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Determinants of Sustainable Financial Inclusion in Sub-Saharan Africa: A System GMM Approach[*]

Meshesha Demie Jima 🅘, Patricia Lindelwa Makoni 🅘

Department of Finance, Risk Management and Banking, University of South Africa, Pretoria, Republic of South Africa

email: makonpl@unisa.ac.za , jdmeshie@gmail.com

Abstract

There is no consensus on the key drivers of financial inclusion due to variation in the socio-economic features of countries, use of indicators and research methods. The main objective of this study is, therefore, to empirically examine the key drivers of financial inclusion across 26 selected Sub-Saharan African (SSA) economies for the period between 2000 and 2019, using a system generalized method of moments (GMM). A principal component analysis (PCA) is applied to construct a composite index of financial inclusion to address the multi-dimensional nature of the variable. The findings of the study indicate that both the macroeconomic and microeconomic factors influence the level of financial inclusion of the SSA countries. Specifically, the lag effect, economic growth, financial stability, inflation, financial deepening, liquidity, profitability, and bank efficiency are important drivers of financial inclusion in the SSA region. It is therefore important for policy makers and regulators to consider these factors while developing policies and strategies that foster access to financial products and services and ensure financial inclusion in the region.

Keywords: financial inclusion, Sub-Saharan Africa, principal component analysis, bootstrap-based bias correction (BBBC), system GMM

JEL Codes: C33, C38, E02, O16, O55

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1. Introduction

Financial inclusion has been one of the policies on the agenda for sustainable economic growth in the developing world. Scholars and policy makers have acknowledged the importance of inclusive financial systems as an enabler of sustainable development (Levine, 2005; Asongu, 2015; Beck et al., 2015). In its simplest form, financial inclusion refers to a situation where a large group of people have access to financial products and services at a reasonable price (Park and Mercado, 2015). Hannig and Jansen (2010) described the term financial inclusion as the absence of price and non-price barriers to access financial services. The World Bank (2017) expressed financial inclusion as a situation where individuals and firms have access to financial products and services at a reasonable cost in a sustainable manner. Financial inclusion thus determines the quality, scope, and efficiency of financial intermediation, which contributes to the economic growth and livelihood of individuals (Babajide et al., 2015).

Makoni (2014) argued that macroeconomic policies on financial inclusion, particularly those with a focus on rural banking programmes, were desirable in a quest to achieve social and economic empowerment of low-income and marginalized communities. Inclusive financial systems enhance access to financial services and expand saving and investments, which promotes inclusive and sustainable growth and social empowerment (UNSGS Annual Report, 2016). Financial inclusion, through fintech and big tech credit, helps to reduce income inequality in countries with an inclusive financial system (Hodula, 2023). It is therefore one of the key enablers to achieve most of the UN Sustainable Development Goals (SDGs) and the African Union (AU) Agenda of 2063. As a result, most governments, academicians and policy makers have identified financial inclusion as a policy priority, and it has become an academic and policy issue often debated in the development of national strategies and policies.

Contrary to the importance of financial inclusion for sustainable economic growth, the majority of the people in Sub-Sahara Africa (SSA) is outside the financial system and the average proportion of adults with bank accounts is below 43%, which is far lower than the proportion of adults in other emerging regions. A low level of financial inclusion in the SSA countries has influenced the financial well-being of households, enterprises, and the economy as a whole (Demirgüç-Kunt et al., 2018). As a result, the majority of the public authorities have taken financial inclusion as an important instrument to promote inclusive growth and a means to tackle poverty through ensuring access to finance to all segments of the society (Jungo et al., 2022).

In order to address the issue and raise the level of financial inclusion in the SSA countries, various efforts were made to assess the key determinants of financial inclusion in the region. However, various studies made to assess the key indicators of financial inclusion have used

different approaches and reached different conclusions (Naceur et al., 2015; Evans and Adeoye, 2016; Gebregziabher Gebrehiwot and Makina, 2019). One of the major reasons for the lack of consensus is that most of the studies were unable to address the multidimensionality of financial inclusion and thus used various indicators to measure financial inclusion (Demirgüç-Kunt et al., 2017; Balele, 2019). In addition, regional, country and sector-specific factors and variations in the methodological approaches contributed to the inconclusive findings.

Given the above facts, we deemed it necessary to assess the determinants of financial inclusion in SSA, as these could be used to inform engaged scholars and policy makers on which aspects to improve in order to uplift the socio-economic standing of communities by enabling their access to basic financial services, including opportunities to save, access credit and insurance. Accordingly, the overall aim of this research is to identify and assess the major drivers of financial inclusion in the selected Sub-Saharan African countries, and to contribute to the live debate on the factors that affect financial inclusion so as to inform academics, as well as feed into strategies and macroeconomic policies.

2. Literature Review

2.1 Financial inclusion theories

Several efforts have been made to put financial inclusion within a certain theoretical framework. These theories are linked to the different financial inclusion objectives and ways to achieve these objectives. Financial inclusion theories explain the debates in the policy literature, provide a set of principles on the practice of financial inclusion and detect abnormal patterns (Ozili, 2020). Buckland (2012) categorized the financial inclusion theories into economic (neoclassical economic theory and New Keynesian theory) and interdisciplinary theories (institutional theories, behavioural economics, and political-economy theories). In line with the objectives of this study, some of the theories of financial inclusion are briefly discussed below.

