Financial inclusion: a catalyst for financial system development in emerging and frontier markets

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Abstract

Purpose – This study aims to examine the relationship between financial inclusion and financial system development in emerging and frontier markets.

Design/methodology/approach – Using data across 35 countries over 19 years (2004–2022), the improved GMM estimation technique reveals that financial inclusion significantly contributes to the development of financial systems.

Findings – The study uses a segmented approach, dividing financial development indices into subindices: financial depth, financial access and financial efficiency. Indicators of bank financial inclusion show a positive and highly significant relationship with bank depth and access but a negative relationship with bank efficiency. Similarly, indicators of the debt market and stock market financial inclusion demonstrate positive relationships with market depth and access but negative relationships with debt and stock market efficiency. The study further examines composite indexes of financial inclusion for bank, debt and stock market segments, finding strong and highly significant relationships with market development. These results underscore the importance of promoting financial inclusion across all segments of the financial sector to achieve an inclusive financial system.

Practical implications – The implications of this research highlight the need for policymakers and practitioners to implement policies and regulations that enhance financial inclusion and foster the development of robust financial systems. By extending access to mainstream financial instruments and services, financial institutions can stimulate financial intermediation and support, thereby accelerating the development of the banking, debt and stock markets.

Originality/value – The study is robust to the use of several indicators of financial inclusion and financial development, and it forms part of the early studies that examine the close relationship between the two variables.

Keywords Financial inclusion, Financial sector development, Bank market, Debt market, Stock market, Frontier markets

Paper type Research paper

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1. Introduction

The dynamism of any economy is intricately tied to the health and robustness of its financial system. A well-functioning financial system is not only a catalyst for economic growth but also a cornerstone for achieving broader developmental goals. The interplay between financial development and economic progress has been a perennial focal point in economic discourse. As a policy instrument, financial development, which encompasses advancements in financial institutions and markets, has been underscored as a crucial means to attain the sustainable development goals (Demirguc-Kunt and Klapper, 2012). The provision of secure savings mechanisms, affordable credit access, efficient payment systems, reliable transfer channels and expert financial advice collectively invigorates financial system growth.

However, despite the undeniable importance of financial development, developing countries, particularly those within emerging and frontier markets, face a disparity in its realization compared to their more developed counterparts (Tchamyou and Asongu, 2017). These regions often house substantial populations and businesses engaged predominantly in informal, cash-based economies. These individuals and entities resort to unsupervised and unregulated informal financial services for their savings, remittance and credit needs (Demirguc-Kunt *et al.*, 2013).

Paradoxically, significant portions of resources are found dormant – tucked away under mattresses, hidden in wardrobes or stowed in unconventional hiding spots (Rutherford, 2000). This financial dormancy impedes effective intermediation, obstructing the developmental trajectory of the financial system. Consequently, the pertinent question emerges: Can a financial system be deemed developed when a vital component, namely, financial inclusion, remains inadequate or absent?

The large exclusion from the formal financial system (1.4 billion unbanked adults in 2021) is a major risk to the development of financial institutions and markets, and also to the complementary roles they played. According to Grohmann and Menkhoff (2017), economic policy in several nations systematically targets the development of financial systems by creating financial systems with a large possible quantum or amount of inclusion. Moreover, the survey works by Global Findex (2011) suggest that the development of the financial system depends largely on the number of people and enterprises that have access to and use finance (financial inclusion) in an economy. Accordingly, promoting increased financial inclusion remains an important intervention and incentive for driving the development of the financial system, in particular financial institutions such as banks and financial markets such as capital markets. In support, Ozili (2018) posits that the financial system is the beneficiary of financial inclusion. Also, financial inclusion is considered an effective policy instrument (tool) in ameliorating financial system inclusiveness (Ofosu-Mensah Ababio *et al.*, 2018).

Modern development economists advocate for the elevation of financial inclusion to a central position in the developmental agenda, as it is recognized as a pivotal element in accelerating financial system progress (Demirguc-Kunt *et al.*, 2018). Moreover, recent studies have convincingly demonstrated the critical role of financial inclusion in the nexus of financial development (Odugbesan *et al.*, 2022; Ozili, 2023; Ali *et al.*, 2022). For example, Odugbesan *et al.* (2022) examine the interplay between financial inclusion, financial development and sustainable progress in sub-Saharan African economies, highlighting the mediating role of foreign direct investment (FDI). Ozili (2023) delves into the determinants of FinTech and BigTech lending, with a particular focus on the roles of financial inclusion and financial development. Similarly, Ali *et al.* (2022) contribute empirical evidence that

underscores the linkage between financial inclusion, institutional quality and financial development, centering their analysis on OIC countries.

It is, however, incumbent upon us to acknowledge that some seminal studies (Demirguc-Kunt and Klapper, 2012; Yartey, 2018) have historically disregarded the pivotal role of financial inclusion in financial development. While these studies, such as those by Demirguc-Kunt Klapper (2012), Levine (2002) and Yartey (2008), have highlighted the positive statistical significance between financial development and economic growth, they have overlooked the nuanced impact of various financial inclusion indicators, especially those related to access and efficiency.

