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The effect of financial development and legal institutions on financial inclusion in Sub-Saharan Africa

Mohammed Gbanja Abdulai^{a,*}, Haruna Issahaku^{b,2}

^a Department of Economic Studies, School of Economics, University of Cape Coast, Ghana

^b Department of Finance, School of Business, University for Development Studies, Tamale, Ghana

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ABSTRACT

Purpose of the study: This study examines the impact of financial development on financial inclusion and the moderating role of legal institutions in enhancing the effect of financial development on financial inclusion in sub-Saharan Africa. The previous literature does not explain how financial development could improve financial inclusion even though the systems theory of financial inclusion argues so.

Design/methodology/approach: Using data from WDI for 41 sub-Saharan Africa countries between, 2000–2020, a two-step system GMM and quantile regression models are used to estimate the objectives of the study. The study takes into consideration the exceptional impact of COVID-19 and the importance of internet usage, along with other macroeconomic factors.

Findings: The sys-GMM shows that financial development positively influences financial inclusion. Across diverse measures of financial development and estimation techniques, a consistent and significant positive relationship is observed. Furthermore, the quantile regression approach reveals that at the 25th, 50th, and 75th quantile of financial inclusion, the effect of financial development is positive. In both the sys-GMM and quantile regression, the effect of institutions on financial inclusion is positive and also positively moderate the association between financial development and inclusion. Financial is influenced by other key macroeconomic variables.

Recommendations/value: The study recommends that Governments and policymakers prioritize initiatives aimed at advancing financial development in sub-Saharan Africa. Additionally, enhancing the legal and regulatory environment governing financial services, encompassing aspects such as contract enforcement, property rights protection, and corruption reduction, is crucial for sustained financial inclusion.

Implications: Open innovation in the financial sector, particularly in mobile payments, can benefit from the positive impact of financial development on inclusion. Also, open innovation in delivery services can benefit from financial inclusion initiatives, ensuring that individuals and businesses across diverse economic strata have access to efficient and affordable financial delivery services.

1. Introduction

Financial inclusion involves providing credit, insurance, savings accounts, and payment services not included in formal financial arrangements. Financial inclusion is identified as a significant mechanism for poverty reduction and enhancement growth of economies and development, particularly in SSA, where about 60 percent of the population cannot access formal financial products (Demirguc-Kunt et al., 2018). Financial inclusion is defined by the World Bank as "a state in which individuals and businesses have access to useful and affordable

financial products and services that meet their needs—transactions, payments, savings, credit, and insurance—delivered responsibly and sustainably" (World Bank, 2018). Integrating the unbanked into the financial landscape can be achieved through open innovation in the financial sector. And more so competition in the sector can be achieved through open innovation (ul Haq et al., 2024). The financial services industry's adoption of both the "inside-out" and "outside-in" facets of the open innovation model is demonstrated by the compelling evidence provided by open innovation. This approach permits both the flow of internal ideas to other businesses for integration into their business

* Corresponding author.

E-mail address: gbanjam@gmail.com (M.G. Abdulai).

¹ <https://orcid.org/0000-0001-8609-6311>

² <https://orcid.org/0000-0002-6324-9546>

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models and the access to external ideas through the company's own business model (ul Haq et al., 2024). To make ideas and services obtained from outside the company financially attractive to both the supplier and the client, open innovation in financial services requires innovation in the business model.

Even with the recent advancements in payment technologies, financial exclusion is still a significant problem in SSA. Compared to the worldwide average of 69%, just 42% of adults in SSA held a bank account in 2017 as indicated by (Demirguc-Kunt et al., 2018). 34% of adults in rural areas have an account in banks, compared to 48% in metropolitan areas, highlighting the severe lack of accessibility to formal financial products and services in these areas. According to Demirguc-Kunt et al. (2018), women are more likely than men to be financially excluded; only 37% of women and 47% of men own bank accounts. According to Demirguc-Kunt et al. (2018), there are several factors contributing to financial exclusion in Sub-Saharan Africa (SSA), such as expensive fees, low confidence in official financial institutions, and low financial literacy. Additionally, it is challenging for households and small enterprises to acquire financial services due to the region's weak financial infrastructure and restricted access to credit. For those who are underprivileged, these difficulties are especially severe because they frequently lack the collateral required to obtain loans from official financial institutions.

In recent years, various programs have been initiated to address these bottlenecks, including creating mobile money platforms and expanding microfinance institutions. The use of Mobile-money has been particularly successful in promoting financial inclusion in sub-Saharan Africa. According to a report by the GSMA, 469 million mobile money accounts were registered in sub-Saharan Africa in 2019, with transactions volumes worth \$490 billion. This growth has been facilitated by the widespread adoption of mobile phones in the region, which has enabled individuals to access financial services even in areas without physical banks (GSMA, 2020).

Mobile money has already had a big influence on financial inclusion in SSA. For example, after the introduction of the mobile money network M-PESA in 2007 and the consequent fast increase in financial inclusion, 73% of adults in Kenya currently have mobile money accounts (Demirguc-Kunt et al., 2018). Similarly, with the influx of mobile money services in 2008, the proportion of Tanzanians with access to formal financial services increased from 11% to 44% (Demirguc-Kunt et al., 2018).

However, while mobile money has shown great promise in improving financial inclusion in SSA, some challenges remain. Limited accessibility to mobile phones and Internet infrastructure remains a significant barrier to adoption, particularly in rural areas. Additionally, there is a risk that the dominance of a few large mobile money providers may lead to limited competition and higher costs for users (Sarpong & Nketiah-Amponsah, 2022).

Several studies indicate that the availability of formal financial services, leading to enhanced financial stability, relies on how regulators and supervisors manage financial inclusion within a sound regulatory environment and prudent supervisory framework (Mehrotra and Yetman, 2015). Such findings highlight the significance of institutions in the financial intermediation process. Therefore, considering institutional roles in financial inclusion appears reasonable given the poor institutional frameworks that have plagued the Sub-Saharan Africa (SSA) region (Adeniyi et al., 2015). Do poor institutional frameworks enhance or repress financial inclusion? Do such institutions work in isolation or need a sound financial infrastructure? Therefore, financial development and legal institutions can play important roles in enhancing financial inclusion in SSA.

Financial development can lead to financial inclusion by creating a robust and diverse financial system that provides greater accessibility to financial products for households and businesses. When financial institutions are well developed, they can offer a broader range of products and services, such as mobile banking, microfinance, and digital

payments, which are more accessible and affordable for marginalized populations. Moreover, financial development can create more job opportunities, increase income levels, and improve economic growth, which can ultimately help reduce poverty and inequality. By promoting financial development, policymakers and financial institutions can help create an enabling environment for financial inclusion, increasing financial services accessibility those traditionally not included in the formal financial space (Levine, 2005; Allen et al., 2016; World Bank, 2018). Judicial effectiveness can lead to financial inclusion by providing individuals and businesses with a secure legal environment that protects their property rights and enforces contracts. A strong and effective judicial system can ensure that financial transactions are fair, transparent, and legally binding, increasing the confidence of both borrowers and lenders in the financial system. Moreover, an effective judiciary can help reduce corruption and other forms of misconduct, creating equal opportunities for all participants in the financial system. This can encourage the development of more innovative financial products that cater to the needs of underserved populations and ultimately promote financial inclusion (Beck et al., 2005; World Bank, 2018).

Demirguc-Kunt et al. (2013), for instance, argue that in the financial sector, innovation and entrepreneurship could be stimulated and enhanced where there exist effective legal institutional environments that ensure property rights enforcement. Such innovations could ensure the development of financial products/services that meets the needs of customers of financial. Beck et al. (2008) also asserted that sound legal processes and sound property rights enforcement could reduce costs of transaction and risks associated with financial mediation and markets, as they would facilitate contract enforcement, dispute resolution, information disclosure, and creditor protection. This could foster competition and efficiency in the financial space, as monopoly, rent-seeking, and bribery that distort resource allocation and hamper financial development could be prevented.