In the neoclassical economic theory, economic agents are considered key players, and the state is labelled as secondary. In this theory, economic agents such as firms and households are considered rational and have full information. One of the neoclassical economic theories, the rational choice theory, is based on the fundamental principle that the choices of individuals are the best choices to achieve individuals' objectives in light of all the uncontrollable factors. In reality, the demand for financial services is a function of the service characteristics, the attributes of the provider of the service, and the decision-making unit. Financial inclusion/exclusion is, thus, the result of consumer choice or state policy intervention. In line with this theory, a consumer's choice to use informal financial services instead of formal ones is mainly linked

to economic costs. Economic costs include transaction costs, contract negotiation costs, and policing and contract enforcement costs (Benston and Smith, 1976). This theory is criticized for its failure to consider that the success of the outcome of a decision is also influenced by the conditions that are not within the control of the individual making the decision.

On the other hand, the New Keynesian theories emphasize factors that lead to market distortions as a result of information asymmetries. Financial market imperfections are at the core of this school of thought. In line with this theory, inequalities persist because of market imperfections. It is because of market frictions that poor people cannot invest in their education and health despite their high marginal productivity of investment (Galor and Zeira, 1993). In this theory, imperfect information is one reason for credit exclusion, whereby creditors tend to reduce interest rates and restrict credit so as to avoid credit risk, which may lead to income inequality (Stieglitz and Weiss, 1981). Diamond (1984) demonstrated that fast information dissemination helps financial intermediaries achieve economies of scale.

Institutional quality is another factor that determines the behaviour and level of interaction among economic agents. Schumpeter (1911) explained the crucial role of finance and financial institutions in carrying out innovations, leading to creative destruction and economic development. In line with this view, economic productivity can be enhanced by accelerating the speed of capital reallocation in the process of creative destruction. Thus, credit is a precondition for those entrepreneurs who are willing to realize their innovation. Weak institutional structure results in weak market operation, high uncertainty and misallocation of resources (Demetriades and Law, 2006). Strong institutional frameworks improve the level of governance, minimize bureaucracy and reduce corruption (Bräutigam and Knack, 2004). Poor institutional environment thus increases information asymmetry and influences contract management, and hence reduces both outreach and usage of financial services.

Supply-side and demand-side factors are critical for financial inclusion. The supply-led hypothesis posits that the financial sector influences the real sector (Levine et al., 2000). It focuses on the transfer of resources from less productive sectors to high-growth sectors and stimulates an entrepreneurial response (Patrick, 1966). In this theory, financial institutions and their services are expected to occur before there is a demand for such services (Murinde and Eng, 1994). Hence, the availability of financial services is crucial to stimulate the demand for financial services. Unlike the supply-led theory, the demand-side perspective emphasizes household characteristics of financial services (Bhanot et al., 2012). It emphasizes that economic growth and successful utilization of resources leads to financial development. Robinson (1952) argued that financial capital tends to follow entrepreneurial efforts; hence, financial development is simply a response to the greater demand for financial services as the real economy grows.

2.2 Empirical literature

Empirical studies undertaken in the developing economies have identified the determinants of financial inclusion to be structural and policy factors (Naceur, 2015). Structural causes of financial inclusion constitute population size and density, per capita income, and the nature of the economy, which have a strong influence on market size. The identified policy factors are macroeconomic stability and institutional frameworks. Hence, financial inclusion is seen as a function of both structural and policy factors. Kim (2016) identified the rationale behind financial exclusion as low income and high risk of lending, religion or race, high costs of financial services, and the level of financial literacy among population.

Expansion of digital payments, mobile phones and internet penetration and change in government policies have improved financial inclusion (Demirgüç-Kunt, et al., 2018). Fintech-based lending can expand credit access to underserved consumers in highly concentrated markets and areas that have fewer bank branches per capita (Jagtiani and Lemieux, 2022). Bazarbash and Beaton (2020) found that, in low-income countries, marketplace lending grows in countries where financial depth and efficiency declines, highlighting the role of fintech in filling the credit gap. Evans and Adeoye (2016) indicated that GDP per capita, broad money to GDP, literacy, access to the internet and the existence of Islamic banking are important determinants of financial inclusion. Yorulmaz (2016) pointed out that unemployment has a negative relation with financial inclusion, thus affirming that the unemployed and irregularly employed people were less likely to be included in the formal financial system. Allen et al., (2016) identified that distance of the services, political stability, costs of account operation and legal rights are identified as key determinants of financial inclusion. Zins and Weill (2016) argued that gender, age, education, and income have a significant influence on financial inclusion in Africa.

According to Adeola and Evans (2017), information asymmetry and weak competition, as well as a low per capita income and low rates of literacy, are the major factors affecting financial inclusion in Africa. Financial regulation may hinder or facilitate financial inclusion and poor financial regulatory frameworks are one of the key setbacks to financial inclusion (Stijn et al., 2016). Gebregziabher Gebrehiwot and Makina (2019) indicated that GDP per capita and mobile phone subscriptions have significant positive impacts on inclusive finance in Africa. Anarfo et al. (2019) opined that financial regulation (financial stability) and the Boone indicator (competition) are important determinants of financial inclusion. On the other hand, bank credit-to-deposit ratio and non-performing loans were identified as nonlinear but significant determinants of inclusive finance in Sub-Saharan Africa. Ditta and Saputra (2020) argued that the expansion of banks as one of the formal financial institutions is critical to increasing finan-

cial inclusion.