As we navigate this landscape of evolving perspectives, our study stands poised to address this lacuna in the literature. By delving into the relationship between financial inclusion and distinct components of the financial system, we shed light on the multifaceted impact of inclusive financial practices on financial system development. In doing so, we ascertain the role of financial inclusion in nurturing more resilient and progressive financial systems. The specific objectives of the study include:

- To examine the effect of financial inclusion on financial sector development.
- To examine the effect of financial inclusion on the different segments of financial market developments.
- To investigate how financial depth, access and efficiency respond to variations in financial inclusion.

2. Theoretical relevance, empirical evidence and hypotheses formation

The literature highlights the intricate relationship between financial inclusion and various dimensions of economic development. Mahato and Jha (2023) delve into whether financial inclusion fosters sustainable livelihood development, investigating the mediating role of microentrepreneurship. Odugbesan *et al.* (2022) affirm that financial inclusion and development indeed promote sustainable development among sub-Saharan African countries. Bhatter and Chhatoi (2023) analyze the interplay between financial inclusion, financial performance and mandatory corporate social responsibility, identifying potential synergies.

Inoue (2019) contributes insights by examining the impact of financial inclusion on poverty reduction in India, illuminating the role of inclusive finance in mitigating poverty. Ajide (2020) extends the exploration to Africa, investigating the link between financial inclusion and entrepreneurship. Furthermore, Yiadom *et al.* (2021) scrutinize the connection between financial inclusion, poverty and growth in Africa, focusing on the potential of institutions to mediate these relationships.

The literature also considers the global perspective. Yiadom *et al.* (2023a) explore the role of financial deepening, access and efficiency in influencing the relationship between environmental risk and FDI. Similarly, Ali *et al.* (2022) and Mensah *et al.* (2018) assert that institutional quality has favorable outcomes on macroeconomic developments, including financial inclusion and economic development. Additionally, Mensah *et al.* (2021) explore means of increasing financial development through FDI advocate for factors that could drive the inflow of foreign capital to boost financial inclusion. Environmental considerations are addressed by Boachie-Yiadom and Mensah (2021), who study the interplay between environmental risk, FDI and tax reforms. Furthermore, Yiadom *et al.* (2022) delve into the role of financial sector development in the connection between environmental risk and FDI.

Yalley *et al.* (2018) contribute to the discussion by examining the beneficiaries of bank recapitalization in Ghana. Ofosu-Mensah Ababio *et al.* (2023) argue that financial inclusion is a catalyst for renewable energy uptake in developing economies. Hence, to achieve the United Nations' "sustainable energy for all" goal, countries should widen the financial activities to cover neglected households.

Collectively, this body of work underscores the far-reaching implications of financial inclusion on diverse economic aspects. By building on these insights, our study aims to enhance comprehension of the intricate interplay between financial inclusion and financial system development in emerging and frontier markets.

Levine (2002) posits that financial systems are formed to tackle information and transaction costs, performing functions like resource allocation, risk mitigation and corporate control. Such systems have intermediation, informative and transformative roles in economic development. They mobilize and allocate resources efficiently, reducing information asymmetry, attracting foreign capital and enhancing corporate governance. The relationship between stock markets and banks is distinct, as argued by Levine and Zervos (1998). Stock markets offer unique services compared to banks. Foreign firms often use local banks for financial transactions, fostering the banking sector. Functional banks attract listed firms, promoting financial transactions and exploiting opportunities. A recent study by Ozili (2023) argues that exploring modern means like FinTech is effective in achieving financial inclusion and development.

Intensive margin theory suggests wealthy individuals and firms benefit from improved financial services, while the extensive margin theory focuses on expanding financial access and usage for underserved populations. The interaction between financial inclusion and financial systems is not limited to banked individuals; it includes the unbanked (Orji *et al.*, 2015).

The Consultative Group to Assist the Poor (CGAP) (2010) posits financial inclusion as a means to provide easy access and effective use of financial services, aiming to mobilize idle funds for households, businesses and institutions. Limited financial inclusion remains a challenge hindering financial system progress in developing economies. In 2011, Findex data revealed 2.5 billion unbanked adults globally, decreasing to 1.4 billion in 2021 (Demirguc-Kunt and Klapper, 2012). Even before COVID-19, 1.7 billion adults lacked access to formal financial services, primarily in developing nations, accounting for nearly 40% of adults without financial access (Vassiliades *et al.*, 2022; Demirguc-Kunt *et al.*, 2018). Zins and Weill (2016) highlight Africa's low financial inclusion, while China's vast unbanked population underscores the issue (Demirguc-Kunt *et al.*, 2017). These statistics underscore exclusion from formal financial services, with 1.4 billion people and enterprises lacking access. Limited access denies opportunities for savings, credit, remittances and ownership of financial products. Encouraging access and use of financial instruments by banks and capital markets can directly boost inclusion. Notably, in 2013, less than 40% of small and medium-sized firms in emerging economies obtained formal financial market loans or credit (World Bank Group, 2014).

Allen *et al.* (2016) contend that there is great promise that financial inclusion will bring the excluded population and businesses into the formal financial sector so that they can have access to and use formal financial services. For instance, an inclusive banking sector can advise its customers to raise long-term finance either in the form of debt, equity or hybrid from the capital market, instead of from the banks where they could only offer short-term loans which would not be appropriate for undertaking capital investments and projects. They could also advise customers who buy short-term

investments such as 91-day treasury bills and roll over for a long period to instead acquire long-term investments such as bonds from the capital markets. Inclusive banks could use increased inclusion prospects to boost their profits by relocating their surplus liquidity put in reserves at the central bank into equities and bonds through the capital markets.