There is still a developing body of research on financial inclusion in Sub-Saharan Africa (SSA), most of it focuses on macroeconomic issues that could affect financial inclusion in the region (Chu Khanh & Nguyen, 2019; Le et al., 2019; Léon and Zins, 2020; Nkoa and Song, 2020). The literature on the connection between legal institutions, financial development, and financial inclusion is rare. Given the assertions of the law and finance theory, it is imperative to understand the ways in which the development of legal institutions and the financial system can both enhance SSA's financial inclusion. To increase financial inclusion, especially for the vulnerable, impoverished members of society, institutions and sound economic governance are crucial components. This is because transactions, markets, and economic activities cannot operate smoothly without them. Thus, governance positively impacts financial inclusion because it increases the amount saved in formal accounts and bank accounts numbers but has a negative effect on borrowing behaviour.

The relationship between financial development and inclusion—the process that establishes the conditions and environment for inclusion—is completely underexploited by contemporary research. How effectively institutions support the relationship between the financial systems and financial inclusion is likewise absent from the literature. This study adds the following to the body of literature: (i) This study closes the literature gap by determining both the influence of financial development and legal institutions that spell out property rights enforcement and transaction structures for an economy. Effective legal systems would facilitate contract enforcement, dispute resolution, information disclosure and creditor protection. (ii) Unanticipated shocks to the financial system, which could trigger inclusion behaviors in the financial system. Such shocks, including the COVID-19 pandemic, have not been accounted for in previous literature. The study specifically examines (i) The effect of financial development on financial inclusion. (ii) The effect of institutions on financial inclusion and the moderating role of institutions on the relationship between financial development and financial inclusion. (iii) the effect of COVID on financial inclusion.

The remainder of the paper follows the review of literature, methodology, results discussion and conclusions,

2. Literature review

This section presents a summary of the theoretic and empirical review of the relationship between financial development and financial inclusion especially in an era of COVID-19 shock to the economies of sub-Saharan Africa.

2.1. Theoretical and conceptual overview

Ozili (2020) defines financial inclusion as the ease of access and availability of formal financial services to member of the society. When people and businesses have access to formal financial services that are accessible, helpful, and meet their requirements in an ethical and sustainable manner, they are said to be financially included. For Reyes (2012), the achievement of financial inclusion necessitates the establishment or improvement of market incentives, including the development of mechanisms to provide financial products to individuals with limited access and utilization of such services. He highlighted the importance of providing financial users with the necessary tools to gain a better insight into the services and products offered by different channels, enabling them to exercise their rights as clients. Reyes (2012) also emphasized that financial inclusion can be evaluated based on three (3) facets: (i) accessibility of financial products, (ii) utilization of financial products, and (iii) the quality of services or products provided. The principles underlying the observed diversity in financial inclusion practices need to be identified, as financial inclusion practices differ throughout countries. Theories are these collections of guiding concepts. Theories of financial inclusion provide meaning to the actions of financial inclusion that are seen (Ozili, 2020). For the purpose of this study, the systems theory of financial inclusion (Ozili, 2020) and the institutions theory of financial inclusion (Ozili, 2023) are used to link the relationships between financial development, institutions and financial inclusion.

The systems theory of financial inclusion posits that financial inclusion outcomes are achieved through existing sub-systems, such as economic, social, and financial systems. Greater financial inclusion benefits these sub-systems, and significant changes can impact the expected outcome (Ozili, 2020). Regulations on financial sector agents can align their interests with users of basic financial services, ensuring affordable and quality services. However, a significant change at the full system level does not necessarily lead to a change in the existing sub-systems. The theory suggests that the efficiency and effectiveness of these sub-systems determine the success or failure of a national financial inclusion agenda. The systems theory has merits, including recognizing the role of existing economic, financial, and social systems in promoting financial inclusion, providing a macro perspective, and considering the interrelationship among sub-systems. However, it has some drawbacks, such as not recognizing the influence of factors outside the full system, and assuming a direct relationship between financial inclusion outcomes and the systems it relies on.

It is crucial to understand financial inclusion within the framework of both formal and informal institutions, as institutional elements including long-standing policies, procedures, laws, and organisational structures can affect how individuals interact with formal financial services as well as how they make decisions. It may have an impact on people's choice of how to use official financial services and may have favourable or unfavourable effects on the degree of financial inclusion in society. The impact of institutional quality on the degree of financial inclusion has received a lot of attention in the literature (e.g., Anthony-Orji et al., 2019; Lashitew et al., 2019; Nkoa and Song, 2020; Aracil et al., 2022; Ouechtati, 2022). The focus on institutional quality as a control variable in empirical research on financial inclusion highlights the necessity of autonomous formal institutions that are able to uphold

rules without fear, perform their duties impartially, and have the right legal authority to penalise rule-breakers in order to advance financial inclusion.

The theoretical review show that financial development (a system variable) and institutions could positively affect financial inclusion. Also, the review indicates that institutions could moderate the effect of financial development on financial inclusion as indicated in the Figure 1 below

2.1.1. Overview of empirical studies

It is observed by Dermirguc-Kunt and Klapper (2012) that the extent of financial inclusivity differs across various countries in Africa. For the southern part of Africa, approximately 51% of the population has access to formal financial institutions. In Central Africa, however, this percentage drops significantly to only 11 percent. For north Africa, the figure stands at a mere 4%, and for West Africa, it increases slightly to 18 percent. Utilizing data from the world bank, Dermirguc-Kunt et al. (2015) reached a similar conclusion, stating that the rate of inclusion in Africa stays considerably low. Khoi et al. (2013), through an examination of the determinants influencing access of Vietnam rural households to informal and formal credit, have inferred that a positive association exist between the formal financial sector and informal sector, which increases the likelihood of households gaining access to credit. Conversely, Madestam (2014) has found that informal credit emerges because of poor institutional quality and eventually helps borrowers as well as households. Khan et al. (2020) also argues that the level of human capital, technological innovation, the openness of an economy to trade can positively affect the level of financial development. Financial development is also positively affected by the interaction between human capital and technological innovation.

Ozili (2020) presents an extensive overview of new global perspectives regarding the notion of financial inclusion. The author unearth a notable correlation between financial stability and the level of financial inclusion. Consequently, the author postulates that the advancement of financial systems may facilitate the enhancement of financial inclusion. In a similar vein, Evans (2015) employs the FMOLS technique to examine the influence of financial development and economic growth on the process of financial integration in African nations. Through their empirical analysis, the authors determined that financial development exerts a favorable impact on the attainment of financial inclusion in Africa. Furthermore, they observed that economic growth, as manifested by the Gross Domestic Product, positively and significantly affects the degree of financial inclusion in Africa. Nutassey et al., (2023) finds that regulations in the financial sector could moderate the relationship between inclusive finance and financial development. They argue that regulations that have restrictions on the financial sector should not be above a threshold of 1.6047. Similarly, Kamalu and Ibrahim (2021) assert that the development of Islamic banking had a positive significant effect on the level of financial development in the organization of Islamic cooperation. Hlophe (2018) using a granger cointegration approach in Eswatini indicates that there existed a unidirectional

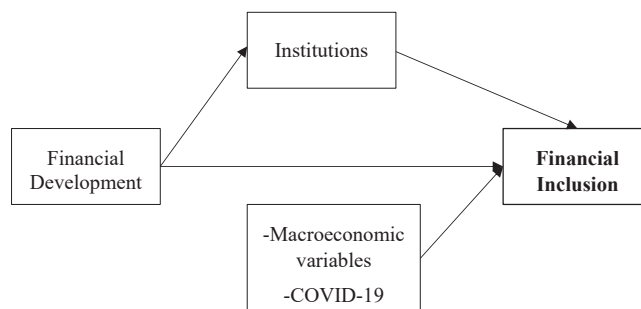


Fig. 1. Conceptual framework of financial development, institutions and financial inclusion.

relationship from financial development to financial inclusion. Niankara and Traoret (2023) finds that indicators of demand side financial inclusion increased the likelihood of individuals using digital payment systems for online and in-store shopping as well as an increase in their marginal utilities.