In general, the empirical findings on the major determinants of financial inclusion have revealed that there are variations in the major drivers of financial inclusion across nations and regions due to the macroeconomic and sector-specific characteristics and methodological approaches. Against this literary background, it is possible to conclude that financial inclusion is affected by macroeconomic as well as sector-specific factors, and that financial inclusion has a strong impact on the level of financial resources available for transactions and investment. On the other hand, the level of financial inclusion in certain economies can be affected by potential customers that have no track record of financial transactions and who have low income to repay debt, which may affect the operation of the formal financial institutions and financial inclusion.

3. Methodology

3.1 Research approach, data and data sources

Several scholars have adopted a quantitative approach to examine and identify the key drivers of financial inclusion (Evans and Adeoye, 2016; Walle and Makina, 2017; Abdu and Adem, 2021). Consistent with the above studies, this study applies a quantitative approach to assess the key drivers of financial inclusion in the SSA countries. In this research, secondary data are collected from the World Bank (WB), the International Monetary Fund (IMF), and the United Nations (UN), and publicly accessible central bank reports. The panel covers 26 Sub-Saharan African countries that have adequate data for the various socio-economic indicators for the period extending from 2000 to 2019. In order to capture possible disparities across the region, the study considers a mix of upper, middle and lower-class economies from all geographical directions.

Several variables are used to examine their impact on financial inclusion. In order to address the limitation linked to using individual indicators for financial inclusion, this study applies a composite financial inclusion index developed from six individual indicators. Use of an individual indicator provides only partial and incomplete information, which may lead to a misleading interpretation on the extent of financial inclusion (Sharma, 2016; Wale and Makina, 2017). In addition, similarly to others, this study uses a composite index of institutional quality, which is constructed from the six World Bank Governance Indicators (Nxumalo and Makoni, 2021). Variables used in the study and their similar applications are summarized in Table 1.

Table 1 : Financial inclusion and other explanatory variables

No.	Variable	Indicator	Similar studies (sources)	Expected sign
1	**Financial inclusion index (composite index of six indicators)**			
	FI	Financial inclusion index	Sarma (2008); Gebregziabher Gebrehiwot and Makina (2019)	+
2	**Financial Stability**			
	FS	Bank Z-score = = (ROA + (equity/asset)/σ(ROA))	Diacon and Maha (2015); Morgan and Pontines (2014)	+/−
3	**Economic and Other Control Variables**			
	EG	LnGDP per capita	Evans and Adeoye (2016); Gebregziabher Gebrehiwot and Makina (2019)	+
	SFS	Broad money (M2) to GDP	Gebregziabher Gebrehiwot and Makina (2019); Evans and Adeoye (2016)	+
	LIT	Literacy rate	Naceur et al. (2015); Evans and Adeoye (2016)	+
	MU	Mobile phone subscriptions per 100 populations	Evans and Adeoye (2016); Gebregziabher Gebrehiwot and Makina (2019)	+
	IU	Internet subscriptions per 100 populations	Evans and Adeoye (2016); Kim et al. (2018)	+
	GEXP	Government expenditure to GDP	Naceur, et al., (2015); Gebregziabher Gebrehiwot and Makina (2019)	+
	INF	Consumer price index	Naceur et al. (2015); Evans and Adeoye (2016)	−
	IQI	Institutional quality index	Nxumalo and Makoni (2021)	+/−
	BCBD	Bank credit to bank deposit	Siddik et al. (2018); Eze and Markjackson (2020)	+
	BCI	Bank cost to income	Umar and Akhtar (2021); Ozili (2020)	−
	NIM	Net interest margin	Ditta and Saputra (2020)	+

3.2 Principal component analysis – composite index development

In this study, a composite financial inclusion index (FI) is constructed using a principal component analysis (PCA) technique. In constructing the composite index of FI, the study selects six indicators from the three dimensions of financial inclusion, namely accessibility (number of accounts with commercial banks per 1,000 adults (NBA)), availability (number of ATMs (NAK) and branches of commercial banks (NBK) per 1,000 km^2 and geographic spread of ATMs (ATD) and branches of commercial banks (CBB) per 100,000 adults), and usage (private domestic credit as a percentage of GDP (PLG)), based on their previous application and availability of data (Makina and Walle, 2019; Sharma, 2016; Siddik and Kabiraj, 2015). In the same manner, an institutional quality index is developed using the six World Bank Governance Indicators, namely government effectiveness (GE), regulatory quality (RQ), the rule of law (RL), control of corruption (CC), voice and accountability (VA) and political stability and absence of violence (PSAV). In developing the stated indices, first the data series are normalized using a min-max approach. The min-max approach helps to smooth-out the variation within the data and make the trend appropriate for index development. Accordingly, the study uses the formula stated below.

$$Z_{i,t} = \frac{R_{i,t} - Min_{i,t}}{Max_{i,t} - Min_{i,t}} \tag{1}$$

where $Z_{i,t}$ represents the normalized indicator i at the time t, $R_{i,t}$ is an individual indicator of financial inclusion or institutional quality, $Max_{i,t}$ and $Min_{i,t}$ are the maximum and minimum values of each indicator, respectively.