CGAP (2010) notes financial inclusion initiatives aim to extend formal financial services like savings, remittances and credit facilities to those currently not using these services. Developmental partners and policymakers shift toward building inclusive financial systems, encompassing various formal financial products, notably from capital markets, to foster comprehensive financial development. For instance, Access Bank in Ghana promoted inclusion through a public share offering, preventing collapse and boosting the stock market (2016). Mitchell and Scott (2019) studied Argentina's use of financial inclusion to attract people to the formal system, observing increased card usage and reduced cash transactions.

Financial inclusion provides mainstream financial services to underserved populations and firms, enabling easy access to affordable, user-friendly services. It facilitates meaningful economic participation by low-income earners, microenterprises and more. This approach ensures widespread access to formal financial services, from accounts to remittances, enhancing economic empowerment.

This assertion buttresses Triki and Faye (2013), which describes financial inclusion as "all initiatives that make formal financial services available, accessible, and affordable to all segments of the population" that covers both demand and supply side factors. Demirguc-Kunt and Klapper (2012) maintain that financial inclusion – access to and use of formal financial services – is an important policy tool for inclusive financial development, the economic prosperity of countries and accomplishing the sustainable development goals of 2017. Demirguc-Kunt and Klapper (2012) document that better financial inclusion in the mainstream financial realm is related to enhancing financial depth, access or efficiency. So, mobilizing financial resources by putting together monies from a great number of depositors, savers or investors and allocating them to their most productive use is, therefore, key to the development of a vibrant, healthier and interdependent banking sector and capital market.

Unfortunately, the assertion that improved financial inclusion may accelerate the development of the financial system exists mainly in theory and developmental reports rather than empirical evidence. It is obvious from the literature evaluated that studies in such areas are momentously desired to facilitate initiatives, interventions, incentives and realistic policies by development partners, governments and policymakers. Thus, the extant studies suggest that factors other than the known ones might be responsible for improving their causal interlinkages. So, it is flawless from the extant literature that the conclusions drawn from the previous studies are mixed and not conclusive, hence this study addresses the lacuna in the literature.

Against this backdrop, the study puts forward the following hypotheses to be tested:

Ho1. Financial inclusion has no direct impact on financial sector development.

Ho2. Financial inclusion has no direct impact on the different segments of financial market development.

Ho3. Financial inclusion has no direct impact on financial depth, access and efficiency development.

3. Methods

3.1 Data and estimation technique

Data for the study is collected from the World Bank's World Development Indicators (World Bank Group, 2022). The data covers 35 countries over 19 years: 2004–2022. Countries were selected based on data availability. The countries can be found in Appendix 1 of the study.

In this study, following the works of Hayakawa (2016), the improved GMM estimation of panel vector autoregressive models (GMM-PVAR) methodology is used as the estimation technique. Vector autoregressive (VAR) models have been used lengthily in empirical works since the seminal work of Sims (1980). The benefit of VAR models is that one can analyze interactions of countless variables, often through impulse response analysis. Even though VAR models have been used extensively for time-series data analysis, several panel studies have also used VAR models. Holtz-Eakin *et al.* (1988) is the first study to use PVAR models. Following the latter study, several other studies, including Ofosu-Mensah Ababio *et al.* (2023) and Binder *et al.* (2005), have used PVAR. Most of these panel studies used GMM or IV estimators, which have become a standard approach for estimating dynamic panel models since the works of Holtz-Eakin *et al.* (1988). However, due to challenges with weak instruments, most recent researchers have resorted to the use of alternative GMM estimators by Arellano and Bover (1995) and Blundell and Bond (1998), which permit additional restrictions to be imposed on initial conditions (Yiadom *et al.*, 2023b).

The improved GMM estimator for PVAR models has been proposed as a superior approach to all the aforesaid GMM estimators and is designed to enhance the applicability of empirical studies (Hayakawa, 2016). This technique demonstrates that the IV estimator using instruments that deviated from past means has the same asymptotic distribution as the efficient bias-corrected FE estimator. Accordingly, the asymptotic properties of IV estimators using new instruments are derived. Moreover, the simulation results confirm that the proposed IV/GMM estimators outperform the GMM estimators – using instruments in levels – in many cases.

In the literature (Blundell and Bond, 1998; Hayakawa, 2007; Bun and Windmeijer, 2010), it is well-known that the GMM estimator using instruments in levels suffer from the problem of weak instruments when the variance ratio of the individual effects to the disturbance is large. However, the GMM estimator using new instruments does not suffer from this problem. A drawback of the new GMM estimators is that because the backward orthogonal deviation transformation is a kind of first-difference transformation, one estimation period is lost compared with the case in which instruments in levels are used. When T is small and N is large, all the GMM estimators introduced above are consistent and asymptotically normal. The intuition behind the degree of data persistence and the variance ratio of individual effects to disturbances is that instruments that deviated from past means have the same structure as infeasible optimal instruments. Therefore, Hayakawa (2016) introduced a system GMM estimator in the context of PVAR models. It demonstrates that the result still holds in a PVAR(p) model. Specifically, it considers a variable deviated from the past means, that is, backward orthogonal deviations.

