

Digital financial inclusion and inclusive development in lower-middle-income countries: the enabling role of institutional quality

Josephine Ofori-Mensah Ababio and Eric Boachie Yiadom
*Department of Banking and Finance, University of Professional Studies,
Accra, Ghana, and*

Daniel Ofori-Sasu and Emmanuel Sarpong-Kumankoma
Department of Banking and Finance, University of Ghana, Legon, Ghana

Abstract

Purpose – This study aims to explore how institutional quality links digital financial inclusion to inclusive development in lower-middle-income countries, considering heterogeneities.

Design/methodology/approach – The study uses dynamic generalized method of moments to analyze a balanced panel data set of 48 lower-middle-income countries (LMICs) from 2004 to 2022, sourced from various databases. It assesses four variables and conducts checks for study robustness.

Findings – The study reveals a positive link between digital financial inclusion and inclusive development in LMICs, confirming theoretical predictions. Empirically, nations with quality institutions exhibit greater financial and developmental inclusion than those with weak institutions, emphasizing the substantial positive impact of institutional quality on the connection between digital financial inclusion and inclusive development in LMICs. For instance, the interaction effect reveals a substantial increase of 0.123 in inclusive development for every unit increase in digital financial inclusion in the presence of strong institutions. The findings provide robust empirical evidence that the presence of quality institutions is a key catalyst for the benefits of digital finance in inclusive development.

Originality/value – This study offers significant insights into digital financial inclusion and inclusive development in LMICs. It confirms a positive relationship between digital financial inclusion and inclusive development, highlighting the pivotal role of institutional quality in amplifying these benefits. Strong institutions benefit deprived individuals, families, communities and businesses, enabling full access to digital financial inclusion benefits. This facilitates engagement in development processes, aiding LMICs in achieving Sustainable Development Goals.

Keywords Digital financial inclusion, Inclusive development, Institutional quality, Lower-middle-income countries (LMICs)

Paper type Research paper

1. Introduction

The United Nations' Agenda 2030 Sustainable Development Goals (SDGs) are a widely used global framework for inclusive development, inspiring action for sustainable and inclusive outcomes. Embracing equitable development, it asserts every person's pivotal role in transforming societies, ensuring better outcomes (USAID, 2023; Pouw and Gupta, 2017).



Amidst a growing focus on growth, scholars are recognizing the positive impact of digital financial inclusion and institutional quality (Aracil *et al.*, 2022; Aslam *et al.*, 2021; Ghouse *et al.*, 2022; Zhu, 2022). Yet, empirical research on their joint influence on inclusive development remains scarce, warranting an investigation into the relationship between institutional quality, digital financial inclusion and inclusive development in LMICs.

The study acknowledges global progress in extending financial services, yet 1.4 billion adults lack access (Global Findex, 2021). Despite efforts, financial inclusion for marginalized populations remains insufficient, prompting concerns for inclusive policies and integrating unbanked populations (Ferrata, 2019). Financial policy reforms, transitioning from repressed to integrated systems, highlight digital financial inclusion's significance for inclusivity (Ferrata, 2019). Lower-middle-income countries (LMICs) enact reforms for inclusive development, but global progress remains uneven, with advanced economies benefiting more, leaving LMICs behind in inclusive development. The study underscores the urgency of addressing this disparity for comprehensive and sustainable global development. Digital finance, encompassing services via ATMs, the internet, or mobile devices, provides avenues for payments, savings, remittances, insurance and credit (Manyika *et al.*, 2016; Gomber *et al.*, 2017). This convergence of financial inclusion and digitalization manifests as digital financial inclusion (Wang *et al.*, 2023), empowering deprived individuals, households and businesses through accessible services. Literature recognizes digital financial inclusion as a vital enabler of inclusive economic development (Ababio and Yiadom, 2023; Mondal, 2020; Siddik and Kabiraj, 2020).

Previous studies have explored the implications of inclusive finance for growth and development (Corrado and Corrado, 2017), including the impact of digital inclusive finance on regional economic growth and innovation-driven development (Wang *et al.*, 2023; Ababio *et al.*, 2023). While some investigations scrutinize the relationship between financial inclusion and inclusive growth (Ofosu-Mensah Ababio *et al.*, 2023; Aslam *et al.*, 2021; Demirgüç-Kunt and Singer, 2017), none systematically examine the effect of digital financial inclusion on inclusive development in LMICs.

This study aims to fill this gap by empirically examining the impact of digital financial inclusion on inclusive development in LMICs. It contributes valuable insights into the role of digital financial inclusion in fostering inclusive development, particularly in LMICs.

The research delves into the intersection of digital financial inclusion, institutional quality and inclusive development, emphasizing their role in achieving SDGs 8 and 10. Success depends on optimizing tradeoffs or synergies between digital financial inclusion and other developmental targets, particularly institutional quality. SDG 16 underscores the importance of strong institutions as an enabling tool for implementing ideas and policies, fostering digital financial inclusion and propelling inclusive development, thus contributing to SDG 15 success. In LMICs, a lack of institutional support hinders development opportunities for the poor. Effective institutions become the empowering tool for digital financial inclusion, enabling marginalized populations to access services through the internet, e-cards, mobile phones or other digital networks. Aslam *et al.*'s (2021) study explores institutional quality, social inclusion and digital inclusion's impact on inclusive growth across diverse economies. The current study addresses a gap in the literature by investigating the intertwined influence of institutions and digital financial inclusion on inclusive development in LMICs, emphasizing the pivotal role of institutional quality in this nexus.

This study makes original contributions to the existing body of knowledge by conducting an empirical investigation into the:

- effect of digital financial inclusion on inclusive development in LMICs;
- the central role of institutional quality in explaining the finance-inclusive development nexus; and

-
- joint effect of financial inclusion and digital finance system on inclusive development across different institutional environment.

The study has the potential to provide policymakers with dependable and consistent empirical findings to aid in the development of comprehensive policies for leveraging the quality of institutions as a tool for accelerating digital financial inclusion and boosting inclusive development. We make four contributions to the literature. First, we construct an index for digital financial inclusion and inclusive development – and we empirically examine their relationships in LMICs. Second, we take into consideration the interaction between digital financial inclusion and institutional quality as an alternative approach to examining the impact of digital financial inclusion on our measure of inclusive development. Third, it provides first time evidence, to the best of our knowledge, of examining how financial inclusion and digital finance system impact inclusive development across different institutional environment in LMICs. Finally, by including educational opportunity variable in the construction of the inclusive development variable, we theoretically contribute to literature.

