = 11.9\% \]
\[ n = 14 \quad \text{RMSE} = 493.32 \]
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.

| Variables | Levels $Z_{[t-bar]}$ | P-value | 1st Difference $Z_{[t-bar]}$ | P-value |
|-----------|---------------------|---------|-----------------------------|---------|
| FII       | 1.466               | 0.929   | -7.441***                   | 0.0000  |
| GDP       | 3.280               | 0.999   | -6.152***                   | 0.0000  |
| HCI       | 1.579               | 0.943   | -3.456***                   | 0.0000  |
| TRA       | 1.677               | 0.953   | -6.752***                   | 0.0000  |
| CAP       | 3.586***            | 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) | (2) | (3) | (4) |
|-----------|-----|-----|-----|-----|
|            | Overall | LIC | LMIC | UMIC |
| L\ln GDP   | 0.793*** (0.050) | 0.984*** (0.023) | 0.778*** (0.077) | 1.414** (0.713) |
| FII        | 0.553** (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) |
| HCl        | -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 F-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); Osiohe (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 workforce 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.

| Test                        | Group | LIC      | LMIC     | UMIC     |
|-----------------------------|-------|----------|----------|----------|
| Sargan Test                 | 2.61  | 0.37***  | 0.261**  | 0.109*** |
|                            | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| Hansen test                 | 17.6  | 0.284*** | 0.720*   | 0.989*   |
|                            | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| Arellano–Bond test for AR(2)| -1.14 | 0.252*** | 0.719*   | 0.831*   |
|                            | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| Wald test                   | 384.339.55 | 1920000.00 | 8720000.00 | 269882.54 |
|                            | [0.0000]** | [0.0000]** | [0.0000]** | [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 | GDP ↔ LAB |
| GDP → GGI | GDP ↔ HCI |
| HCI → TRA | HCI ↔ GGI |
| GDP ↔ LAB | GDP ↔ HIC |
| GDP ↔ CAP | GDP ↔ HCI |
| LAB → TRA | LAB ↔ GGI |
| LAB → CAP | LAB ↔ HCI |
| LAB → GGI | LAB ↔ HCI |
| HCI ↔ GGI | HCI ↔ 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 | UMI Countries |
|---------------|---------------|
| Unidirectional | Bidirectional |
| FII → TRA  | FII ↔ GDP |
| FII → GGI  | FII ↔ CAP |
| TRA → GDP  | GDP → TRA |
| GDP → GGI  | GDP → HCI |
| LAB → GGI  | LAB → GGI |
| HCI → TRA  | HCI → GGI |
| TRA → GGI  | CAP → HI |
| CAP → GGI  | TRA → GGI |
| LAB → HCI  | CAP → HI |
| LAB → GGI  | CAP → GGI |
| HCI ↔ GGI  | 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 minimized 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.

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**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.

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