3.2 Model specification

The relevant econometric models to be estimated for financial inclusion and financial system development are as specified as follows:

$$BSD_{it}^{J} = \alpha_i + \beta_\tau BSD_{it-1}^{J} + \rho_j^{'} FI_{it}^{'} + \sum_{m=1}^{p} X_{it}\lambda' + \mu_{it} \quad (1)$$

$$DMD_{it}^{J} = \alpha_i + \beta_\tau DMD_{it-1}^{J} + \rho_j^{'} FI_{it}^{'} + \sum_{m=1}^{p} X_{it}\lambda' + \mu_{it} \quad (2)$$

$$SMD_{it}^{J} = \alpha_i + \beta_\tau SMD_{it-1}^{J} + \rho_j^{'} FI_{it}^{'} + \sum_{m=1}^{p} X_{it}\lambda' + \mu_{it} \quad (3)$$

$$FSD_{it} = \alpha_i + \beta_\tau FSD_{it-1} + \rho_j^{'} FI_{it} + \sum_{m=1}^{p} X_{it}\lambda' + \mu_{it} \quad (4)$$

where:

FI_{it} = financial inclusion (the main variable of interest) for country i at time t;

BSD_{it}^{j} = banking sector development for country i at time t;$J$is the depth, activity (access) and efficiency of the market;

DMD_{it}^{j} = debt market development for country i at time t; $J$is the depth, activity (access) and efficiency of the market;

SMD_{it}^{j} = stock market development for country i at time t;$J$is the depth, activity (access) and efficiency of the market;

FSD_{it} = entire financial system development for country i at time t;

α_i = is unobserved country-specific effect;

X_{it} = matrix of explanatory control variables; and

μ_{it} = is the remaining disturbance term.

Other variables include account ownership by an adult (Account_Adult), Borrowing by an adult (Borrow_Adult), bank branches (Bank_branch), ATM availability (ATM), remittance (Remittance), mobile money usage (Mobile_usage), internet availability (Internet), economic growth (Economy_size), financial openness (Fin_open), trade openness (Trade_open), regulatory quality (Regulatory), bank charges (Bank_Charges), credit to private sector (Credit_priv), financial intermediation (Fin_intmedration), telephone availability (Telephone), control of corruption (Corruption), financial charges (Fin_charges), listed companies (Listed_comp), investment (Invest_FDI), inflation (Infla), bank financial inclusion index (Bankfiincl_Indx), debt financial inclusion (Debt_inclu_Indx), stock market financial inclusion index (Stock_inclu Indx) and overall financial inclusion index (Fin_inclu_indx).

Detail variables descriptions and units of measurement are included as supplementary.

3.3 Variables

3.3.1 Financial sector development indicators. The indicators chosen for assessing the development of the bank market, debt market, stock market and the overall financial sector

are grounded in the existing literature, particularly the works of Yiadom *et al.* (2023a), Ozili (2023), Yiadom *et al.* (2022) and Sahay *et al.* (2015).

Yiadom *et al.* (2023a) categorized essential financial development components into three dimensions: financial depth, access and efficiency. Building on this foundation, we used a set of indicators to measure these dimensions within each market.

The first financial sector development indicator, bank market development (BMD), comprises bank depth, bank activity and bank efficiency. Bank depth, representing the size of the banking sector relative to the economy, is quantified by the ratio of money and quasi-money (M2) to GDP. Bank activity, indicating access, is gauged through the bank intermediation ratio, which reflects lending and borrowing facilitation. Bank efficiency, reflecting liquidity, is measured by the interest rate spread, showing profitability and effectiveness.

The second indicator, debt market development (DMD), assesses depth, access and efficiency. Debt market depth is captured by the debt market capitalization, reflecting the total value of debt securities traded. Debt market activity, denoting access, is evaluated using the private debt ratio, indicating the proportion of private debt in the total market. Debt market efficiency or liquidity, is determined by the public debt-to-GDP ratio, showcasing the government's debt management capability.

The third indicator, stock market development (SMD), explores depth, access and efficiency. Stock market depth is calculated using the stock market capitalization, representing the total value of publicly traded stocks. Stock market activity, indicating access, is evaluated by the total value of shares traded as a percentage of GDP, indicating investor participation and liquidity. Stock market efficiency or liquidity, is assessed through the stock market turnover ratio, which showcases trading frequency and stock liquidity.

Through the application of these indicators, the study seeks to uncover the impact of financial inclusion on the development of the bank market, debt market, stock market and the overall financial sector. A comprehensive explanation of the variables and computation methods can be found in the Appendix of this study.

3.3.2 Financial inclusion indicators. To substantiate the selection of financial inclusion variables, we refer to the insights provided by Ozili (2023), Ofosu-Mensah Ababio *et al.* (2023), Yiadom *et al.* (2021) and Sahay *et al.* (2015). These studies underscore the effectiveness of bank account penetration, borrower penetration, ATM penetration and bank branch availability in measuring financial inclusion. Accordingly, the present study adopts similar proxies endorsed by prior research to gauge financial inclusion.

The financial inclusion indices chosen align with the BMD, DMD and SMD, furnishing valuable insights into the degree of financial inclusion and its influence on distinct financial sector components.

For BMD, we incorporate bank account penetration, borrower penetration, ATM penetration and bank branch availability. Bank account penetration reflects the number of bank accounts per 1,000 adults, capturing individuals' access to formal banking services. Borrower penetration gauges the number of borrowers from commercial banks per 1,000 adults, thereby portraying borrowing activity within the banking sector. ATM penetration denotes the availability of ATMs per 100,000 adults, signifying the accessibility of cash withdrawal services. Finally, bank branch availability signifies the presence of physical bank branches, facilitating face-to-face banking interactions.