The rest of the study is developed as follows. Section 2 reviews closely related literature and highlights the hypothesis. Section 3 provides the data and methods used for the analysis. Section 4 presents and discusses the empirical results. Section 5 concludes and offers policy implications of the study.

2. Literature review

2.1 Theoretical framework

2.1.1 Financial services and economic growth. The theoretical underpinnings linking financial services to economic growth are rooted in several prominent theories. One such theory is the financial intermediation theory, which posits that financial institutions play a crucial role in allocating resources efficiently by channeling funds from savers to investors. This process enhances investment, productivity and ultimately economic growth (Levine, 1997). Moreover, the finance–growth nexus theory suggests that well-functioning financial systems stimulate economic growth by facilitating savings mobilization, capital accumulation and investment in productive ventures (King and Levine, 1993). This theory highlights the importance of financial deepening, which involves the expansion and diversification of financial services, including banking, insurance and capital markets.

The human capital theory further elucidates the link between financial services and economic growth by emphasizing the role of education and skills development in enhancing productivity and innovation. Access to financial services enables individuals to invest in education and training, thereby improving human capital and contributing to economic development (Becker, 1964).

2.1.2 Human development through finance. In addition to economic growth, financial services also play a pivotal role in promoting human development. The capabilities approach, advocated by Amartya Sen, posits that human development should be measured not only in terms of economic indicators but also by individuals' capabilities to lead fulfilling lives (Sen, 1999). Access to financial services empowers individuals by enhancing their capabilities to make choices, pursue education, access healthcare and engage in entrepreneurial activities. Furthermore, the inclusive finance theory emphasizes the importance of providing financial services to marginalized and underserved populations, including women, youth and rural communities. Access to financial services enables these groups to overcome barriers to economic participation, reduce vulnerability to shocks and improve overall well-being (Robinson, 2001).

Moreover, the empowerment theory underscores the transformative potential of financial inclusion in empowering individuals and communities to assert control over their economic

lives. By providing access to credit, savings and insurance, financial services enable individuals to take risks, invest in income-generating activities and build assets, thereby breaking the cycle of poverty and promoting upward mobility (Kabeer, 1999).

2.2 Empirical literature

The rise of digital technology has catalyzed economic, social and financial inclusion, profoundly impacting individuals, households and businesses. Mobile banking, digital wallets and other services have broadened financial access (Zhang *et al.*, 2020), fostering inclusive development in developing countries (Mondal, 2020). Digitalization, lauded for its potential to empower individuals and small businesses, transforms global financial systems, breaking down traditional barriers (Wysokinska, 2023; Helms, 2006). Recognized as a key enabler, digital financial inclusion plays a vital role in achieving the 2030 SDGs (Allen *et al.*, 2016), significantly enhancing financial inclusion, promoting inclusive development and advancing SDG success.

Digital financial inclusion has emerged as a promising avenue to reach unbanked and underbanked populations worldwide, as highlighted by Asongu and Asongu (2018) and Mondal (2020). While it holds the potential to extend financial access to marginalized groups such as the poor, women and youth, there are critical gaps and limitations in existing research. While Manyika *et al.* (2016) outline the potential benefits, including job creation and GDP growth, there is a need for further investigation into the actual impact on these outcomes, particularly in diverse socioeconomic contexts. Moreover, while digitizing salary payments and remittances can offer cost savings and poverty reduction, the extent to which these benefits are realized in practice requires closer examination. In addition, while Demirgüç-Kunt *et al.* (2018) emphasize the empowering potential of digital financial services, there is limited understanding of how these services interact with broader socioeconomic factors and institutional contexts, particularly in LMICs. Therefore, this study seeks to address these gaps by providing a nuanced analysis of the strengths, limitations and potential of digital financial inclusion in fostering inclusive and sustainable development.

Globally, an estimated 1.4 billion people lack access to formal financial services (Global Findex, 2021 report). Establishing universal access to essential financial services like savings, insurance, pensions, credit and remittances through digital channels is crucial. Digital financial inclusion, embracing mobile phones, the internet and e-cards like Visa, is fundamental for equitable development, shielding the vulnerable from exploitative moneylenders (Mondal, 2020). Wysokinska (2023) notes its transformative impact on both developed and developing countries, enhancing their financial systems. Nations with improved digital financial inclusion exhibit greater economic resilience (Mensah *et al.*, 2018).

This inclusion facilitates bringing the savings of the marginalized into the formal financial system, enabling investment. Governments can efficiently disburse social security payments through beneficiary bank accounts or electronic transfers, reducing transaction costs and combating corruption (Global Findex, 2021). Despite progress, low digital financial inclusion hinders economic advancement (Mensah *et al.*, 2021; Ahmad *et al.*, 2021).

Government digital transfers increased women's labor market entry by 92% (Biljon *et al.*, 2018). Women's empowerment in LMICs catalyzes entrepreneurship, financial autonomy and decision-making, enhancing their well-being. The USAID (2023) urges generating 470 million jobs via digital finance by 2030. In Bangladesh, mobile money facilitated loans for over 16,000 low-income households, enabling toilet installations, with plans to reach 170,000 (Khan, 2022). Digital financial inclusion emerges as a potent force for economic, social and financial empowerment, unlocking global opportunities and enhancing livelihoods.

Recognized for its transparency-enhancing potential, digital finance combats corruption (Ferrata, 2019). Tafotie (2020) noted efficiency gains in Ghana's utility sector from mobile money adoption. Despite being touted as an inclusive development driver, critics like Aslam *et al.* (2021) and Aracil *et al.* (2022) stress contextual considerations, notably institutional quality. Strong institutions, pivotal for enabling digital finance, facilitate a conducive environment (Yiadom *et al.*, 2021). This study bridges gaps by examining digital financial inclusion's empowering potential in LMICs, focusing on institutional quality's role.

Institutional quality, encompassing regulatory frameworks and governance structures, shapes digital financial inclusion's impact on inclusive development. It influences regulatory effectiveness, income distribution and financial and digital literacy crucial for success (Yiadom *et al.*, 2023; Aracil *et al.*, 2022). Strong institutions can overhaul economies by enhancing digital infrastructure and incentivizing marginalized groups' inclusion in formal digital financial services.