Then, principal component analysis (PCA) is applied to calculate the eigenvalues of the variance matrix for the indicators and develop the composite indices. In this case, the study employs the equations stated below to construct the composite indices for the selected SSA economies.

$$FI_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \dots + W_{in}X_n \tag{2}$$

$$IQI_i = W_{i1}P_1 + W_{i2}P_2 + W_{i3}P_3 + \dots + W_{in}P_n \tag{3}$$

where FI_i is the estimate of the ith factor of financial inclusion, IQI_i is the estimate of the ith factor of governance indicators, W_i is the weight of the score coefficient factor, X_i is the variable of interest and n is the number of variables.

3.3 Panel unit root and serial correlation tests

A panel unit root test ascertains that the variables used in the model are stationary and prevents the possibility of spurious regression (Breitung and Pesaran, 2005). A dynamic panel approach is effective irrespective of the nature of the regressors, exogenous or endogenous, or whether the variables are I(0) or I(1). However, it is necessary to ensure that none of the variables is second-difference (Pesaran and Smith, 1995). On the basis of this argument, the first (Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS) and Breitung) and second (CIPS, Pesaran (2007)) generation panel root tests are undertaken to ascertain that none of the series are integrated in order two (I(2)). Accordingly, the following model is used to test the stationarity of the variables.

$$\Delta Y_{it} = \alpha_i + \delta Y_{i,t-1} + \sum_{j=1}^{n} \rho_i \Delta Y_{i,t-q} + z_t^i \gamma + u_{it} \tag{4}$$

where Δ is the first-difference operator in the series of observations for the country i for $t = 1 \ldots, n$ periods. The panel unit root test has the following null hypothesis: $H_0: \delta_i = \delta = 0$ for all i, which presumes that all series are stationary.

3.4 Econometric model specification

An empirical technique is applied to examine and identify the factors that affect financial inclusion. Specifically, a dynamic panel data analysis technique is applied to assess the key determinants of financial inclusion. Some of the empirical models with similar specifications include those of Evans and Adeoye (2016) and Gebregziabher Gebrehiwot and Makina (2019). In line with these studies, the model is specified as follows:

$$Y_{it} = \alpha Y_{it-1} + \beta X_{it} + \varepsilon_{it} \tag{5}$$

where α denotes a constant term, $Y_{i,t}$ represents financial inclusion and financial stability in the country i at the time t, $Y_{i,t-1}$ represents the lag of the dependent variables, the vector $X_{i,t}$ represents a matrix of control variables in the country i at the time t, and $\varepsilon_{i,t}$ is the random error term.

In order to address the effect of dynamisms in the model, the study applies a dynamic panel generalized method of moments (GMM). The dynamic GMM technique deals with country-specific effects in a way that controls unobserved heterogeneity. It also takes care of omitted variable biases and removes any correlation between the disturbance term and the explanatory variables. Although there are two versions of the GMM estimators – the difference GMM (Anderson and Hsiao, 1981; Arellano and Bond, 1991) and the system GMM (Arellano and Bover,

1995; Blundell and Bond, 1998) – this study adopts the system GMM, which takes into account the values of lagged dependence and explanatory variables as instruments to attain a robust and consistent result. Accordingly, the study adopts the estimation equation below.

$$FI_{it} = \dot{\alpha} + \beta_1 FI_{i,t-1} + \beta_2 FS_{i,t} + \beta_3 EG_{i,t} + \beta_4 \sum_{n=1}^{i} X_{i,t} + \varepsilon_{i,t} \tag{6}$$

where $FI_{i,t}$ represents the dependent variable, measuring financial inclusion in the country i for the time t, $FI_{i,t-1}$ represents the lag of financial inclusion (FI), $FS_{i,t}$ represents financial stability, $EG_{i,t}$ represents economic growth, $X_{i,t}$ stands for other control variables that have direct and indirect influence on financial inclusion, and ε_{it} is the error term. In addition, the subscript i refers to the country, while t refers to the year.

3.5 Model robustness check

The GMM estimators, both the difference GMM (Arellano and Bond, 1991) and system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998), are asymptotically unbiased under different assumptions (when N tends to infinity and T is finite). However, these estimators use instrumental variables to avoid the dynamic panel data bias often leading to poor small-sample properties and highly unstable estimates over alternative instrument sets (Nickell, 1981).