In the context of DMD, we integrate financial intermediation, credit to private firms and remittances. Financial intermediation is assessed by the ratio of private credit by the entire financial sector to total deposits, reflecting lending activity and credit allocation efficiency. Credit to private firms indicates the extent of loans extended by the financial sector to the private sector as a proportion of GDP, thus reflecting credit availability for business endeavors. Furthermore, remittances contribute to DMD by augmenting the influx of funds into the economy.

Regarding SMD, the chosen financial inclusion indices encompass stock market accessibility, stock market penetration, remittances, mobile usage and internet usage. Stock market accessibility is gauged by the presence of domestically listed companies, elucidating investment opportunities. Stock market penetration/accessibility per adult quantifies listed companies per 1,000,000 individuals, thereby depicting individual engagement in the stock market. Remittances foster SMD by bolstering investment funds. Mobile and internet usage facilitate SMD by enabling access to market information and online trading.

These financial inclusion indices collectively provide a comprehensive framework to comprehend the determinants that shape the evolution of the bank market, debt market and stock market. By leveraging these indices, researchers can examine the influence of financial inclusion on distinct financial sector facets and identify avenues to bolster inclusive financial system development.

4. Results and discussion

This section contains the empirical results.

Appendix 2 contains the descriptive statistics, which give insights into the nature of the data set used in estimating the various models of the study. Appendix 2 highlights that the data is relatively stable and do not exhibit high deviations from their means. Again, the similarities among the variables used in the study may raise suspicions of multicollinearity. However, the variable inflation factor (VIF) results in Appendix 3 indicate that there is no concern for multicollinearity among the variables.

To be able to apply the GMM-PVAR estimation technique, preliminary checks were conducted to identify the lag levels, presence of unit root and cointegration. The results of these exercise are included in Appendices 4–6, respectively. The results pave the way for the application of the GMM-PVAR estimation techniques.

4.1 Effect of financial inclusion indices on financial developments indicators

In Table 1, the research study uses a segmented approach, dividing the financial development indices (bank market, debt market and stock market) into three subindices: financial depth, financial access and financial efficiency. These subindices serve as measures for evaluating the impact of financial inclusion on each component of the financial sector. Using the improved GMM, Table 1 presents the empirical results of equations (1)–(3). The Wald Chi-2 test results show that the instruments used and error terms are not correlated. Preliminary checks did not reveal any concern for multicollinearity.

Table 1 indicates that for most of the estimations conducted, the individual indicators of bank financial inclusion comprising accounts per adult, borrowers per adult, bank branch, ATM per adult, remittance, mobile and internet usage registered positive and highly significant relationship at 1% significance level with bank depth and access, while they established negative and highly significant relationship also at 1% significance level with bank efficiency. The findings show that if more and more individuals, households and

Table 1. Decomposed financial development and financial inclusion results

Variables	(1) Bank depth (M2/ GDP)	(2) Financial depth Debt_mkt depth (Debtmkt_cap)	(3) Stock_mkt depth (Stock_mkt_cap)	(4) Financial access Bank access (Bank_intmedtn)	(5) Debt_mkt access (Private_debt /GDP)
L, dependent	1.636** (0.731)	0.0537* (0.0325)	24.97*** (8.338)	0.548* (0.322)	0.0229** (0.0114)
Account_Adult	*19.33*** (0.0688)*			*15.74*** (0.214)*	
Borrow_Adult	*13.98*** (0.0734)*			*2.637*** (0.228)*	
Bank_branch	*−0.0260 (0.111)*			*14.53*** (0.346)*	
ATM	*12.80*** (0.0671)*			*10.95*** (0.209)*	
Remittance	*0.907*** (0.0121)*	*0.768*** (0.141)*	*1.659*** (0.0371)*	*3.068*** (0.0377)*	*−0.859** (0.345)*
Mobile_usage	*21.06*** (0.105)*	*15.13*** (1.956)*	*14.38*** (0.574)*	*1.389*** (0.325)*	*−2.975 (4.784)*
Internet	*0.593*** (0.00330)*	*0.260*** (0.0386)*	*−0.106*** (0.0109)*	*−0.0194* (0.0103)*	*0.312*** (0.0945)*
Economy_size	−578.8*** (10.23)	1,384*** (119.5)	370.3*** (33.25)	−101.3*** (31.83)	1,056*** (292.3)
Fin_open	−85.61*** (0.567)	11.90** (5.910)	9.960*** (1.829)	63.97*** (1.765)	−15.66 (14.46)
Trade_open	32.26*** (0.184)	13.97*** (2.145)	1.346** (0.569)	−36.05*** (0.571)	0.761 (5.246)
Regulatory	−10.82*** (0.118)		23.58*** (0.371)	7.760*** (0.367)	
Bank_Charges	−154.5*** (0.835)			−182.1*** (2.599)	
Credit_priv		*2.545*** (0.0166)*			*1.002*** (0.0405)*
Fin_intmedration		*25.54*** (1.414)*			*21.54*** (3.459)*
Telephone		0.143*** (0.0343)	0.171*** (0.0101)		−0.162* (0.0840)
Corruption		−7.800*** (1.216)			−10.31*** (2.975)
Fin_charges		−0.0164 (0.0939)			−0.152 (0.230)
Listed_comp			*11.57*** (0.136)*		
List_comp_per1m			*0.0415*** (0.00845)*		
Invest_FDI			0.423*** (0.0151)		
Infla			−0.283*** (0.0215)		
Constant	226.2*** (0.936)	−37.88*** (12.16)	−79.98*** (3.471)	175.0*** (2.913)	−41.87 (29.75)
Observations	655	655	655	655	655
Wald χ^2	26,831.10	4,163.84	1,877.99	3,024.45	95.88

Notes: Standard errors in parentheses; ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$
Source: Authors' computations (2023)

(*continued*)

Table 1.