Conversely, weak institutions not only fail to protect the rights and interests of marginalized entities but can lead to the misuse of digital financial services, perpetuating inequalities and hindering access to developmental opportunities (Acemoglu and Robinson, 2012). Therefore, the relationship between digital financial inclusion and inclusive development hinges on the quality of institutions, making institutional quality a decisive factor in shaping the impact of digital financial inclusion initiatives globally.

In the discourse surrounding digital financial inclusion and its implications for inclusive development, the significance of a robust institutional framework cannot be overstated. However, while Chikalipah (2020) highlights the risks associated with weak regulatory systems, there remains a critical gap in understanding how these risks manifest in different socioeconomic contexts. Furthermore, while studies by Dorffel and Schuhmann (2022), and the World Economic Forum (2022) shed light on the unequal distribution of benefits, there is limited research exploring the underlying mechanisms driving this inequality. In addition, while Dabla-Norris *et al.* (2015) underscore the importance of digital literacy and access, there is a need for further investigation into the specific barriers faced by marginalized groups and how institutions can address these challenges more effectively. Therefore, this study aims to delve deeper into the complexities of institutional quality and its impact on digital financial inclusion, with a focus on identifying actionable strategies to promote more equitable outcomes.

As digital systems expand, concerns about privacy and cybersecurity grow. Vulnerabilities can lead to theft and loss of personal information, affecting trust in these services (Mensah *et al.*, 2018), necessitating the presence of strong institutions. Access to digital infrastructure, including smartphones and the internet, is essential for digital financial inclusion (Yiadom *et al.*, 2022; Aslam *et al.*, 2021). Quality institutions must ensure structures and frameworks that allow individuals, households, communities and firms to fully benefit from digital financial inclusion, including access to credit, account opening, savings and reduced transaction costs (World Bank, 2023). A strong institution facilitates digital financial inclusion by establishing clear rules, ensuring a level playing field and protecting consumer rights. Interventions to curb corruption, leakages and bribery are crucial. Conversely, weak institutional quality undermines trust in the financial system, discouraging digital financial service use. In countries with weak institutions, these services may be inaccessible, unreliable, or fraudulent, discouraging usage (Allen *et al.*, 2016). Scholars highlight the role of institutional quality in hindering effective digital financial inclusion initiatives (Aslam *et al.*, 2021; Ghouse *et al.*, 2022), emphasizing its pivotal role in the success of such initiatives.

Aracil *et al.* (2022) underscore the pivotal role of institutional quality in shaping the effectiveness of policies and programs for digital financial inclusion. While their emphasis on strong institutions aligns with prior research (Acemoglu and Robinson, 2012), there

remains a gap in understanding the nuanced mechanisms through which institutional failures contribute to financial and development exclusion. While studies by [Bastiaensen et al. \(2005\)](#) and [Chong and Calderon \(2000\)](#) highlight the adverse effects of institutional weaknesses, further exploration is needed to unpack the specific pathways through which these failures hinder inclusive development. In addition, while [Bastiaensen et al. \(2005\)](#) identify corruption as a barrier to institutional improvement, more research is required to elucidate how corruption intersects with institutional quality to impede digital financial inclusion. Moreover, while good governance is touted as essential for promoting inclusive development, there is a lack of consensus on the most effective governance strategies in the context of digital financial inclusion. Thus, this study seeks to address these gaps by providing a more nuanced understanding of the relationship between institutional quality and digital financial inclusion, with implications for policy and practice.

Inclusive development hinges on institutional quality, ensuring equitable sharing of digital financial inclusion benefits ([Yiadom and Abdul-Mumuni, 2022](#); [Allen et al., 2016](#)). Strong institutions contribute by investing in capacity-building, regulatory frameworks and consumer protection measures. This fosters an environment supporting digital financial services growth and inclusive development ([World Bank, 2023](#)). The review underscores the interconnected dynamics of digital financial inclusion, institutional quality and inclusive development in today's technology-driven era, where policymakers aim to leverage technology for equitable financial service accessibility.

While literature extensively explores the link between financial inclusion and economic growth, there's a notable scarcity of studies connecting institutional quality, digital financial inclusion and inclusive development in LMICs ([Yiadom et al., 2020](#); [Ahmad et al., 2021](#)). The quality of institutions influences the benefits of digital financial inclusion and economic progression ([Dziwornu et al., 2024](#)). Our study addresses limitations in prior research by considering spatial dependency, speed of adjustment and examining the moderating role of institutional quality in the linkage between digital financial inclusion and inclusive development in LMICs. The study aims to contribute valuable insights into this critical nexus, addressing gaps left by previous studies and providing a comprehensive understanding of the intricate relationships at play in the digital financial landscape.

3. Data and methods

This study explores the synergy between institutional quality, digital financial inclusion and inclusive development, using a panel data set spanning 48 LMICs from 2004 to 2022. Data from the Global Financial Inclusion Database, World Development Indicators (WDIs) and Worldwide Governance Indicators of the [World Bank \(2023\)](#) were used for their consistent representation. Few missing datapoints in the series were corrected using the moving average technique.

3.1 Ground theory, model specification and measurement

This study is grounded in theories linking financial inclusion to economic growth, digital finance's role in expanding access and the influence of institutional quality on development outcomes. Specifically, theories including financial intermediation theory, finance-growth nexus theory, human capital theory and the capabilities approach have been discussed in our literature as the underpinning theories for the study. The study integrates these perspectives to explore how financial inclusion, digital finance and institutional quality interact to shape inclusive development in LMICs. Drawing from foundational works in economics and institutional theory, the study hypothesizes that strong institutions amplify the positive impacts of financial inclusion and digital finance on development, while weak institutions may

constrain these effects. By examining these dynamics, the study aims to provide insights into policy interventions that promote inclusive and sustainable development in LMICs.

Building on prior research (Corrado and Corrado, 2017; Matekenya *et al.*, 2021; Samans *et al.*, 2015), we investigate key determinants of inclusive development, addressing potential endogeneity with dynamic system generalized method of moments (GMM) estimations. The baseline model is expressed as:

$$Y_{jt} = \alpha_1 Y_{jt-1} + \sum_{l=1}^3 \beta_l X_{jt} + \sum_{l=1}^N \nu_l C_{jt} + \theta_j + \sigma_t + \epsilon_{jt} \quad (1)$$

In the equations above the dependent variable, Y , is inclusive development; X is a vector of explanatory variables of interest, including financial inclusion, digital finance system and institutional quality. C is a vector of control variables; α_1 is the coefficient of the lag of the dependent variable; β_l is the coefficients of the variables of interest; ν_l is the coefficient of the control variables; θ_j is the country fixed effect, σ_t is the time fixed effect; and ϵ_{jt} is idiosyncratic error term.