Ozili (2021) establishes how financial inclusion and legal institutions are related. The study finds strong insights that the judicial system's quality and financial inclusion are positively correlated. The results indicate a strong correlation between advances in financial inclusion and enhancements in the standard of the legal system. The "rule of law" index is used as a stand-in for measuring the caliber of the legal system, and financial access indicators like the ATM numbers and branches of banks per 100,000 adults are used by the study to assess this link. The study shows that an increased number of ATMs is associated with a more robust insolvency resolution. Furthermore, in non-European nations, the strength of the legal institutions and legal rights is positively correlated with the bank branch per every 100,000 adults. Also, the effectiveness of insolvency resolution and the amount of time needed to address insolvency is strongly correlated with the ATM's accessible per every 100,000 adults.

A study by Nkoa and Song (2020) looked at the relationship between the calibre of institutions and financial inclusiveness in Africa. They offer proof that financial inclusion tends to improve financial products and services' accessibility, uptake, and utilisation in Africa. To estimate their models, they use the two-step GMM approach. In line with this, Chinoda & Kwenda (2019) found that financial inclusion was significantly positively impacted by the quality of institutions and governance, based on data gathered in Africa between 2004 and 2016. The impact of financial regulation on financial inclusion is examined by Anarfo et al. (2020) in relation to the role of financial stability. Their results show that financial inclusion is positively impacted by the relationship between financial stability and financial regulation.

Anthony-Orji et al. (2019) used the autoregressive distributed lag unrestricted error correction model to conduct a study to investigate the links among financial stability, financial inclusion, and quality of institutions in Nigeria. The quarterly data from 1986 to 2013 shows that the quality of institutions had a considerable positive influence on financial inclusion over the long and short terms. The researchers recommend that policymakers consider the institutional variables that are currently in place and adhere to the financial inclusion agenda considering these findings. When the judicial, political, economic, and legal systems are weak, people and companies could not have the protection they need when financial agreements are enforced or there are economic infractions.

Using the panel GMM technique, Ali et al. (2016) look into the relationship between financial integration and the soundness of institutions in 52 countries between 2004 and 2010. The study comes to the conclusion that raising the standard of institutions is necessary to increase financial inclusion in emerging nations. Moreover, their results suggest that financial inclusion in the countries they looked at is positively and significantly impacted by financial openness and economic growth. Thus, the research indicates that robust rules, low levels of violence, political stability, and efficient governance are useful instruments for promoting financial integration. Chu Khanh & Nguyen (2019) came to the conclusion—using the system-GMM technique—that, in addition to social and economic considerations, sustainable development and the calibre of institutions promote financial inclusion.

Mose and Thomi (2021) undertook an investigation into the factors influencing financial inclusion in East Africa. From the perspective of financial service consumers—often referred to as the demand side—their analysis illuminated policy approaches and offered an overview of the numerous sources of financial inclusion. Their study's findings show that East Africa's financial access is positively and significantly impacted by both economic growth and the number of Internet users. Their results do, however, also show that there is no discernible relationship between the deposit interest rate and financial inclusion.

The implementation of M-Pesa in Kenya has demonstrated the critical role that internet connectivity plays in attaining financial inclusion. This has resulted in the remarkable expansion and advancement of numerous financial services. According to Sarma and Pais (2011) and Olaniyi & Ismaila (2016), there is a positive and affirmative link between deposit interest rates and financial inclusion. This suggests that interest rates play a crucial role in promoting access to financial resources and have a direct influence on the degree of financial inclusion. The escalating number of individuals with internet connectivity, as highlighted by Sarma and Pais (2011), underscores the criticality of internet access in the rapid expansion of the financial system. The level of literacy bears immense significance in the financial market, specifically in decision-making processes. This complexity presents challenges for the financially illiterate individuals when making well-informed choices. This stems from the fact that individuals with higher literacy levels comprehend the necessity of utilizing formal financial system services, as noted by Sarma (2016).

Allen et al. (2016), indicates that the inclusivity of an economy's financial system is influenced by its specific characteristics. Higher levels of financial participation are influenced by the existence of reliable mechanisms for the enforcement of contracts, effective legal frameworks, superior institutions, and a stable political environment. Additionally, the attributes of the banking sector play a pivotal role, whereby the high charges associated with creation and using bank accounts, geographical distances, and disclosure requirements act as barriers to formal inclusion. Trust in the banking sector also exerts an influence, while the availability of deposit insurance and tax incentive schemes further enhance financial inclusion.

The evidence presented by the review of the literature shows that a stable financial environment could foster financial inclusion. Also, a financial inclusion thrives when institutions facilitate the operations of the financial systems. While the literature on institutions and inclusion is vast and indicate a positive relationship, the literature on financial development and financial inclusion is scarce and remain under exploited especially in the sub-Sahara Africa region, even though the systems theory of inclusion shows that the relationship could be a positive and reinforcing one. It is also worth noting that the literature does not show how institutions could moderate the relationship between financial development and financial inclusion. Also, it is important to understand how the COVID pandemic has changed the financial inclusion narrative in the sub-region. The influx of the pandemic halted economic systems and led to innovations in the payment systems, transport systems and delivery systems.

This study contributes to the literature by examining the effect of financial development and legal institutions on financial development. Using various measures of financial development and methods of estimation, this study also estimates the moderating role of institutions on the relationship between financial development and financial inclusion. It also explores the possible innovative mechanisms through which COVID-19 pandemic could affect financial inclusion.

3. Methodology

3.1. Sample and data sources

A panel of forty-one (41) SSA countries with annual data spanning the period 2000–2020 is used for the purpose of this study. The data on macroeconomic variables, including financial inclusion, utilised in the study are taken from the World Development Indicators. Data on legal institutions were taken from the economic freedom data from Heritage Foundation and the Fraiser Institute. The sample is built based on countries with available data on financial inclusion, financial development, and legal institutions.

The sample includes 'Angola, Botswana, Benin, Burundi, Cabo Verde, Burkina Faso, Cameroon, the Central African Rep., Chad, and Cote d'Ivoire, Congo Dem. Rep, Congo Rep., Eswatini, Ethiopia, Gabon,

Gambia, The, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Lesotho, Madagascar, Malawi, Mali, Mauritania, Namibia, Mozambique, Mauritius, Niger, Nigeria, Seychelles, Senegal, Rwanda, Sierra Leone, Sudan, South Africa, Tanzania, Togo, Uganda, Zambia'.

The selection of the 41 Sub-Saharan Africa countries was driven by the region's diversity in economic structures, legal frameworks, and financial development stages. Due to their abundant natural resources, developing markets, and expanding populations, the countries of Sub-Saharan Africa collectively play a significant role in the global economy. A large number of Sub-Saharan African nations are actively pursuing sustainable development objectives. The region's focus on inclusive financial systems encourages social and environmental responsibility, lowers poverty, and promotes economic participation—all of which are in line with sustainable development goals.