In order to address the limitations above, which include large standard deviations compared to FE, finite sample bias due to weak instruments and difficulty selecting proper instruments, scholars have proposed various bias-corrected estimators (Kiviet, 1995; Bruno, 2005; Bun and Kiviet, 2006; Bun and Windmeijer, 2010; Roodman, 2009). However, the bootstrap-based bias correction (BBBC) procedure is important with more indicative outcomes. One of the main advantages of BBBC is that it does not require an analytical expression for the bias of the FE estimator as it is numerically evaluated using bootstrap resampling (Everaert and Pozzi, 2007). In line with the above argument, this study applies the following general homogeneous dynamic panel data model of order p to check the robustness of the system GMM output stated above.

$$Y_{i,t} = \alpha_i + \sum_{\delta=1}^{p} \gamma_\delta Y_{i,t-\delta} + \beta X_{i,t} + \varepsilon_{i,t} \tag{7}$$

where $i = 1, \ldots, N$ and $t = 1, \ldots, T$ are the cross-section and the time series dimension, respectively, $Y_{i,t}$ is the dependent variable, $X_{i,t}$ is a 1 x $(k\text{-}p)$ vector of strictly exogenous explanatory variables (where k is the total number of time-varying regressors), and α_i is an observed individual effect that may be correlated with $X_{i,t}$. $\varepsilon_{i,t}$ is the error term.

In addition, the study undertakes a pooled ordinary least square (POLS) estimation and uses the result to compare it with the system GMM model and assess the robustness of the system GMM model. In this regard, the study uses a simple pooled OLS regression model stated below.

$$Y_{i,t} = \alpha_i + \beta Y_{i,t-1} + \sum_{i}^{n} \beta_{i,t} X_{i,t} + \varepsilon_{i,t} \tag{8}$$

where $i = 1, \ldots, N$ and $t = 1, \ldots, T$ are the cross-section and the time series dimensions, respectively, $Y_{i,t}$ is the dependent variable, $X_{i,t}$ is explanatory variables, $\beta_{i,t}$ is the coefficients, α_i is the constant term and $\varepsilon_{i,t}$ is the error term.

4. Data Analysis and Discussion of Findings

4.1 Summary of descriptive statistics

Several factors are considered as potential drivers of financial inclusion in different countries. A summary of the descriptive statistics for the selected indicators used in the study is presented in Table 2 below.

Table 2 : Summary of descriptive statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
FI	520	0.200	0.234	0.014	0.824
FS	520	11.137	6.014	2.204	47.341
BCBD	520	73.827	23.859	13.754	137.331
GDPPc	520	2317.993	3403.413	111.927	22942.583
SFS	520	28.975	20.376	2.857	120.817
NIM	520	7.337	3.593	0.000	39.210
LIT	520	63.789	20.102	14.376	95.023
GEXP	520	14.883	6.135	0.952	41.571
INF	520	10.63	32.302	−8.975	513.907
IU	520	9.833	13.295	0.006	68.200
MU	520	45.299	42.148	0.018	165.600
BCI	520	57.628	13.474	21.026	103.685
IQI	520	−1.416	1.509	−4.680	2.132

Source: authors' calculations

Over the past two decades, financial inclusion has shown improvements in emerging markets and low-income countries (Demirgüç-Kunt et al., 2018). Unfortunately, the financial inclusion performance of Sub-Saharan African (SSA) countries is still low due to the various socioeconomic and political reasons (Zins and Weill, 2016). The summary above highlights that there is a slight variation in the level of financial inclusion across the region. On the other hand, financial stability (FS), measured by financial distress (Z-score), has been relatively stable across the selected countries. Other macroeconomic and microeconomic indicators show a slight but insignificant variation across the selected SSA countries, except GDP per capita and financial deepening, and hence the observations are helpful to give insight on the determinants of financial inclusion in the sample SSA countries and the region.

4.2 Composite index of financial inclusion

On the basis of the methodological approaches discussed above, we calculate the eigenvalues of the various financial inclusion indicators using a principal component analysis (PCA) technique, as shown in Table 3 below.

Table 3 : Principal component analysis: eigenvalues

Principal component	Eigenvalue	Variance (%)	Cumulative (%)
1	4.477	74.60	74.60
2	1.015	16.90	91.50
3	0.276	4.60	96.10
4	0.135	2.20	98.40
5	0.083	1.40	99.80
6	0.014	0.20	100.00

Source: authors' calculations

In line with the above analysis results, the first two principal components have an eigenvalue of above one (1) and explain the maximum variance (91.5%). The rule of thumb is that those principal components with an eigenvalue of one and above and a variance greater than average are helpful to construct a composite index. On the basis of the rule of thumb, only the first two principal components meet the standard and are suitable to develop a composite index of financial inclusion.

Table 4 : Principal component analysis: eigenvectors (loadings)

Variable	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6
NBA	0.452	−0.021	−0.066	−0.619	−0.639	0.025
CBB	0.429	0.032	−0.682	0.557	−0.170	−0.102
ATD	0.383	0.528	−0.201	−0.360	0.627	0.105
PLG	0.367	0.504	0.637	0.400	−0.211	−0.015
NAK	0.412	−0.456	0.232	−0.043	0.297	−0.692
NBK	0.400	−0.509	0.175	0.122	0.192	0.707

Source: authors' calculations

Accordingly, the first two components are taken and used to construct a financial inclusion index for the selected SSA countries. Subsequently, the equation below is used to construct a composite index of financial inclusion of the region.

$$FI = (0.452*NBA + 0.429*CBB + 0.383*ATD + 0.367*PLG + 0.412*NAK + 0.400*NBK) + ((-0.021*NBA) + 0.032*CBB + 0.528*ATD + 0.504*PLG + (-0.456*NAK) + (-0.509*NBK)) \quad (9)$$

Where *FI* is the financial inclusion index, *NBA* represents the number of deposit accounts per 100,000 of the population (access), *CBB* measures the number of branches per 100,000 of the population (access), *ATD* is the number of ATMs per 100,000 of the adult population (access), *PLG* measures private domestic credit gauged by GDP (usage), *NAK* is the number of ATMs per 1000 km^2 (availability), and *NBK* is the number of branches per 1000 km^2 (availability).