The variables are discussed below.

Inclusive development: Inclusive development, aligned with the UN's sustainable development concept, integrates citizen empowerment and well-being while ensuring social and environmental sustainability (UN, 2005). Using the World Economic Forum (2022) Inclusive Development Index, we assess it through a composite of 12 indicators grouped into growth and development, inclusion and intergenerational equity. Education inclusion emphasizes access for all, especially the underprivileged, aligning with human development goals. Data, sourced from WDIs and WEF databases, yields a composite index through principal component analysis. condenses correlated variables into uncorrelated components. We computed eigenvalues from indicators of inclusive development, ensuring a comprehensive index. Higher eigenvalues denote greater variance explained, aiding in data condensation. The resulting index ranges from -3 to 3 , with higher values indicating greater inclusive development (Samans *et al.*, 2015). Lagged inclusive development is expected to positively influence contemporaneous values. Our approach aligns with studies by Anand *et al.* (2023), Asongu and Asongu (2018), Dorffell and Schuhmann (2022) and World Economic Forum (2022).

Financial inclusion: Financial inclusion, defined by the World Bank (2023), refers to accessible and affordable financial products and services for individuals and businesses. The study uses a financial inclusion index derived from the Financial Access Survey (FAS) and WDI. The index, reflecting eight dimensions, covers financial availability (ATMs, bank branches, bank accounts), financial services usage (borrowers, deposits, outstanding loans) and financial knowledge (credit information depth). Used in previous studies (Ofosu-Mensah Ababio *et al.*, 2023), data from the IMF and WDI indicate higher values signify increased access, availability and usage of financial services.

Digital finance system: The digital finance system encompasses financial services via mobile phones, the internet or cards (ATMs) (Manyika *et al.*, 2016). This involves accessing insurance, remittance, payments, savings and credit through mobile phones, the internet or e-cards (Gomber *et al.*, 2017). Computed as an index with ATM (e-cards) access, mobile phones (payment per 1,000 adults) and secure internet servers (per 1 million adults), the study uses data from the World Bank Global Financial Development and the IMF Financial Service Database (Asongu and Asongu, 2018; Wang *et al.*, 2023).

Institutional quality: The concept comprises law, individual rights and effective government regulation/services, measured through six indicators (rule of law, government

effectiveness, control of corruption, political stability, regulatory quality and voice/accountability). Data from the World Governance Indicators of the World Bank scale this measure from -2.5 (weak institutions) to 2.5 (strong institutions), as used in prior works (Aracil *et al.*, 2022). The specification of equations with strong and weak institutions enables us to analyze how institutional quality moderates the impact of financial inclusion and digital finance on inclusive development. By comparing coefficients between countries with strong and weak institutions, we assess how institutional context influences the effectiveness of financial inclusion and digital finance initiatives. This approach provides insights into tailoring policy interventions to different institutional contexts, facilitating inclusive and sustainable development in LMICs.

Equation (1) includes control variables (total investment, population, inflation, trade openness, GDP per capita) sourced from the WDI of the World Bank.

3.2 Effect of digital financial inclusion and institutional quality on inclusive development

To examine the effect of digital financial inclusion and institutional quality on inclusive development, we present the following empirical models:

$$\begin{aligned} \text{Inclusive_development index}_{jt} &= \lambda_1 \text{Inclusive_development index}_{jt-1} + \lambda_2 \text{Financial inclusion}_{jt} \\ &+ \lambda_3 \text{Institutional quality}_{jt} + \lambda_4 \text{Digital finance system}_{jt} + \\ &+ \sum_{l=1}^N \lambda_l X_{jt} + \mu_j + \epsilon_t + \sigma_{jt} \end{aligned} \quad (2)$$

To capture possible unobserved heterogeneity and to analyze the impact of institutional quality on the relationship between financial inclusion, digital finance system and inclusive development, we specify the equations based on interactions:

$$\begin{aligned} \text{Inclusive_development index}_{jt} &= \lambda_1 \text{Inclusive_development index}_{jt-1} + \lambda_2 \text{Financial inclusion}_{jt} \\ &+ \lambda_3 \text{Institutional quality}_{jt} + \beta_1 [\text{Financial inclusion}_{jt} * \text{Institutional quality}_{jt}] \\ &+ \lambda_4 \text{Digital finance system}_{jt} + \sum_{l=1}^N \lambda_l X_{jt} + \mu_j + \epsilon_t + \sigma_{jt} \end{aligned} \quad (3)$$

$$\begin{aligned} \text{Inclusive_development index}_{jt} &= \lambda_1 \text{Inclusive_development index}_{jt-1} + \lambda_2 \text{Financial inclusion}_{jt} \\ &+ \lambda_3 \text{Digital finance system}_{jt} + \beta_1 [\text{Financial inclusion}_{jt} * \text{Digital finance system} * \text{strong institution}_{jt}] \\ &+ \beta_2 [\text{Financial inclusion}_{jt} * \text{Digital finance system} * \text{weak institution}_{jt}] + \sum_{l=1}^N \lambda_l X_{jt} + \mu_j \\ &+ \epsilon_t + \sigma_{jt} \end{aligned} \quad (4)$$

To properly interpret the interaction terms in equations (2) and (3), we estimate the net effects. For instance, in equation (2), the effect of a change in financial inclusion on inclusive development when conditioned on institutional quality is expressed as:

$$\text{Net Effect} = \frac{\partial \text{Financial Inclusion}}{\partial \text{Inclusive development}_{i,t}} = \lambda_2 + \beta_1 \text{Institutional quality}_{jt} \quad (5)$$