3.2. Estimation technique

In order to investigate how legal institutions and development of the financial system affect financial inclusion in SSA, a system generalised methods of moments estimator (Sys-GMM) is used. Arellano and Bond (1991) introduced and Arellano and Bover (1995) developed this estimator specifically for the analysis of dynamic panels. The rationale behind employing this estimator stems from the recognition that ordinary least squares (OLS) may not adequately address endogeneity concerns, such as data measurement errors and omitted variable biases.

Given an initial model in (1),

$$Y_{it} = \phi Y_{it-1} + \beta X'_{it} + (\eta_i + \varepsilon_{it}) \quad (1)$$

$$\Delta Y_{it} = \phi \Delta Y_{it-1} + \beta \Delta X'_{it} + \Delta \varepsilon_{it} \quad (2)$$

Regressors are classified into three under panel GMM: predetermined, endogenous, and strictly exogenous regressors. Predetermined regressors are assumed to correlate with past errors but not current and future ones. Endogenous regressors are assumed to be correlated with past and possibly present errors, whereas strictly exogenous regressors are assumed to be uncorrelated with errors in all temporal periods.

It is assumed that Equation (1) represents a random walk model and that y_{it} , the dependent variable, is persistent for the design of system GMM models. When T is short, the application of a difference GMM estimator in this situation results in an estimate of ϕ that is both biased and inefficient in infinite samples. For the lagged dependent variable, y_{it} , the parameter that needs to be estimated is ϕ . The inadequate performance of the difference-GMM estimator in this scenario can be ascribed to the utilization of insufficient instruments (Blundell and Bond, 1998). Consequently, it emphasizes the justification for adopting the system GMM. While the second equation is represented in its first differenced form and uses lags as instruments, the first equation is provided in its original form using the first difference as an instrument. The system-GMM approach entails the utilization of a larger number of moment conditions (instruments). Nevertheless, empirical evidence from Monte Carlo simulations suggests that when the time span (T) is limited and the dependent variable exhibits persistence, there are improvements in precision, and the bias in small samples is mitigated.

It is best to use a two-step system GMM estimator with a weighting matrix that includes the first step's residuals when heteroscedasticity and serial correlation are present. It is important to keep in mind, though, that these standard errors have a tendency to be downwardly biased in limited samples. To address this small sample bias, researchers typically employ the Windmeijer adjustment in these situations.

According to Davidson and Duclos (2000), sys-GMM offers three advantages: unbiased, convergent, and efficient estimators when lagged variables are present; consideration of unobservable factors affecting infrastructure and financial development (Rodrik, 2002); and correction

of simultaneity bias between the control variables and other variables that are of interest (Wooldridge, 2013).

3.3. Model specification

Following the works of Chinoda and Kwenda (2019), who indicated that financial integration is dependent on institutional and economic factors; the model is indicated as follows.

$$FI_{it} = f(X_{it}I_{it}) \quad (3)$$

Where X_{it} represents economic variables, including financial development and I_{it} represents the legal institutions. FI_{it} is financial inclusion.

From Equation (3), a simple dynamic panel can be specified as

$$FI_{it} = \beta_0 + FI_{it-1} + Institutions_{it} + FD_{it} + X_{it} + u_i + v_i + \varepsilon_{it} \quad (4)$$

Equation (4) is further expanded to include all control variables in the equation as follows: A baseline equation for the influence of financial development on financial inclusion is first run as:

$$FI_{it} = \beta_0 + \beta_1 FI_{it-1} + \beta_2 FD_{it} + \beta_3 gfcf_{it} + \beta_4 inflation_{it} + \beta_5 lendingrate_{it} + \beta_6 trade_{it} + \beta_7 GDP_{it} + \beta_8 FDI_{it} + \beta_9 consumption_{it} + \beta_{10} exchange_{it} + \beta_{11} Internet_{it} + \beta_{12} COVID_{it} + u_i + v_i + \varepsilon_{it} \quad (5)$$

In Equation (6), a different model that measures the effect of legal systems on financial inclusion is specified.

$$FI_{it} = \beta_0 + \beta_1 FI_{it-1} + \beta_2 Legal_{it} + \beta_3 gfcf_{it} + \beta_4 inflation_{it} + \beta_5 lendingrate_{it} + \beta_6 trade_{it} + \beta_7 GDP_{it} + \beta_8 FDI_{it} + \beta_9 consumption_{it} + \beta_{10} exchange_{it} + \beta_{11} Internet_{it} + \beta_{12} COVID_{it} + u_i + v_i + \varepsilon_{it} \quad (6)$$

The study estimates the combined impact of legal institutions and financial development on financial inclusion using Equation (7). As a result, the following term for the interaction between legal systems and financial development is added to the formula:

$$FI_{it} = \beta_0 + \beta_1 FI_{it-1} + \beta_2 FD_{it} + \beta_3 Legal_{it} + \beta_4 Legal_{it} * FD_{it} + \beta_5 gfcf_{it} + \beta_6 inflation_{it} + \beta_7 lendingrate_{it} + \beta_8 trade_{it} + \beta_9 GDP_{it} + \beta_{10} FDI_{it} + \beta_{11} consumption_{it} + \beta_{12} exchange_{it} + \beta_{13} Internet_{it} + \beta_{14} COVID_{it} + u_i + v_i + \varepsilon_{it} \quad (7)$$

Finally in Equation (8), the channel through which COVID-19 could affect financial inclusion is model. The study hypothesise that the use of internet could serve as a mechanism through which COVID-19 could affect financial inclusion. This interaction is indicated as

$$FI_{it} = \beta_0 + \beta_1 FI_{it-1} + \beta_2 Legal_{it} + \beta_3 gfcf_{it} + \beta_4 inflation_{it} + \beta_5 lendingrate_{it} + \beta_6 trade_{it} + \beta_7 GDP_{it} + \beta_8 FDI_{it} + \beta_9 consumption_{it} + \beta_{10} exchange_{it} + \beta_{11} Internet_{it} + \beta_{12} COVID_{it} + \beta_{13} COVID_{it} * Internet_{it} + u_i + v_i + \varepsilon_{it} \quad (8)$$

Where $t = 1, \dots, T$ and $i = 1, \dots, N$ where N and T denotes the countries and the number of time periods respectively. $u_i, \varepsilon_{it}, v_i$ are the country-specific effects, errors, and time-effects respectively.

3.4. Description and measurement of variables

where FI is a financial inclusion variable and estimated as the dependent variable. It is calculated as the total of effective mobile phone subscribers per 100 people (Gebrehiwot and Makina, 2019).

FD_{it} Based on information from the International Monetary Fund, Svirydzhenka (2016) created the financial development index, or FD. It is an extensive index that illustrates various aspects of financial growth, such as the efficacy, depth, and accessibility of financial markets and institutions. Other indicators of financial development that have been

used in the literature include liquid liabilities, private credit, and domestic credit, while market capitalization, or the value of traded shares, is commonly used to describe stock market development (Ibrahim and Alagidede, 2018). Agbloyor et al. (2014). The GDP ratio of domestic loans to the private sector is another financial development indicator that was considered in this research (Gopalan and Rajan, 2015). The degree of financial inclusion is anticipated to be positively impacted by financial development.

Legal, derived from the Fraiser Institute’s Economic Freedom Index database, is a measure of the efficacy of legal institutions. It is computed based on five factors: the rule of law, absence of corruption, efficiency of the judiciary system, contract enforcement, and property rights protection. It is scored on a scale of 0–10. Countries with high scores tend to have very effective legal systems. Effective legal systems are expected to positively influence financial inclusion by increasing people’s confidence in financial institutions.

GCFC is a proxy for measuring economic investment activities and represents gross fixed capital formation as a percent of GDP. Sourced from WDI database. Investments could be a significant factor in enhancing financial inclusion by offering resources for increasing access to financial services/products (N’dri and Kakinaka, 2020). Financial inclusion is also expected to be enhanced through the decrease of the charges of financial services.