Variables	(6) Financial access Stock_mkt access (Stock_value traded)	(7) Bank efficiency (Bank_ spread)	(8) Financial efficiency Debt_mkt efficiency (Public_debt/GDP)	(9) Stock_mkt efficiency (Stock_turn)
L, dependent	0.280** (0.140)	−0.765* (0.462)	0.297** (0.150)	0.153*** (0.0404)
Account_Adult		*−0.400*** (0.127)*		
Borrow_Adult		*0.151 (0.136)*		
Bank_branch		*−1.727*** (0.206)*		
ATM		*0.655*** (0.124)*		
Remittance	*−1.959*** (0.0331)*	*0.0765*** (0.0224)*	*1.314*** (0.116)*	*−1.197*** (0.0330)*
Mobile_usage	*−0.0668 (0.512)*	*−0.139 (0.194)*	*2.995* (1.614)*	*9.534*** (0.511)*
Internet	*−0.138*** (0.00975)*	*−0.00375 (0.00612)*	*0.262*** (0.0319)*	*−0.771*** (0.00973)*
Economy_size	1,035*** (29.63)	45.59** (18.95)	175.8* (98.59)	555.8*** (29.56)
Fin_open	65.52*** (1.630)	3.545*** (1.051)	19.91*** (4.877)	29.47*** (1.626)
Trade_open	3.322*** (0.507)	0.820** (0.340)	−2.697 (1.770)	19.45*** (0.506)
Regulatory	−1.995*** (0.331)	0.583*** (0.219)		−13.18*** (0.330)
Bank_Charges		−69.68*** (1.547)		
Credit_priv			*0.119*** (0.0137)*	
Fin_intmedration			*9.018*** (1.167)*	
Telephone	−0.0875*** (0.00896)		−0.122*** (0.0283)	0.0777*** (0.00894)
Corruption			0.656 (1.004)	
Fin_charges			−0.510*** (0.0775)	
Listed_comp	*8.761*** (0.122)*			*11.68*** (0.121)*
List_comp_per1m	*0.140*** (0.00753)*			*0.792*** (0.00751)*
Invest_FDI	0.0293** (0.0134)			0.0322** (0.0134)
Infla	−0.0411** (0.0191)			−0.828*** (0.0191)
Constant	−114.2*** (3.094)	−3.582** (1.734)	−21.17** (10.04)	37.65*** (3.086)
Observations	655	655	655	655
Wald χ^2	1,829.36	230.36	43.83	2,893.50

micro, small and medium enterprises are enrolled in formal financial institutions such as banks, it will help augment the pace of their development. The findings also support the claim by Léon and Zins (2020) that to create sustainable and reliable financial systems, the inclusion of households and firms must be done.

Also, from Table 1, the individual indicators of debt market financial inclusion consisting of credit to the private sector, financial intermediation, remittance, mobile, telephone and internet usage mostly reported positive coefficients highly significant at either 1% or 10% significance level with debt market depth, activity and efficiency. However, remittance and telephone registered a negative and highly significant relationship with debt market activity and efficiency in a few cases of the estimations conducted.

Likewise, the individual indicators of stock market financial inclusion made up of listed companies, listed companies per 1 m, remittance, mobile, telephone and internet usage recorded positive coefficients highly significant at a 1% significance level with stock market depth and activity for most of the estimations conducted. But some (remittance, internet) reported a negative and highly significant relationship at a 1% significance level with stock market efficiency, except for telephone with stock market activity. The findings are in line with the empirical work of Tchamyou *et al.* (2019) and Ozili (2023), which argue that financial inclusion is important for boosting the constituents of the financial system.

4.2 Effect of financial inclusion composite index on financial developments indicators

In Table 2, the study further examined the composite indexes of the inquiry and predictor variables of interest. The results of the composite indexes of financial inclusion for different market segments show strong and highly significant values at a 1% significance level. For instance, the bank financial inclusion index documented a positive and highly significant relationship with banking sector development, and similar results were obtained for the DMD. In contrast, the stock market financial inclusion index reported a negative and highly

Table 2. Financial development composite index and financial inclusion composite index