4.3 Panel unit root and serial correlation tests

On the basis of the model specified above, the three first-generation panel unit root tests, namely LLC, IPS, and Breitung, and the second-generation panel unit root test, are used to prove the stationarity of the variables. The regression results of the panel unit root tests reveal mixed-order integrations. Table 5 below depicts the various panel unit root test results for the variables used in this study.

Table 5 : Panel unit root tests

Variables	Levin Lin Chu (LLC)		Im Pesaran Shin (IPS)		Breitung		Pesaran (2007) (CIPS)	
	Statistic	Order	Statistic	Order	Statistic	Order	Statistic	Order
FI	−1.370*	I(0)	−6.465***	I(1)	−5.123***	I(1)	−3.980***	I(1)
FS	−3.8917***	I(0)	−5.4304***	I(0)	−3.094***	I(0)	−5.902***	I(0)
BCBD	−5.483***	I(0)	−7.211***	I(1)	−2.089**	I(0)	−3.140***	I(1)
EG	−7.260***	I(0)	−8.195***	I(1)	−5.772***	I(1)	−4.147***	I(0)
SFS	−3.051**	I(0)	−10.508***	I(1)	−4.807***	I(1)	−3.724***	I(0)
NIM	−6.690***	I(0)	−8.249***	I(0)	−1.775**	I(0)	−10.431***	I(0)
LIT	−6.459***	I(1)	−9.977***	I(1)	−8.752***	I(1)	−3.784***	I(1)
GEXP	−2.389***	I(0)	−10.845***	I(1)	−6.032***	I(1)	−1.972***	I(0)
INF	−39.133***	I(0)	−8.086***	I(0)	−1.998**	I(0)	−7.481**	I(0)
MU	−2.044**	I(0)	−7.179***	I(1)	−6.767***	I(1)	−4.327***	I(0)
IQI	−2.787***	I(0)	−11.204***	I(1)	−5.663***	I(1)	−4.212***	I(1)
IUG	−7.130***	I(0)	−8.536***	I(0)	−4.541***	I(0)	−10.123***	I(0)
BCI	−4.294***	I(0)	−3.772***	I(0)	−2.032**	I(0)	−3.593***	I(0)

Notes: Robust standard errors in parentheses (***), (**), (*) indicate the level of significance at 1%, 5% and 10%, respectively

Source: authors' calculations

In all the models, the analysis results reveal that the indicators are statistically significant at 1% and 5%. In addition, the panel unit root tests confirm that the variables have a mixed order of integrations. Some of the variables are integrated at level I(0), and others at order I(1). However, none of the variables is integrated at order I(2). As such, we proceed with the dynamic panel data estimation, as the variables can be applied irrespective of their order.

4.4 Determinants of financial inclusion – empirical findings

Several macro and microeconomic indicators drive financial inclusion (FI) across regions and nations (Zins and Weill, 2016; Ozili, 2020; Abdu and Adem, 2021). In this study, the econometric estimation results indicate that financial inclusion in SSA countries is driven by both macroeconomic and microeconomic factors. Table 6 below summarizes the regression results of the study.

Table 6: Key drivers of financial inclusion in selected SSA countries

Variables	(Financial inclusion)	(Financial inclusion)
	One-step system GMM	Two-step system GMM
L.FI	0.9266*** (0.2055)	0.9044*** (0.2050)
FS	−0.0033*** (0.0008)	−0.0033*** (0.0012)
EG	0.0296*** (0.0093)	0.0260* (0.0132)
SFS	0.0647** (0.0260)	0.0663* (0.0344)
INF	0.0005* (0.0003)	0.0005** (0.0002)
GEXP	0.0016 (0.0021)	0.0007 (0.0029)
MU	−0.0003 (0.0005)	−0.0002 (0.0005)
LIT	0.0002 (0.0005)	0.0004 (0.0006)
IQI	−0.0350 (0.0265)	−0.0347 (0.0264)
BCI	−0.0009** (0.0004)	−0.0009** (0.0004)
NIM	0.0097** (0.0041)	0.0105** (0.0048)
BCBD	0.0008** (0.0003)	0.0009** (0.0004)
IUG	−0.0001 (0.0002)	−0.0001 (0.0002)
Constant	−0.5041*** (0.1513)	−0.5041*** (0.1763)
Observations	494	494
Number of countries and instruments	26	26
AR(1)	0.00196	0.00537
AR(2)	0.866	0.816
Hansen	0.224	0.224
Sargan	0.0363	0.0363

Notes: Robust standard errors in parentheses (***), (**), (*) indicate the level of significance at 1%, 5% and 10%, respectively. AR(2) should be insignificant, and Hansen test between 0.1 and 0.3

Source: authors' calculations

On the basis of the regression results above, one of the major findings of this study is that the lag of the financial inclusion index has a positive and statistically strong influence on the current and future levels of financial inclusion, indicating a catch-up effect. In this study, the lagged coefficient of financial inclusion is above zero and below one, implying that the selected SSA countries are expanding their financial services, and hence tend to address excluded people, which is similar to the conclusions drawn by Evans and Adeoye (2016) and Gebregziabher Gebrehiwot and Makina (2019). Financial stability, proxied by financial distress (Z-score), has a significant negative effect on financial inclusion across the selected SSA countries, implying that financial instability in the financial system leads to frustration among the population and potential users of financial services, thereby negatively affecting the possibility of expanding the use of financial services.