Inflation. Measured annually, **inflation** is the variation in an economy’s prices for goods and services. The consumer price index’s percentage fluctuations are used to measure it. As Beck et al. (2007) indicate, high inflation erodes the purchasing power of individuals, particularly those with lower incomes. This can make financial services and products, such as banking fees or loan interest rates, less affordable for the financially vulnerable, hindering their ability to access and utilise financial services effectively.

Lending rate. The average interest rate at which formal financial institutions lend money to the private sector is known as the **lending rate**. Higher rates are expected to increase the cost of borrowing, thereby discouraging agents from using formal financial services. It is thus expected to dampen financial inclusion.

Trade is measured as the summation of imports and exports as the ratio of GDP. The World Bank (2019) shows that trade openness is a significant positive factor determining financial inclusion, fostering competition, innovation, and efficiency in financial markets. They can also facilitate the adoption of digital technologies and financial innovations, which can greatly enhance financial inclusion. Thus, trade is expected to have a significant positive impact on financial inclusion.

GDP represents the level of Gross Domestic Product per year. Therefore, it was used as a measure of economic health. This is expected to affect financial development positively.

FDI indicates the net inflow of foreign direct investment into an economy. It is measured as the net inflow of foreign direct investment to FDI as a ratio of Gross domestic product. FDI inflow improves internal finance and efficiency, as Chen (2021) indicated; thus, it is expected to affect financial inclusion positively.

Consumption is the ultimate amount that households in an economy spend on consumption. It is calculated as the GDP divided by total private consumption. It is collected from the World Bank’s publication of World Development Indicators. According to Demirguc-Kunt et al. (2017), information and communication technology is necessary for the availability and purchase of specific products, which could lead to a rise in financial inclusion.

The **Exchange rate** is the official rate at which a domestic currency is exchanged for the US dollar. Exchange rate stability is crucial for financial institutions to provide various financial products and services. Excessive exchange rate volatility can create uncertainty and risks for financial institutions, limiting their ability to offer services such as foreign currency loans, hedging instruments, and international investment options. This may restrict the choices available to individuals and businesses, affecting their financial inclusion.

Internet represents the usage of internet among the population. It is measured as the broadband subscription per 100 persons. Internet usage is expected to influence financial inclusion positively (Friedline, 2017).

COVID is a dummy variable which captures the influence of the COVID-19 pandemic in SSA. Even though COVID-19 has been a disruption to economic systems, it is however expected that the COVID-19 pandemic will induce innovation and increase the demand for digital financial services especially during the periods of social restrictions and closure of international borders.

3.5. Model diagnostics and robustness checks

The consistency of the GMM estimator is impacted by the validity of the instruments. Two specification tests to solve this issue are considered in the study: Arellano and Bover (1995), Arellano and Bond (1991), and Blundell and Bond (1998). The sample analogue of the actual conditions utilised in the evaluation process is examined in the first test, the Sargan test statistic of overidentifying restraints, which assesses the general validity of instruments used. The error component’s possible non-serializability is examined in the second test. To ascertain whether the error term differenced is second order correlated serially, the regression differenced and system difference-level regressions are both analysed (by construction, even if the original error term is not serially correlated, the differenced residual is likely to be first-order serially correlated).

A bootstrapped quantile regression analysis is carried out to further evaluate if the link proposed by the main model is constant across the whole distribution of financial inclusion. Using quantile regression helps us determine whether financial development and legal systems influence very low levels of financial inclusion different from higher quantiles of financial inclusion.

4. Findings and discussion

Table 1 shows the summary statistics for the variables in the study. The mean value of the proxy for financial inclusion is 51.87 percent. According to the sample countries examined, it is implied that, out of every 100 individuals, 51.87 percent are financially included. The variance in the impact of the evolution of legal institutions and the financial system on financial inclusion may be examined thanks to the significant standard deviation of 43.031. Financial development is measured by two proxies: the financial development index and the ratio of domestic credit to GDP in the domestic private sector.

The average value of the financial development index is 14.259, and a standard deviation of approximately 10.714. Throughout the period of study, domestic credit allocated to the private sector in Sub-Saharan Africa (SSA) showed an average of around 18.182 percent of GDP. Notably, certain economies within SSA observed levels as high as

Table 1
Summary Statistics.

Variable	Count	Mean	Std Dev	Minimum	Maximum
Inclusion	936	51.875	43.031	0	185.559
FD	943	14.259	10.714	2.629	64.265
gfcf	839	22.26	8.782	1.097	81.021
inflation	936	12.202	88.277	-21.165	2630.123
lendingrate	861	17.756	3.817	14.518	25.795
Trade	875	69.502	35.647	.757	225.023
growth	941	4.081	4.545	-36.392	33.629
fdi	942	4.426	7.95	-18.918	103.337
Consumption	799	6.885	26.246	-55.348	565.539
exchange	938	571.534	1088.043	.545	9565.082
Internet	909	30.507	22.177	.013	159.329
covid	943	.13	.337	0	1
Privatecredit	917	18.182	17.02	0	104.849
Legal	943	36.741	7.712	15.8	60.1

Source: Authors computation

approximately 104.849 percent of GDP during this period, with a standard deviation of roughly 17.02.

Using both indicators, the level of financial development is very low in the sub region. Also, the level of development of legal institutions is relatively with a mean of 36.741 and a standard deviation of about 7.712.

Gross domestic product in sub-Saharan Africa grows 4.081 percent per annum. During the sample period, while some economies recorded negative growth rates of GDP, other had a growth rate of about 33.629 percent per annum. Usage of internet within the sub-region averages around 30.507 percent of 100 persons in the population. While some economies recorded as little as 0.013 percent, other economies recorded about 159.39percent. This implies a wide discrepancy in the spread of internet across SSA.

4.1. Correlation matrix

The correlation matrix reported in Table 2 shows no signs of high correlation between variables, and thus models containing the variables are likely not to suffer from multicollinearity. The correlation of the financial development, legal institutions and financial inclusion is 0.481, and 0.311, respectively.

4.2. Results of the effect of financial development and legal systems on financial inclusion

Table 3 shows the influence of financial development and legal institutions on financial inclusion in sub-Saharan Africa. Table 3 presents the four models that were estimated. Model 1 estimates the impact of financial development, taking into account additional control variables, on financial inclusion. The influence of legal institutions is eliminated in this formula. The influence of legal institutions on financial inclusion is estimated via Model 2. To determine the influence of financial development, legal institutions, and their interaction on financial integration, model 3 incorporates and estimates the relationship between financial development and these entities. Model 4 shows the interaction between COVID-19 and the use internet to test the transmission of COVID-19 pandemic to financial inclusion using internet.

The ARL test for serial autocorrelation and Hansen test of instrument validity indicates that models 1, 2, 3 and 4 do not suffer from autocorrelation and instruments used are valid and strictly exogenous. To correct for endogeneity, the first lags of the independent variables are treated as instruments.

According to model 1, there is a substantial positive correlation between the degree of financial inclusion and financial development. The rate of financial inclusion is predicted to rise by roughly 1.212 percent for every 1% growth in financial development. This outcome agrees with what Evans (2015) and Ozili (2020) found. The promotion of financial

inclusion depends heavily on financial development. Access to formal financial products like banks, insurance services, and capital markets is made possible by a well-developed financial system. Economic theory holds that financial development lowers information and transaction costs, facilitating participation in the financial system for both individuals and enterprises. The quality and variety of financial services and products, such as credit, insurance, savings, and payments, that cater to the requirements of various demographic groups, particularly the underprivileged and marginalised ones, can also be enhanced by financial development. Through digital financial services, which can reduce costs and hazards associated with financial transactions and improve client convenience and accessibility, it also promotes innovation and competition in the financial industry (Allen et al., 2016). The advent of mobile money technology has made financial goods more accessible in sub-Saharan Africa. Members of the financial systems who did not previously have access to official bank accounts have been included.