In [equation \(3\)](#), the effect of a change in financial inclusion on inclusive development when conditioned on digital finance system in weak and strong institutional environment is expressed as:

$$\text{Net Effect} = \frac{\partial \text{Financial Inclusion}}{\partial \text{Inclusive development}_{i,t}} = \lambda_2 + \beta_1 \text{Digital finance system}_{\text{strong} \text{institution}_{jt}} \quad (6-1)$$

$$\text{Net Effect} = \frac{\partial \text{Financial Inclusion}}{\partial \text{Inclusive development}_{i,t}} = \lambda_2 + \beta_2 \text{Digital finance system}_{\text{weak} \text{institution}_{jt}} \quad (6-2)$$

where subscript j denotes cross sectional dimension (country specifics), $j = 1, \dots, M$; t denotes the time series dimension (time), $t = 1, \dots, T$; λ_1 and λ_1 represent the respective coefficients of the lag of the dependent variable (i.e., inclusive development) in the equations; λ_2 and λ_2 represent the coefficients of financial inclusion in the respective equations; λ_4 represents the coefficient of digital finance system in [equations \(1\)](#) and [\(2\)](#); λ_3 represents the coefficient of digital finance system in [equations \(3\)](#); λ_3 represents the coefficient of institutional quality in [equations \(1\)](#) and [\(2\)](#); β_4 represents the coefficient of the interaction term between financial inclusion and institutional quality in [equation \(2\)](#); β_1 and β_2 denote the coefficients of the interaction terms between financial inclusion and digital finance system in a strong and a weak institutional environment respectively in [equation \(3\)](#); λ_i and λ_i ; $i = 1, \dots, N$, represent the regression parameters for vector X to be estimated. X is a vector of control variables that explain the models above; μ_j is the country fixed effect; e_t is the time fixed effect; σ_{jt} is the idiosyncratic error term, which controls for unit-specific residual in the models for the j th country at period t .

3.3 Independent effects

In [equation \(2\)](#), we assess the impact of financial inclusion and institutional quality on inclusive development while accounting for the digital finance system. We anticipate a positive correlation between financial inclusion and inclusive development, consistent with [Corrado and Corrado \(2017\)](#). Higher financial inclusion levels should elevate development. Similarly, we expect institutional quality to positively influence inclusive development, aligning with [Aracil et al. \(2022\)](#), who observed improved institutional quality enhancing overall inclusive human development. In addition, a positive association between the digital finance system and inclusive development is anticipated, in line with [Ozili \(2018\)](#), who highlighted digital finance's role in fostering inclusive development through enhanced financial inclusion.

3.4 Interaction effect

In [equation \(3\)](#), we demonstrate the impact of financial inclusion on inclusive development when interacted with institutional quality. Interpreting results following [Brambor et al. \(2006\)](#), we find the marginal effects of financial inclusion [[equation \(5\)](#)]. Economically, this explains how financial inclusion influences inclusive development concerning institutional

quality. We anticipate enhanced institutional quality will strengthen the link between financial inclusion and inclusive development in LMICs.

Equation (4) explores digital financial inclusion's impact on inclusive development, elucidating variations across distinct institutional environments.

Digital financial inclusion, facilitating marginalized populations' access to formal financial services, shapes inclusive development, particularly influenced by digital finance systems. Equation (4) introduces an interaction between the financial inclusion index and the digital finance system, capturing various dimensions and reflecting their joint impact across diverse institutional environments. Following Brambor *et al.* (2006), we interpret the conditional impact [equations (6.1) and (6.2)], anticipating a strengthened positive influence of financial inclusion on inclusive development when interacting with the digital finance system. Splitting the data set based on institutional strength, we predict a relatively greater impact of digital financial inclusion on inclusive development in countries with robust institutional environments compared to weaker ones.

3.5 Estimation technique

The GMM technique, developed by Arellano and Bond (1991), addresses endogeneity issues in panel estimation by capturing correlations between explanatory variables and error terms. Endogeneity, stemming from omitted variables or reverse causality, may distort the relationship between financial inclusion, institutional quality and inclusive development in our model.

Compared to alternatives like two-stage least squares or fixed/random effects techniques, GMM is robust to common panel data issues like heteroskedasticity and autocorrelation, ensuring more precise parameter estimates. Moreover, GMM permits the use of lagged dependent variables as instruments, effectively addressing endogeneity concerns. The Hansen and Sargan tests validate the GMM model. The Hansen test evaluates instrument validity, while the Sargan test assesses both validity and efficiency. Their null hypotheses confirm correct specification and valid instrument correlation, respectively.

4. Empirical results and discussions

Table 1 depicts the descriptive statistics of the variables used for the study. The mean of inclusive development was 0.084 in LMICs, ranging from a country with a minimum value of -2.49 to a country with a maximum value of 3.10. This suggests that the inclusive development in LMICs is still developing. Countries like Congo, Gabon, Malawi and Sierra Leone recorded low levels of financial inclusion; whereas Mauritius and Seychelles were

Variables	Obs	Mean	SD	Minimum	Maximum
Inclusive development index	912	0.084	0.626	-2.492	3.101
Financial inclusion index	912	0.401	2.057	-3.524	16.347
Institutional quality	912	-0.045	0.913	-2.449	1.96
Digital finance system	912	0.01	0.382	-0.432	8.022
Total investment	912	24.491	8.707	-3.744	78.301
Population	912	1.722	2.15	-4.711	7.244
Inflation	912	5.553	11.509	-8.975	379.848
Trade	912	93.723	59.139	0.167	675.678
GDP per capita	912	11.069	2.665	-4.962	18.261

Table 1.

Descriptive statistics **Source:** Authors' own work

found in the upper quantiles of the financial inclusion indicator. The mean of financial inclusion in the sample is 0.40, ranging between a minimum of -3.52 and a maximum of 16.35. This is indicative of the fact that the financial inclusion is low in LMICs which confirms the [Global Findex \(2021\)](#) report of global financial inclusion. The average digital finance system recorded 0.01 ranging between -0.43 and 8.02. Given the average (-0.045), minimum (-2.45) and maximum (1.96) values of the institutional quality variables (control of corruption, regulatory quality, rule of law and voice and accountability), it can be inferred that the nations in LMICs category have relatively a moderate institutional structure compared to the world range of -2.5 and 2.5. In terms of the controls, total investment has an average of 24.29% of GDP; population recorded an average of 36.15; inflation rate recorded an average of 5.55; trade openness recorded an average of 93.72% of GDP; whereas an average of 11.07 was recorded by the GDP per capital.

The pairwise correlation matrix ([Table 2](#)) reveals insights into relationships between variables. Notably, a weak inverse correlation exists between the financial inclusion index and inclusive development (-0.078). Furthermore, a significant linear relationship is evident between institutional quality and the digital finance system (-0.016). Population exhibits a positive correlation with Total Investment (0.167), suggesting higher population leads to increased investment. In addition, a weak positive correlation is observed between trade and GDP per capita (0.015), indicating countries with higher trade levels tend to have higher GDP per capita values. These findings deepen understanding of the dynamics between inclusive development and digital financial inclusion variables.