GDP per capita, which is a proxy for economic growth, is one of the major drivers of financial inclusion in the SSA countries. Increase in per capita income of individuals and households raises the possibilities of saving and investment, which has a close tie with the use of financial services and financial inclusion. Financial inclusion, although a universal goal as per the United Nations SDG agenda, is especially important for the developing countries, where the uptake of formal financial products and services is typically low, as it is an enabler for achieving other goals such as poverty alleviation, zero hunger, good health, gender equality and economic growth (Demirgüç-Kunt et al., 2017). This study found that per capita income has a positive and significant effect on financial inclusion in SSA countries, indicating that increasing per capita income raises the interest of individuals and households in accessing and using financial services, which in turn improves the inclusiveness of the financial system.

Unlike some scholars who argue that there is a strong relation between consumption and GDP in low and middle-income countries, i.e., economic growth promotes consumption rather than saving and investment (Diacon and Maha, 2015; Kim, 2016), this study found that an increase in economic growth (per capita income) promotes the use of financial services and savings rather than consumption. The coefficient of GDP per capita is positive and significant at 5%, implying that countries with a high GDP per capita have high levels of financial inclusion. This finding is consistent with those of several other empirical studies that have been conducted to assess the determinants of financial inclusion (Yorulmaz, 2016; Evans and Adeoye, 2016; Allen et al., 2016). In all these studies, it is indicated that increasing per capita income improves access to financial services, and thereby to financial inclusion.

Several studies have used broad money (M2) to GDP as a measure of the size of the financial sector. Evans and Adeoye (2016) indicated that the size of financial service has a significant

positive impact on financial inclusion. An optimal level of financial inclusion can be achieved when basic financial services are accessible and available to all at a reasonable price (Ozili, 2020). Consistent with the findings of the above research, this study identified a significant positive effect of financial depth on financial inclusion, indicating that economies with a relatively large financial sector have the possibility to raise their level of financial inclusion. On the other hand, a higher inflation rate leads to macroeconomic instability, as it erodes the nominal income and negatively affects the low-income group of the population (Zhang and Naceur, 2019). Contrary to the above findings, this research identified that inflation has a significant positive effect on financial inclusion, implying that the people of SSA countries want to save and be more secure in the future, rather than considering the time value of money and investing in more profitable ventures, which is consistent with the findings of Matsebula and Sheefeni (2022).

Large banks have a greater ability to reach a more diverse set of populations and increase financial inclusion (Eze and Markjackson, 2020). Consistent with this finding, our regression outcomes indicated that bank credit expansion relative to deposits has a positive and significant effect on the level of financial inclusion, implying that credit expansion to potential users attracts unbanked groups of the population and contributes to enhanced financial inclusion. In addition, we found that the bank efficiency has a significant negative effect on the level of financial inclusion, i.e., inefficiency of financial institutions limits the scope of operation and financial inclusion. Studies show that the choice of a business model, i.e., portfolio mix and funding structures, has an influence on the risk and return of banks, thereby affecting financial inclusion (Demirgüç-Kunt and Huizinga, 2010). It is for this reason that in some countries, some financial institutions have established branches and products tailor-made to low-income earners to incorporate them into the formal financial system.

On the other hand, the performance of banks has a positive and significant effect on financial inclusion, i.e., profitability of the financial institutions significantly contributes to financial service expansion across the SSA countries, and thereby financial inclusion. This result is consistent with the findings of other scholars who found a positive and significant relationship between financial inclusion and profitability (Jouini, 2021). Commercial banks share profits while competition rises in the markets, and hence increase their financial service quality and quantity to obtain extra profits through credit expansion and this fact can increase financial inclusion, which may lead to financial instability (Mengistu and Saiz, 2018).

Various empirical studies have endorsed other macroeconomic and microeconomic variables such as LIT (literacy rate), IQI (institutional quality), GEXP (government expenditure), MU (mobile subscription) and IU (internet subscription) as important drivers of financial inclu-

sion (Evans and Adeoye, 2016; Ozili, 2020; Demirgüç-Kunt et al., 2018). However, this study revealed that these variables do not seem to have significant impacts on financial inclusion in the SSA countries. This opens room for researchers to undertake further country-level assessment using other models and verify the reasons behind the underlined facts.