Legal institutions have a significant positive effect on financial inclusion. This is indicated in model 2 of Table 3. Development of legal institutions is anticipated to increase financial inclusion by about 1.331 per cent. This result supports the theoretical argument that legal institutions provide the necessary framework for enforcing contracts, protecting property rights, and resolving disputes, which are essential for facilitating financial transactions and plummeting asymmetric information and moral hazard (La Porta and Lopez-de-Silanes, 1998). It also confirms the empirical findings of Allen et al. (2016), who found that legal institutions positively affect financial inclusion across different regions of the world. Economic theory suggests that robust legal institutions reduce transaction costs, promote trust, and encourage financial inclusivity. Previous studies have highlighted the positive correlation between legal institutions and financial inclusion ((Chinoda et al., 2019; Nkoa and Song, 2020; Ozili, 2021).

According to Model 3, financial inclusion is significantly impacted by both legal institutions and financial development. However, when the interaction term between legal systems and financial development is taken into consideration, the effect of financial development on financial inclusion reverses. The interaction coefficient for legal institutions and financial development is a significant factor affecting financial development. The interaction of financial development and legal institutions increases financial inclusion by about 0.056. The positive interaction suggests that a well-developed legal system enhances the significant positive influence of financial development on financial inclusivity in SSA. A well-developed legal system plays a significant role in enhancing the impact of financial development on financial inclusion. This is accomplished by guaranteeing property rights, ensuring contract enforcement, providing effective dispute resolution procedures, and protecting consumers through transparent and fair regulations. These legislative foundations encourage people, especially vulnerable

Table 2
Correlation Matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Mobile	1.000													
(2) FD	0.481*	1.000												
(3) gfcf	0.214*	0.048	1.000											
(4) Inflation	-0.071*	-0.050	-0.031	1.000										
(5) lendingrate	-0.618*	-0.118*	-0.220*	0.095*	1.000									
(6) Trade	0.292*	0.322*	0.335*	-0.037	-0.051	1.000								
(7) growth	-0.145*	-0.100*	0.087*	-0.081*	-0.004	-0.019	1.000							
(8) fdi	0.054	0.012	0.409*	-0.008	-0.073*	0.381*	0.042	1.000						
(9) Consumption	-0.077*	-0.036	-0.024	-0.025	0.065	-0.027	0.129*	0.010	1.000					
(10) exchange	-0.047	-0.230*	0.004	-0.023	-0.081*	-0.131*	0.032	-0.061	0.022	1.000				
(11) Internet	0.499*	0.681*	0.126*	-0.068*	-0.150*	0.458*	-0.133*	0.035	-0.075*	-0.189*	1.000			
(12) covid	0.251*	0.026	0.019	-0.007	-0.122*	-0.038	-0.168*	-0.033	-0.007	0.055	0.143*	1.000		
(13) Privatecredit	0.489*	0.768*	0.055	-0.070*	-0.183*	0.283*	-0.097*	-0.030	-0.081*	-0.205*	0.865*	0.073*	1.000	
(14) Legal	0.311*	0.656*	0.145*	-0.103*	-0.024	0.233*	0.064*	0.017	-0.030	-0.186*	0.527*	0.013	0.562*	1.000

*** p<0.01, ** p<0.05, * p<0.1

Table 3
Results of Two Step System-GMM.

	(1)	(2)	(3)	(4)
L.Mobile	0.724***(0.0398)	0.767***(0.0291)	0.786***(0.0354)	0.766***(0.049)
Financial development	1.212***(0.322)		-2.832*(1.473)	-1.041**(0.556)
Legal		1.331***(0.348)	1.012*(0.516)	1.842***(0.513)
Financial development*Legal			0.0561*(0.0297)	
Gfcf	-0.0716(0.0874)	-0.337**(0.142)	-0.208(0.184)	-0.477***(0.173)
Inflation	0.249***(0.0521)	0.367***(0.0770)	0.387***(0.0792)	0.456***(0.087)
lendingrate	-1.566***(0.235)	-1.487***(0.185)	-1.450***(0.189)	-1.445***(0.233)
Trade	-0.0755*(0.0387)	-0.0449(0.0431)	-0.0430(0.0452)	-0.074(0.050)
Growth	1.084***(0.207)	0.625***(0.207)	0.715***(0.228)	0.497***(0.195)
Fdi	0.0674(0.164)	0.238(0.150)	0.0939(0.173)	0.285(0.195)
Consumption	-0.0382(0.0439)	-0.0537(0.0374)	-0.0936*(0.0516)	-0.104*(0.055)
Exchange	0.00246***(0.000622)	0.00170***(0.000491)	0.00156***(0.000666)	0.001(0.001)
Internet	0.542***(0.137)	0.576***(0.144)	0.548***(0.146)	0.997***(0.224)
covid	4.953**(1.892)	-0.00150(2.355)	-0.104(3.026)	5.934(4.175)
COVID*Internet				0.221****(0.072)
Constant	12.53****(3.845)	-17.89*(9.044)	-2.119(14.88)	-29.204***(12.489)
Observations	638	638	638	638
Number of Instruments	29	29	29	29
AR1 Stat [P-Value]	0.000301	0.000562	0.000946	0.0002
AR2 Stat [P-Value]	0.730	0.934	0.834	0.906
Hansen-J Stat [P-Value]	0.538	0.594	0.624	0.671

Standard errors in parentheses and significant values are * $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

populations, to interact with formal financial institutions and receive necessary financial services. They also promote trust, confidence, and stability in the financial system. This result corroborates the findings of Ozili (2021) and Anarfo et al. (2020). Even though Aluko and Azeze (2019), argues that institutional development in sub-Saharan Africa is relatively low compared to other regions in the world and this they attribute to bottlenecks such as enforcement issues resulting from poor infrastructure, and corruption, the result indicates that legal institutions still play a significant role in improving financial inclusion in the sub region.

Inflation is a significant determinant of financial inclusion in sub-Saharan Africa. As indicated in Table 3, the inflation rate significantly positively affects financial inclusion in all models. The lending rate has a negative significant negative effect on financial inclusion. In all models in Table 3, increasing the lending rate tends to dampen the rate of financial inclusion. The result is consistent with the theoretical argument that the lending rate reflects the cost of borrowing and the risk premium in the financial market and thus affects the demand and supply of credit (Mishkin, 2007). A high lending rate can discourage potential borrowers from accessing formal financial services, especially those who are poor or have low incomes. It can also reduce the profitability and sustainability of financial intermediaries, especially those who serve the low-end market segment.

The growth rate also has a positive impact on the level of financial inclusion across all models. Park and Mercado (2015) argued that economic growth could enhance financial inclusion by increasing income levels, reducing poverty and inequality, creating more opportunities and incentives for saving and investing and expanding the size and diversity of the financial market.

In SSA, internet usage has a significant role in determining financial inclusion. Financial inclusion may be enhanced by increased internet use. The outcome supports the claim that using the internet can lower information and transaction costs, improve accessibility and convenience of financial services, spur competition and innovation in the financial industry, and open up new delivery channels and modes like fintech and mobile banking (Demirguc-Kunt et al., 2018). Additionally, it supports the empirical results of Asongu et al. (2019), who discovered that internet usage positively influences a number of financial inclusion measures using data from 49 African nations between 2004 and 2011.