In addition, it can be deduced that there is no indication of a multicollinearity as confirmed by correlation coefficients of the variables that are less than 0.7 and a variance inflation factor (VIF) with threshold less than 10 (see [Table 2](#)).

4.1 Effect of digital financial inclusion and institutional quality on inclusive development

This section analyzes how financial inclusion, the digital finance system and institutional quality individually influence inclusive development.

4.2 Relationship between financial inclusion and institutional quality on inclusive development

[Table 3](#) illustrates that our financial inclusion index positively influences inclusive development while controlling for the digital finance system. This means that enhancing financial inclusion leads to improved inclusive development, aligning with previous studies by [Corrado and Corrado \(2017\)](#), [Matekenya et al. \(2021\)](#) and [Siddik and Kabiraj \(2020\)](#). For example, [Corrado and Corrado \(2017\)](#) found that inclusive finance fosters development by providing equal and affordable access to financial services, especially for marginalized households and entrepreneurs. Inclusive finance facilitates sustainable growth by enabling individuals to access credit, engage in economic activities and invest in long-term ventures, thus enhancing inclusive development. Increased financial inclusion allows countries to manage risks, invest in health and education, support startups ([Amankwa et al., 2024](#); [Ofosu-Mensah Ababio et al., 2023](#)), and overall, promote inclusive development.

Moreover, in [Table 3](#), we observe a positive relationship between inclusive development and the digital finance system, indicating that higher levels of digitalization in LMICs contribute to inclusive development. The digital finance system, comprising e-cards, mobile phones and internet diffusion, facilitates financial information access, reducing barriers and enhancing resource allocation efficiency. These findings support [Wang et al. \(2023\)](#), who highlight the direct positive impact of digital inclusive finance on innovative development,

Table 2.
Pairwise correlations

Variables	VIF	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Inclusive development	1.000	1.000								
(2) Financial inclusion index	1.01	-0.078 (0.002)	1.000							
(3) Institutional quality	1.135	-0.015 (0.456)	0.010 (0.749)	1.000						
(4) Digital finance system	1.076	-0.016 (0.338)	-0.023 (0.360)	0.002 (0.010)	1.000					
(5) Total investment	1.026	-0.098 (0.000)	-0.038 (0.186)	-0.022 (0.335)	-0.004 (0.850)	1.000				
(6) Population	1.586	0.095 (0.000)	-0.011 (0.677)	0.028 (0.200)	0.016 (0.361)	0.167 (0.000)	1.000			
(7) Inflation	1.008	-0.051 (0.006)	-0.047 (0.084)	-0.007 (0.733)	0.000 (0.980)	-0.054 (0.005)	0.083 (0.000)	1.000		
(8) Trade	1.137	-0.064 (0.003)	-0.024 (0.448)	0.316 (0.000)	-0.003 (0.902)	-0.010 (0.686)	0.054 (0.017)	0.015 (0.517)	1.000	
(9) GDP per capita	1.531	-0.016 (0.380)	-0.056 (0.039)	0.001 (0.969)	-0.012 (0.522)	0.161 (0.000)	0.050 (0.006)	-0.016 (0.381)	0.015 (0.504)	1.000

Source: Authors' own work

Variables	Independent effect Model 1	Interaction with institutional quality Model 2
Inclusive development index _{t-1}	0.532*** (0.182)	0.513** (0.190)
Financial inclusion index	0.0419*** (0.0101)	0.0400*** (0.0129)
Institutional quality	0.0247 (0.0193)	0.0243 (0.0240)
Financial inclusion index χ institutional quality		0.123*** (0.0223)
Digital finance system	0.289* (0.156)	0.248* (0.137)
Total investment	-0.00446 (0.00299)	0.000185 (0.00306)
Population	-0.00793 (0.00894)	-0.0353* (0.0176)
Inflation	6.82e-07 (1.79e-06)	5.06e-07 (2.09e-06)
Trade	-0.000443 (0.000560)	-0.000782 (0.000664)
GDP per capita	5.71e-08** (2.27e-08)	1.34e-07** (5.33e-08)
Constant	0.273 (0.179)	0.922** (0.349)
Country fixed effect	Yes	
Time fixed effect	Yes	
Observations	912	912
Number of code	48	48
No. of instruments.	14	19
AB1	-1.956	-1.878
P-value	0.0505	0.0604
AB2	1.308	1.536
P-value	0.191	0.125
Sargan's test	4.422	13.55
P-value	0.352	0.0943
Hansen's test	3.666	8.355
P-value	0.453	0.400
F-test	26.35	59.83
P-value	0	0
Marginal effect		0.0345***

Table 3.
Independent and
interaction effect of
financial inclusion
and institutional
quality on inclusive
development

Notes: Standard errors in parentheses; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Source: Authors' own work

as well as the works of [Asongu and Asongu \(2018\)](#) and [Asongu and Nwachukwu \(2018\)](#), which emphasize the role of mobile phone penetration in enhancing inclusive development.

Table 3 shows the independent and interaction effect of financial Inclusion and Institutional quality on inclusive development.

4.3 Interactions effects

In **Table 3**, the results show that institutional quality has no significant effect on inclusive development. However, when interacted with financial inclusion, the coefficient of the interaction term was positive. This means that financial inclusion has an indirect impact on inclusive development and the impact is conditioned on institutional quality. As was found earlier, the unconditional effect of financial inclusion on inclusive development was positive. Consistent with [Brambor et al. \(2006\)](#) on the pitfalls surrounding interactive regressions, the impacts of financial inclusion is interpreted as a conditional impact. For proper interpretation of the interactions, we compute the net effects of financial inclusion on inclusive development at levels of institutional quality. For instance, in Model 2, the net effect is 0.0345 [$0.04 + (0.123 \times \text{institutional quality})$], when the average institutional quality is -0.045 . Thus, the positive effect of financial inclusion on inclusive development is enhanced when a country's level of institutional quality increases.

A country that is characterized by enhanced institutional quality supports the development of their markets and increases the efficient allocation of resources. A high level of institutional quality is a major catalyst for social progress and can influence the benefits of financial inclusion. Thus, the functioning of quality institutional framework is important in strengthening the effect of financial inclusion on inclusive development. In view of that strengthening the institutional structures will boost the nexus between financial inclusion and inclusive development (Aslam *et al.*, 2021). Therefore, it can be deduced that the positive effect of financial inclusion on inclusive development is enhanced when the level of institutional quality increases in LMICs.