Variables	(10) BMD	(11) FSD indicators DMD	(12) SMD	(13) Overall FSD index FSD
L, dependent	6.878** (2.907)	1.063** (0.428)	0.0251* (0.0131)	0.533** (0.253)
Economy_size	−1.104 (0.758)	36.66*** (3.272)	11.95*** (0.602)	−47.19*** (1.946)
Fin_open	1.727*** (0.0456)	−2.000*** (0.165)	3.382*** (0.0282)	3.768*** (0.0956)
Trade_open	−0.0132 (0.0161)	0.135** (0.0562)	−0.378*** (0.00866)	0.0289 (0.0307)
Regulatory	0.113*** (0.0103)		0.381*** (0.00595)	−0.0139 (0.0216)
Bank_Charges	−5.584*** (0.0724)			
Bankfiincl_Indx	*0.221*** (0.00447)*			
Corruption		0.140*** (0.0355)		
Fin_charges		0.0149*** (0.00267)		
Debt_inclu_Indx		*0.738*** (0.0154)*		
Invest_FDI			−0.00621*** (0.000242)	0.00223*** (0.000857)
Infla			−0.00903*** (0.000345)	−0.0130*** (0.00122)
Stock_inclu Indx			*−0.0300*** (0.00337)*	
Fin_inclu_indx				*0.741*** (0.0101)*
Constant	0.350*** (0.0679)	−3.210*** (0.295)	−1.629*** (0.0531)	3.632*** (0.171)
Observations	655	655	655	655
Wald χ^2	3,001.28	1,343.12	4,798.76	1,589.92

Notes: Standard errors in parentheses; ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$
Source: Authors' computations (2023)

significant relationship with SMD. The findings endorse Čihák *et al.* (2013) and confirm the thinking of SDGs (2015) that countries should promote financial inclusion in all segments of the financial sector to attain an inclusive financial system.

Above all, the results of the composite index of financial inclusion for the entire financial system established a positive and highly significant 1% significance level with financial system development. The findings of the study lend support to the study's claims. The lucidity behind the study is that more mobilized and allocative funds within the financial system may accelerate financial development, and thereby boost the provision of better financial products, services or support to existing and potential customers. Furthermore, the findings are consistent with recent empirical evidence (Ofosu-Mensah Ababio *et al.*, 2018; Tchamyou and Asongu, 2017; Tchamyou *et al.*, 2019) which found that improved financial inclusion serves as an effective intervening tool for improving and enhancing the financial system.

So, the results attest to the fact that the presence of improved financial inclusion may augment and stimulate the financial system, especially the banking industry and the debt markets. It lends support to previous studies (Allen *et al.*, 2016; Demirguc-Kunt *et al.*, 2018; Léon and Zins, 2020) contending that financial inclusion matters for achieving an inclusive financial system. Likewise, the findings support empirical works that maintain that financial inclusion expands financial coverage, and provides people with access to savings instruments, increases savings and credit facilities (Ashraf *et al.*, 2010), all of which are important for financial system inclusion and development. The findings also buttress Ofosu-Mensah Ababio *et al.* (2018) and Tchamyou *et al.* (2019), who designed and applied financial inclusion index and found that it enhances the outreach of financial services, thereby fostering financial development. The findings reinforce the assertion that broader access to and use of financial services – financial inclusion – should be a central development agenda for financial systems (Demirguc-Kunt *et al.*, 2018). The findings further highlight the crucial role of financial inclusion in improving and expanding the financial systems of emerging and frontier economies. In general, the findings show that individuals become active users of financial services when they are brought into the formal financial system. Also, the findings support the works of Čihák *et al.* (2013) and SDGs (2015) which maintain that all financial systems are important for providing and promoting inclusive finance for economic progress and inclusion.

Furthermore, the control variables were prodigiously significant with positive signs. The findings for the control variables are in line with previous studies (Beck, 2016; Léon and Zins 2020). The study finds that the control variables are likewise important drivers of the depth, access, efficiency, overall development and interlinkages of bank, debt and stock markets. Contrarily, it finds that financial charges and inflation impede the depth, access, efficiency and overall progress of financial systems in emerging and frontier countries. These results are no puzzle as they validate the findings of the growing literature.

The study documents that financial openness, economy size, trade openness, regulatory control and investment (FDI) are important factors of financial development. In contrast, financial charges and inflation serve as deterrents to boosting financial development. Also, these results are no mystery as they corroborate the findings of evolving empirical works and theoretical intuitions. The findings agree with the empirical works which document those digital tools such as ATMs (Ofosu-Mensah Ababio *et al.*, 2020), mobile telephony, internet and other branchless services (Ofosu-Mensah Ababio *et al.*, 2018; 2020) are important elements for promoting more financial inclusion such as greater use of digital financial services foster financial development. Besides, the findings support empirical works (Allen *et al.*, 2016), which say that factors such as high financial charges are detrimental to promoting inclusive financial systems.

5. Conclusion

This paper sets out to investigate the relationships between financial inclusion and financial system development in emerging and frontier countries. It used the improved GMM in a balanced panel of 35 emerging and frontier market countries from 2004 to 2022 for the analysis. The study establishes new empirical evidence suggesting that improved financial inclusion plays an important role in boosting financial system development. This result attests to the lacuna in the literature, and the ambiguous effects form the impetus for this study. The findings buttress the theoretical works of Čihák *et al.* (2013), which state that when bond, stock and derivative markets permit the holding of a lot of diversified portfolios, this inspires investment in greater return projects that might otherwise be avoided. In conclusion, therefore, the level of financial inclusiveness is very important for stimulating significant levels of development for financial market depth, access and efficiency, as well as realizing notable interlinkages in emerging and frontier market countries.