The world economy has been significantly impacted by the COVID-19 pandemic. Despite its difficulties, it also contributed to greater financial inclusion in the sub-region by hastening the use of digital

financial services, particularly for small enterprises and low-income people (Demirguc-Kunt et al., 2021). The epidemic increased the usage of digital payments, including utilising a card, phone, or the internet to pay utility bills or retailers straight from an account. Access to other financial services, like managing cash flows, borrowing, and saving, may be made possible by these digital payments. COVID-19 is a major factor in influencing financial inclusion, but only in the first model, as Table 3 shows. Ganum and Thakoor (2021) also argued that the COVID-19 improved internet usage in the sub region. The expansion of internet in the sub region is an important driver for financial inclusion and the growth of financial services. The results indicates that internet expansion has improved financial inclusion in the sub region, and this could serve as a good channel through which the COVID-19 shock could positively impact the growth of financial inclusion in SSA. In model 4, shown in column 4, it is further seen that the effect of COVID-19 on financial inclusion through the use of internet in SSA increased financial inclusion by about 0.221 percent. During the period of the COVID 19 pandemic the use of the internet services increased substantially especially during lockdowns, to reducing physical contacts (Demirguc-Kunt et al., 2021). Financial transactions were conducted using the internet and other electronic means prompting the needed to be included in the financial space.

4.3. Robustness checks

The study creates a novel model of financial inclusion for robustness tests and employs the ratio of private sector credit to GDP as an alternative indicator of financial progress. The system GMM model is used to approximate this, as Table 3 illustrates. The study also computes a quantile regression to determine whether the effects of financial development and legal institutions on financial inclusion vary at different quantiles of the financial inclusion variable. Table 4 and Table 5, respectively, show the outcomes. To account for regional heterogeneities, each model is estimated with regional dummies. This is done to account for the individual fixed effects that could be present in the models.

The result diagnostics in Table 4 indicates the models 1, 2, 3 and 4 do not suffer from autocorrelation and instruments used are valid and strictly exogenous. To correct for issues of endogeneity, the first lagged values of the independent variables are treated as instruments.

The findings presented in Tables 4 and 5 highlight a compelling argument for the positive influence of financial development and legal

Table 4
Effect of financial development on financial inclusion (credit to the private sector to GDP).

	(1)	(2)	(3)	(4)
L.Mobile	0.757***(0.0463)	0.767***(0.0291)	0.788***(0.0356)	0.761***(0.039)
Privatecredit	0.577***(0.247)		1.863*(0.990)	0.286***(0.112)
Legal		1.331***(0.348)	2.389****(0.522)	1.487****(0.421)
Privatecredit*Legal			0.0479***(0.0223)	
gfcf	-0.134(0.131)	-0.337***(0.142)	-0.447***(0.167)	-0.382***(0.151)
inflation	0.299****(0.0878)	0.367****(0.0770)	0.514****(0.105)	0.382****(0.084)
lendingrate	-1.183****(0.228)	-1.487****(0.185)	-1.302****(0.191)	-1.566****(0.199)
Trade	-0.0712(0.0490)	-0.0449(0.0431)	-0.0270(0.0471)	-0.059(0.051)
growth	1.451****(0.282)	0.625****(0.207)	0.263(0.259)	0.479***(0.216)
fdi	0.0973(0.209)	0.238(0.150)	0.215(0.174)	0.253(0.163)
Consumption	-0.0663(0.0494)	-0.0537(0.0374)	-0.0725(0.0441)	-0.066(0.039)
exchange	0.00213****(0.000613)	0.00170****(0.000491)	0.00130***(0.000708)	0.002****(0.001)
Internet	0.589****(0.150)	0.576****(0.144)	0.611****(0.160)	0.808****(0.207)
covid	6.584****(2.210)	-0.00150(2.355)	-2.372(2.776)	3.077(3.931)
COVID*Internet				0.129***(0.061)
Constant	8.130(5.221)	-17.89*(9.044)	-57.89****(17.71)	-20.842(10.444)
Observations	638	638	638	638
Number of Instruments	29	29	29	29
AR1 Stat [P-Value]	0.000341	0.000562	0.000753	0.0001
AR2 Stat [P-Value]	0.832	0.934	0.897	0.861
Hansen-J Stat [P-Value]	0.411	0.594	0.675	0.530

Standard errors in parentheses and significant values are * p<0.10, ** p<0.05, *** p<0.010*

Table 5
Effect of financial development and legal institutions on financial inclusion using a bootstrapped quantile regression.

Variables	Quantile 0.25			Quantile 0.50			Quantile 0.75		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Financial development	0.960*** (0.149)		2.225*** (0.822)	1.265*** (0.226)		3.337*** (0.831)	1.297*** (0.225)		2.758*(1.447)
Legal		0.606*** (0.190)	0.452* (0.239)		1.021*** (0.159)	0.978*** (0.287)		1.106*** (0.162)	0.882** (0.428)
Interaction			-0.0256* (0.0155)			-0.05*** (0.0168)			-0.0330 (0.0286)
Gfcf	0.563*** (0.177)	0.494** (0.202)	0.412*** (0.157)	0.391* (0.205)	0.306(0.255)	0.318(0.236)	0.335* (0.185)	0.231(0.205)	0.281*(0.152)
Inflation	0.00582 (0.141)	0.00738 (0.0638)	0.00914 (0.0825)	0.000331 (0.172)	0.00704 (0.134)	0.00728 (0.170)	0.00268 (0.102)	0.00815 (0.104)	0.00738 (0.0979)
lendingrate	-4.20*** (0.377)	-4.05*** (0.235)	-4.53*** (0.314)	-5.51*** (0.349)	-5.78*** (0.309)	-5.46*** (0.359)	-7.07*** (0.232)	-7.13*** (0.269)	-6.99*** (0.274)
Trade	0.00397 (0.0606)	0.0229 (0.0492)	0.0564 (0.0444)	0.0198 (0.0358)	0.0519 (0.0384)	0.0602 (0.0400)	0.122*** (0.0431)	0.140*** (0.0413)	0.141*** (0.0383)
Growth	-0.843* (0.461)	-0.868** (0.358)	-0.97*** (0.352)	-1.00*** (0.376)	-0.92*** (0.340)	-1.01*** (0.353)	-0.0730 (0.197)	-0.259(0.240)	-0.374(0.235)
Fdi	-0.147(0.138)	-0.120(0.143)	-0.0702 (0.108)	-0.332 (0.262)	-0.209(0.272)	-0.140(0.315)	-0.0397 (0.314)	0.0937 (0.401)	-0.00272 (0.200)
Consumption	-0.00763 (0.0718)	-0.00700 (0.0296)	-0.0108 (0.0412)	-0.0384 (0.0509)	-0.00515 (0.0609)	-0.0455 (0.0900)	-0.0251 (0.0470)	-0.0287 (0.0558)	-0.00283 (0.0675)
Exchange	0.00218* (0.00114)	0.00106 (0.00113)	0.002** (0.001)	0.0001 (0.00144)	-0.00143 (0.00154)	-0.00014 (0.00118)	-0.001 (0.0017)	-0.00080 (0.00211)	-0.00035 (0.00131)
Internet	0.269*** (0.0833)	0.475*** (0.0805)	0.165(0.134) (0.0936)	0.0972 (0.0936)	0.387*** (0.0838)	0.0212 (0.108)	0.0477 (0.104)	0.376*** (0.0908)	-0.0483 (0.102)
covid	17.68** (7.725)	19.20*** (4.924)	17.81* (10.29)	19.76** (8.357)	13.29(10.28)	20.09** (9.696)	21.42*** (7.623)	22.00*** (8.048)	21.87*** (6.812)
Constant	73.12*** (7.181)	57.95*** (7.966)	63.51*** (6.741)	121.0*** (11.00)	97.80*** (13.06)	82.79*** (13.47)	158.9*** (9.006)	130.5*** (9.647)	127.1*** (18.09)
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	680	680	680	680	680	680	691	690	650
R-Square	0.3884	0.3732	0.3925	0.4019	0.3927	0.4138	0.4110	0.3955	0.4172

Bootstrapped Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.010

institutions on financial inclusion. These results contribute to a growing body of literature that emphasizes the crucial role played by economic and legal frameworks in shaping the inclusivity of financial systems.