4.4 Effect of financial inclusion and digital finance system on inclusive development

The results in Table 4 shows the effect of digital financial inclusion on inclusive development across different institutional environments of LMICs. We capture digital financial inclusion by interacting the financial inclusion index with digital finance system variable. We regress them on inclusive development. In Table 4, the coefficients for the financial inclusion is positive and significant (see models 5), while the coefficients for the interaction terms between financial

Variables	Full sample Model 3	Weak institutional quality Model 4	Strong institutional quality Model 5
Inclusive development index _{t-1}	0.561** (0.270)	0.751** (0.303)	0.0931 (0.106)
Financial inclusion index	0.0451** (0.0167)	0.0252* (0.0145)	0.124*** (0.0233)
Digital finance system	0.404*** (0.0298)	0.523*** (0.0943)	0.287*** (0.0488)
Financial inclusion index χ digital finance system	0.263** (0.102)	0.429*** (0.0533)	0.430*** (0.146)
Institutional quality	0.0183 (0.0179)		
Total investment	-0.00216 (0.00341)	-0.00102 (0.00265)	-0.00702* (0.00378)
Population	-0.0323** (0.0123)	-0.0214 (0.0172)	-0.00310 (0.0142)
Inflation	3.49e-07 (1.80e-06)	-7.00e-07 (9.91e-07)	-1.79e-06 (1.99e-06)
Trade	-0.000520 (0.000632)	-0.000401 (0.000299)	-0.000625 (0.000538)
GDP per capita	1.19e-07** (4.37e-08)	5.61e-08 (5.95e-08)	1.11e-07*** (3.16e-08)
Constant	0.862** (0.331)	0.645 (0.405)	0.279 (0.283)
Country fixed effect	Yes		
Time fixed effect	Yes		
Observations	912	901	901
Number of countries	48	48	48
No. of instruments.	17	18	16
AB1	-1.852	-1.810	-1.789
P-value	0.0641	0.094	0.149
AB2	1.470	1.454	0.227
P-value	0.142	0.831	0.972
Sargan's test	14.59	3.503	9.461
P-value	0.0237	0.146	0.820
Hansen's test	4.414	4.279	7.401
P-value	0.621	0.0703	0.285
F-test	63.63	46.73	102.4
P-value	0.962	0.899	0.0736
Marginal effect	0.0477***		

Table 4. Interaction effect of financial inclusion and digital finance system on inclusive development across different institutional settings

Notes: Standard errors in parentheses; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$
Source: Authors' own work

inclusion and digital finance system is also positive and significant. According to Brambor *et al.* (2006) and Asongu and Nwachukwu (2018), it is necessary to calculate the overall or net effects of the interactions to allow for a meaningful economic interpretation. For example, the net effect of financial inclusion is $0.0477[0.0451 + (0.263 \times \text{digital finance system})]$ (see Model 3), when digital finance system assumes an average of 0.01 (see Table 1). Thus, the positive net effect suggests that the impact of financial inclusion on inclusive development is enhanced with digital finance systems. Thus, financial inclusion increases inclusive development when the level of digital finance system increases in a given country. The results agree with recent studies by Wang *et al.* (2023) and Wang and Wen (2020). For instance, Wang *et al.* (2023) explored the impact of digital inclusive finance on economic growth and innovative development. They found that digital inclusive finance can have an indirect impact on economic growth and inventive development by raising citizens' own disposable income, increasing government spending and raising educational standards. Thus, digital inclusive finance effectively reduce people's accessible threshold and expand coverage of financial services, improve service capacity of the financial market, so that inclusive development of people and businesses can improve. This confirms our results that financial inclusion increases inclusive development at greater levels of digital finance systems in LMICs. Therefore, financial inclusion and digital finance systems are better complements in determining a desirable outcome of inclusive development.

Table 4 shows the interaction effect of financial inclusion and digital finance system on inclusive development across different institutional settings.

We argue that the conditional effects of digital financial inclusion (interaction terms between financial inclusion and digital finance system) on inclusive development differ across a weak and strong institutional environment in LMICs. After splitting the data into two, we observe that the net effect of financial inclusion on inclusive development conditioned on digital finance system is relatively greater for countries operating in a strong institutional environment (see Model 4) compared to those operating in a weak institutional environment (see Model 5).

4.5 Robustness results

An alternative method to analyze the impact of digital financial inclusion on inclusive development across different institutional contexts is to interact financial inclusion and the digital finance system with institutional quality dummies. Table 5 illustrates that in weak institutional contexts, the coefficient of the financial inclusion index is lower than in strong institutional contexts. This suggests that strong institutions amplify the positive impact of financial inclusion on inclusive development compared to weak institutions. Similarly, the coefficient of the digital finance system is lower in weak institutional environments, indicating a stronger positive impact in strong institutional settings. While the interaction coefficient between financial inclusion, the digital finance system and weak institutions is negative, it is positive for strong institutions. This implies that the overall effect of financial inclusion on inclusive development is stronger in countries with robust institutions. In general, the digital finance system enhances the impact of financial inclusion on inclusive development, particularly in countries with strong institutional frameworks.

5. Conclusion and policy implication

Using dynamic system-GMM on a panel data set covering 48 LMICs from 2004 to 2022, we construct indices for financial inclusion, digital finance systems, institutional quality and inclusive development. We introduce an innovative measure for digital financial inclusion by interacting the financial inclusion index with the digital finance system.

Our findings reveal a positive influence of the financial inclusion index on inclusive development, particularly when controlling for the digital finance system. Notably, inclusive

Variables	Model 6
Inclusive development index _{t-1}	0.568** (0.222)
Financial inclusion index χ weak institution	0.0306* (0.0166)
Financial inclusion index χ strong institution	0.0519*** (0.0134)
Digital finance system χ weak institution	-0.673 (0.676)
Digital finance system χ strong institution	0.424*** (0.0304)
Financial inclusion index χ digital finance system χ weak institution	-1.926* (0.986)
Financial inclusion-index χ digital finance system χ strong institution	0.0541*** (0.0150)
Total investment	-0.000131 (0.00314)
Population	-0.0309* (0.0162)
Inflation	-8.07e-07 (1.28e-06)
Trade	-0.000617 (0.000607)
GDP per capita	1.20e-07** (5.42e-08)
Constant	0.803** (0.356)
Country fixed effect	Yes
Time fixed effect	Yes
Observations	912
Number of countries	48
No. of instruments	21
AB1	-1.987
<i>P</i> -value	0.0469
AB2	1.471
<i>P</i> -value	0.141
Sargan's test	15.74
<i>P</i> -value	0.0463
Hansen's test	9.251
<i>P</i> -value	0.322
<i>F</i> -test	63.14
Robustness results <i>P</i> -value	0

Table 5.
Robustness results

development is positively driven by the digital finance system. Although institutional quality alone does not significantly impact inclusive development, its interaction with financial inclusion yields a positive overall effect. This suggests that elevating institutional quality establishes a conducive environment for maximizing the positive impact of financial inclusion on inclusive development.