5.1 Implication of study

The findings have several implications for governments, practitioners and policymakers of emerging, frontier and developing market countries as a whole. In general, this study suggests that countries should put in place feasible policies and prudent regulations, augment technological innovations and improve local conditions aimed at attracting or enticing all individuals, households and firms to have and use mainstream financial instruments, products and services. Moreover, an investor's decision to participate in investment activities depends on ready access to finance, which is driven by the presence of strong, vibrant and developed financial systems. The findings of the study imply that when banks reach out to deprived people and businesses through savings, remittances or borrowing using outlets such as bank branches, ATMs, mobile phones and the internet, they can provide effective financial intermediation and support which may accelerate the improvement and enhancement of the banking industry. Similarly, the findings imply that when the debt and stock markets extend their products, instruments and services to disadvantaged businesses and investors through the provision of private credit, remittance services and listing on domestic markets as well as channels such as telephones, mobile phones and the internet, they may augment the development of the debt and stock markets.

5.2 Limitations of the study

This study's insights into the link between financial inclusion and financial system development in emerging markets are valuable, yet certain limitations need acknowledgment. The narrow time frame (2004–2022) and quantitative approach might not fully capture nuances across diverse contexts. The study also overlooks microlevel dynamics and potential qualitative aspects. Further research is needed to comprehensively understand these dynamics and consider additional factors.

5.3 Areas for future research

This study provides avenues for future exploration. Research could delve into cultural, social and institutional influences on financial inclusion's impact, use case studies and assess spillover effects on broader economic indicators. The evolving technological landscape and its influence on financial inclusion could also be a focus. Incorporating multidimensional methods can provide a more comprehensive understanding of financial inclusion's intricate relationship with financial system development.

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Appendix 1

Table A1. Countries

Argentina	Ghana	Mauritius	South Africa
Bangladesh	Hungary	Morocco	Sri Lanka
Botswana	India	Namibia	Thailand
Brazil	Indonesia	Nigeria	Tunisia
Chile	Jamaica	Pakistan	Turkey
China	Kenya	Panama	
Colombia	Kuwait	Peru	
Cyprus	Latvia	Poland	
Ecuador	Lebanon	Qatar	
Egypt, Arab Rep.	Malaysia	Saudi Arabia	

Source: Authors' computations (2023)

Appendix 2

Table A2. Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
Financial system	525	0.062	0.979	−3.276	1.883
Fin Inclu Indx	525	0.0	1.568	−5.983	2.995
Economy size	525	0.094	0.008	0.075	0.117
Fin open	525	0.249	0.113	−0.028	0.647
Trade open	525	0.767	0.368	0.207	2.104
Regulatory	525	0.108	0.613	−1.352	1.539
Invest FDI	525	4.008	10.901	−46.769	198.074
Infla	525	6.703	7.846	−25.958	80.755

Source: Authors' computations (2023)

Appendix 3

Table A3. Multicollinearity test using variable inflation factor

Variable	VIF	1/VIF
Economy size	3.280	0.305
Fin Inclu Indx	3.060	0.327
Regulatory	2.140	0.468
Trade open	1.550	0.647
Fin open	1.420	0.705
Infla	1.120	0.895
Invest FDI	1.060	0.942
Mean VIF	*1.950*	

Source: Authors' computations (2023)

Appendix 4

Table A4. Lag length selection criteria (lag 2 is selected based on the above results)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−2,339.816	NA	0.00004	10.32007	10.39252	10.34861
1	1,955.660	8,421.02	0.00000	−8.27983	−7.62782*	−8.02296*
2	2,049.474	180.616*	0.00000*	−8.41087*	−7.17931	−7.92569*

Notes: *Indicates lag order selected by the criterion; LR = sequential modified LR test statistic (each test at 5% level); FPE = final prediction error; AIC = Akaike information criterion; SC = Schwarz information criterion; HQ = Hannan–Quinn information criterion
Source: Authors' computations (2023)

Appendix 5

Table A5. Panel unit root test results

Variable	Finsys indx	Fin_inclu _indx	Economy_size	Fin open	Trade open	Regulatory	Invest_Fdi	Infla
Levin, Lin and Chu I(1)	−8.835*** (0.000)	−13.64*** (0.000)	−7.391*** (0.000)	−10.388*** (0.000)	−11.171*** (0.000)	−4.183*** (0.000)	−11.643*** (0.000)	−13.623*** (0.000)
Im, Pesaran and Shin W-stat I(1)	−3.419*** (0.000)	−5.478*** (0.000)	−4.7422*** (0.000)	−7.475*** (0.000)	−7.868*** (0.000)	−6.126*** (0.000)	−11.234** (0.000)	−12.722*** (0.000)
ADF – Fisher χ^2 I(1)	115.21*** (0.000)	130.33*** (0.000)	130.492*** (0.000)	184.779*** (0.000)	186.758*** (0.000)	155.612*** (0.000)	255.763*** (0.000)	285.633*** (0.000)
PP - Fisher χ^2 I(1)	275.89*** (0.000)	190.828*** (0.000)	180.235*** (0.000)	297.055*** (0.000)	319.327*** (0.000)	339.332*** (0.000)	515.252*** (0.000)	597.181*** (0.000)

Note: ***, ** and * show significance at a 1, 5 and 10% levels, respectively
Source: Authors' computations (2023)

Appendix 6

Panel cointegration test	*t*-statistic	Prob.
ADF	−9.029623	0.0000
Residual variance	0.052605	
HAC variance	0.045979	

Note: ***, ** and * show significance at a 1, 5 and 10% levels, respectively
Source: Authors' computations (2023)

Table A6. Panel cointegration test results

Supplementary material

The supplementary material for this article can be found online.

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