First and foremost, it is critical to recognise that there is a positive correlation between financial development and financial inclusion when measured by domestic credit as a percentage of GDP. This is in line with the more general systems theory of financial inclusion, which holds that

a strong financial sector enables greater access to financial services for both individuals and enterprises. The fact that the favourable effect is not only statistically significant but also constant across quantiles suggests that the positive link is robust and holds across various levels of financial inclusion.

Furthermore, Table 4’s evidence of the influence of legal institutions on financial inclusion strengthens the case earlier argued. Given the

positive and significant impact of legal institutions, it is clear that a strong legal foundation is necessary to promote an inclusive financial environment. This result is consistent with the theory that strong legal systems offer the structures and protections required to promote confidence and involvement in the financial system.

The analysis of the results across different quantiles in Table 5 further strengthens the argument by showing that the positive influence of financial development and legal institutions on financial inclusion becomes more pronounced as we move towards higher quantiles. This implies that as financial systems and legal institutions develop further, their impact on financial inclusion intensifies, leading to more substantial benefits for the economy. In Table 5, the influence of financial development on financial inclusion on various quantiles of financial inclusion is positive and increases with higher quantiles. For a percentage increase in financial development, financial inclusion increases by 0.960, 1.265 and 1.297 per cent, respectively, for the 25th, 50th and 75th quantile. The effect of financial development tends to increase for higher values of financial inclusion. Similarly, legal institutions significantly positively affect financial inclusion at the various quantiles. A percentage increase in the level of legal institutions will increase financial inclusion by about 0.606, 1.021 and 1.106 per cent, respectively, for the 25th, 50th and 75th quantiles.

The result also indicates that financial inclusion during the COVID-19 pandemic increased, and this is pass through is captured through the interaction between internet usage and COVID-19. The results indicate in Table 4 that during the periods of COVID-19, internet usage increased financial inclusion by about 0.129 percent. This result is consistent with the findings of Ganum and Thakoor (2021). An intriguing aspect of the study is the examination of the COVID-19 period's impact on financial inclusion, particularly the role of internet usage. The finding that internet usage during the pandemic increased financial inclusion by about 0.129 percent adds a contemporary dimension to the discussion. This result is not only relevant in the context of the pandemic but also aligns with the broader trend of digitalization playing a pivotal role in enhancing financial access.

The commentary points out that these results are consistent across multiple financial development metrics and estimating approaches, which lends validity to the conclusions. This implies that the effects of legal institutions and financial development on financial inclusion are well-established and insensitive to particular methods of measurement or analysis. The results in Tables 4 and 5 indicate that the effect of financial development on financial inclusion is consistent with the results estimated in Table 3.

5. Conclusion

This study used data from the World Development Indicators database and the Fraiser Institute database to analyse the effects of legal institutions and financial development on financial inclusion in sub-Saharan Africa using a sample of 41 countries between 2000 and 2022. The two-step sys GMM estimation model is applied to the study's objective. The study further investigates the robustness of the two-step system GMM estimations using a bootstrapped quantile regression estimation technique. In all models, the effect of COVID-19 is included, to serves as a shock parameter to the economy. The empirical findings demonstrate that financial development has a significant influence on financial inclusion in SSA. Using a range of financial development criteria and estimation techniques, it is evident that financial development and legal institutions greatly enhances financial inclusion in sub-Saharan Africa.

The results of the system GMM indicates that financial development and legal institutions have significant positive influences on financial inclusion. The study also indicates that the effect of financial development on financial inclusion is positively moderated by the presence of legal institutions implying that the effect of financial development to financial inclusion could be facilitated by the legal institutional

structures. When the measure of financial development is changed, the analysis still followed the same argument. Using a quantile regression technique, it is observed that the influence of financial development on financial integration increases at higher distributions of financial inclusion. However, at the lower quantiles of financial inclusion, legal institutions negatively moderate the effect of financial development on inclusion. COVID-19 has also improved access to financial services as indicated in the results. Internet usage also positively improves financial inclusion. The effect of COVID-19 on financial inclusion is argued to have been facilitated by internet use while financial development is transmitted through effectiveness of legal institutions.

5.1. Policy implications

The outcomes of the study could have valuable policy and managerial implications. To promote the advancement of financial development in SSA, it is imperative for governments and financial institutions to place emphasis on prioritizing initiatives that would facilitate the establishment and expansion of financial institutions that cater specifically to the needs and preferences of the local population. This could entail the implementation of various strategies, such as the promotion of microfinance, cooperatives, and mobile money providers. Additionally, efforts should be made to improve the private sector's access to credit by reducing collateral requirements, interest rates, and bureaucratic procedures. Furthermore, alternative financing sources, such as crowdfunding, peer-to-peer lending, and venture capital, should be actively promoted. It is also crucial to foster a regulatory framework that is conducive to financial innovation and inclusion. This can be achieved through the establishment of clear and consistent rules, standards, and oversight mechanisms for financial service providers, as well as ensuring consumer protection and financial literacy. Policies could also be designed to specifically target areas of populations with lower levels of financial inclusion to ensure a more equitable distribution of benefits.

Enhancing legal institutions serves a crucial role in fostering financial integration, as it has the potential to augment trust, transparency, and accountability within the financial system. Governments must accord priority to strengthening the legal and regulatory framework that oversees financial services, through enhancing the efficiency and efficacy of the judiciary, nurturing the capabilities and integrity of legal professionals and institutions, and reforming the laws and regulations governing financial transactions, including contract enforcement, safeguarding property rights, and curbing corruption. It is imperative for them to synchronize and coordinate the legal frameworks across various nations and regions, thereby facilitating cross-border trade and integration. Despite the lockdowns and social distancing measures caused by the COVID-19 pandemic, the study indicates that access to financial services has improved in sub-Saharan Africa as people have migrated to digital platforms. By leveraging technology and digitalization and open innovation in the financial sector, policymakers can further increase financial inclusion in rural areas and among underserved groups, this may involve extending mobile banking coverage and adoption of digital payment systems and fintech innovation. It is also imperative that policymakers address the challenges and risks associated with digital finance, such as cybersecurity, data privacy, and financial fraud. Open innovation in the financial sector, particularly in mobile payments, can benefit from the positive impact of financial development on inclusion. Also, open innovation in delivery services can benefit from financial inclusion initiatives, ensuring that individuals and businesses across diverse economic strata have access to efficient and affordable delivery services.

5.2. Limitations and further research

The study is limited by its inability to account for obstacles to legal reform implementation, that could alter the relationships between independent variables and the dependent variable. Future research could

probe into this. Further research works should delve into finding the challenges in implementation of legal reforms and how this could affect the role of institutions in achieving macroeconomic stability and other financial reforms as well as other sociopolitical factors which influences financial inclusion in the sub regions. Also, in as much as the choice of variables and methodology in this study is comprehensive, further studies could the asymmetric relationship between financial development, institutions and financial inclusion.

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Ethical statement

Ethical Statement/Approval is not applicable because the research paper does not include animal and humans as subjects.

CRediT authorship contribution statement

Mohammed Gbanja Abdulai: Conceptualisation, Formal analysis, Methodology, Writing original draft. **Haruna Issahaku:** Methodology, Writing original draft, Validation, Review and Editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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