4.5 Robustness check results

In order to test the robustness of the system GMM results above, the study applied a bootstrap-based bias correction (BBBC) technique and a simple pooled ordinary least square (POLS) analysis. In this analysis, we used a bootstrap with various resampling techniques (wild bootstrap (wboot), randomized temporal heteroscedasticity (thet_r) and cross-sectional dependence (csd)). The analysis results of the BBBC technique and the POLS were compared with the output of the system GMM and we found that there is slight variation. In line with the results of the robustness check, the output of GMM has slight bias compared to the BBBC and POLS estimations. Table 7 below summarizes the robustness of the GMM against the BBBC and POLS estimations.

On the basis of the comparison made in the table 7, the major economic and business indicators such as the lag of financial inclusion, financial stability (FS), economic growth (EG) and financial service expansion (SFS) are still the key drivers of financial inclusion under the BBBC and POLS estimations. However, the BBBC and POLS estimations have slight variation compared to the system GMM output and indicate the existence of certain bias. Hence, it is important to consider the robust output and use it to design policies and strategies that help address the low level of financial inclusion in the SSA countries.

Table 7: Results of bootstrap dynamic FE regression, pooled OLS and system GMM

| Variables | Bootstrap resampling | | Pooled OLS | System GMM | |
	Wild bootstrap	Random t-hetero-scedasticity		One-step GMM	Two-step GMM
l.FI	0.9869*** (0.0362)	1.0139*** (0.0401)	0.9808*** (0.0113)	0.9266*** (0.2055)	0.9044*** (0.2050)
FS	−0.0073* (0.00076)	−0.0076* (0.0006)	−0.0076*** (0.0005)	−0.0033*** (0.0008)	−0.0033*** (0.0012)
EG	0.0109*** (0.00358)	0.0114*** (0.0031)	0.0514*** (0.0019)	0.0296*** (0.0093)	0.0260* (0.0132)
SFS	0.0682** (0.00383)	0.0775*** (0.0038)	0.0098*** (0.0026)	0.0647** (0.0260)	0.0663* (0.0344)
INF	0.00011 (0.00048)	0.00069 (0.00072)	0.0001*** (0.0004)	0.0005* (0.0003)	0.0005** (0.0002)
GEXP	0.00024 (0.00035)	−0.00018 (0.00032)	0.0001 (0.0102)	0.0016 (0.0021)	0.0007 (0.0029)
MU	−0.00254 (0.00053)	−0.00134 (0.00016)	−0.00131** (0.0034)	−0.0003 (0.0005)	−0.0002 (0.0005)
LIT	−0.00248 (0.0002)	−0.00237 (0.00024)	0.0001 (0.00016)	0.0002 (0.0005)	0.0004 (0.0006)
IQI	0.00172 (0.00193)	−0.00480 (0.00275)	−0.0001 (0.0006)	−0.0350 (0.0265)	−0.0347 (0.0264)
BCI	−0.00064 (0.0001)	−0.00586 (0.00013)	−0.0201 (0.0001)	−0.0009** (0.0004)	−0.0009** (0.0004)
NIM	0.00514* (0.00038)	0.00556* (0.00032)	0.0023** (0.0003)	0.0097** (0.0041)	0.0105** (0.0048)
BCBD	−0.00057 (0.00014)	−0.00055 (0.00011)	0.0001** (0.0001)	0.0008** (0.0003)	0.0009** (0.0004)
IUG	0.00064 (0.00011)	0.00056 (0.00011)	0.0001 (0.0001)	−0.0001 (0.0002)	−0.0001 (0.0002)

Notes: i) Robust standard errors *** p < 0.01, ** p < 0 .05, * p < 0.1, ii) The bootstrap-corrected fixed-effect (BCFE) estimator uses default bootstrap samples with a burn-in (bi) initialization and various resampling options to allow for general error and cross-sectional as well as unconditional temporal heteroscedasticity

Source: authors' calculations

5. Conclusion and Recommendations

Financial inclusion plays a pivotal role in ensuring sustainable economic growth and development. In most of the low-income developing economies such as the SSA, there is a low level of financial inclusion, which hampers the effort of ensuring smooth economic growth, and hence most of these countries strive to address the issues and promote sustainable economic growth. However, scholars have identified various factors as drivers of financial inclusion in different regions and countries. In addition, there is no consensus on the factors to be considered and the methodology to be adopted in examining and identifying the major factors affecting financial inclusion. In order to bridge these gaps, this study endeavoured to assess and identify the key drivers of financial inclusion in selected SSA countries.

The findings of this study confirmed that both macroeconomic and microeconomic factors determine the level of financial inclusion. Specifically, the lagged effect, economic growth, financial service expansion, inflation and profitability of banks have a significant positive effect on financial inclusion in the SSA economies. On the other hand, financial stability and bank efficiency have a significant negative effect on the financial inclusion level of the region. On the basis of the above findings, we recommend that the SSA countries devise economic policies which will respond to the needs of their population, including opening up the financial sector to new players who are keen to provide products and services tailor-made for low-income earners with reasonable profit margins.

In addition, it is important for the SSA countries to incentivize financial institutions such as commercial banks, microfinance institutions and credit and saving associations that absorb marginalized and low-income earners, particularly women, by reducing the capital requirements, provide soft loans and expand basic infrastructure that help expand financial services. In these ways, this study would contribute to the efforts of the SSA countries to design and implement macroeconomic policies and strategies broad enough to address the factors limiting financial inclusion in the region.

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