Furthermore, when financial inclusion is interacted with the digital finance system, the marginal effect on inclusive development becomes notably more positive than the unconditional effects. This indicates that as the digital finance system advances within a country, the positive influence of financial inclusion on inclusive development intensifies.

Policymakers should prioritize initiatives to enhance digital financial inclusion, supported by investments in infrastructure and regulatory frameworks. Strengthening governance and regulatory effectiveness can amplify the positive impact of financial inclusion on inclusive development. Tailoring policies to specific institutional contexts is essential, as countries with robust institutions are likely to benefit more from digital financial inclusion. By promoting synergies between financial inclusion and the digital finance system, policymakers can advance inclusive development outcomes effectively.

5.1 Limitations of the study

Despite its contributions, this study has certain limitations. It focuses solely on LMICs. Moreover, interpreting the estimates (based on interaction coefficients of three variables) as

causal effects is not permissible by the empirical methodology described in the study. In addition, our study lacks an alternative and a single measure of digital financial inclusion. Future studies should explore alternative measures of digital financial inclusion to capture the dimensions of financial inclusion and digitalization across various market economies, thus assessing their impacts on inclusive development and economic growth.

References

- Ababio, J.O.M. and Yiadom, E.B. (2023), "The known, the unknown, and the path to private investment pursuit and thrive for emerging countries", *Journal of Namibian Studies: History Politics Culture*, Vol. 33, pp. 6826-6851.
- Ababio, J.O.M., Yiadom, E.B., Mawutor, J.K., Tuffour, J.K. and Attah-Botchwey, E. (2023), "Sustainable energy for all: the link between financial inclusion, renewable energy and environmental sustainability in developing economies", *International Journal of Energy Sector Management*.
- Acemoglu, D. and Robinson, J.A. (2012), *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*, Crown Currency, New York, NY.
- Ahmad, M., Majeed, A., Khan, M.A., Sohaib, M. and Shehzad, K. (2021), "Digital financial inclusion and economic growth: provincial data analysis of China", *China Economic Journal*, Vol. 14 No. 3, pp. 291-310.
- Allen, F., Demirguc-Kunt, A., Klapper, L. and Peria, M.S.M. (2016), "The foundations of financial inclusion: understanding ownership and use of formal accounts", *Journal of Financial Intermediation*, Vol. 27, pp. 1-30.
- Amankwa, R.F., Yiadom, E.B., Acheampong, E. and Mawutor, J.K. (2024), "Climate change mitigation with Eurobonds: an environmental Kuznets curve analysis", *Cogent Economics and Finance*, Vol. 12 No. 1, p. 2312782.
- Anand, R., Mishra, M.S. and Peiris, M.S.J. (2023), *Inclusive Growth: Measurement and Determinants*, International Monetary Fund, Washington, DC.
- Aracil, E., Gómez-Bengoechea, G. and Moreno-de-Tejada, O. (2022), "Institutional quality and the financial inclusion-poverty alleviation link: empirical evidence across countries", *Borsa Istanbul Review*, Vol. 22 No. 1, pp. 179-188.
- Arellano, M. and Bond, S. (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *The Review of Economic Studies*, Vol. 58 No. 2, pp. 277-297.
- Aslam, A., Naveed, A. and Shabbir, G. (2021), "Is it an institution, digital or social inclusion that matters for inclusive growth? A panel data analysis", *Quality and Quantity*, Vol. 55 No. 1, pp. 333-355.
- Asongu, S. and Asongu, N. (2018), "The comparative exploration of mobile money services in inclusive development", *International Journal of Social Economics*, Vol. 45 No. 1, pp. 124-139.
- Asongu, S. and Nwachukwu, J.C. (2018), "Comparative human development thresholds for absolute and relative pro-poor mobile banking in developing countries", *Information Technology and People*, Vol. 31 No. 1, pp. 63-83.
- Bastiaensen, J., De Herdt, T. and d'Exelle, B. (2005), "Poverty reduction as a local institutional process", *World Development*, Vol. 33 No. 6, pp. 979-993.
- Becker, G.S. (1964), *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, Columbia University Press, Columbia
- Biljon, C.V., Fintel, D.V. and Pasha, A. (2018), "Bargaining to work: the effect of female autonomy on female labour supply", Working paper 04/2018, Stellenbosch University, Department of Economics.
- Brambor, T., Clark, W.R. and Golder, M. (2006), "Understanding interaction models: improving empirical analyses", *Political Analysis*, Vol. 14 No. 1, pp. 63-82.
- Chikalipah, S. (2020), "Does the pursuit of outreach consistently stifle the financial performance of microfinance institutions in Sub-Saharan Africa?", *Development in Practice*, Vol. 30 No. 3, pp. 409-420.
-

-
- Chong, A. and Calderon, C. (2000), "Causality and feedback between institutional measures and economic growth", *Economics and Politics*, Vol. 12 No. 1, pp. 69-81.
- Corrado, G. and Corrado, L. (2017), "Inclusive finance for inclusive growth and development", *Current Opinion in Environmental Sustainability*, Vol. 24, pp. 19-23.
- Dabla-Norris, M.E., Kochhar, M.K., Suphaphiphat, M.N., Ricka, M.F. and Tsounta, M.E. (2015), *Causes and Consequences of Income Inequality: A Global Perspective*, International Monetary Fund, Washington, DC.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S. and Hess, J. (2018), "Opportunities for expanding financial inclusion through digital technology".
- Demirgüç-Kunt, A. and Singer, D. (2017), "Financial inclusion and inclusive growth: a review of recent empirical evidence", World Bank Policy Research Working Paper, (8040).
- Dorffle, C. and Schuhmann, S. (2022), "What is inclusive development? Introducing the multidimensional inclusiveness index", *Social Indicators Research*, Vol. 162 No. 3, pp. 1117-1148.
- Dziwornu, R.K., Yiadom, E.B. and Narteh-Yoe, S.B. (2024), "Agricultural loan pricing by banks in Ghana: a panel data analysis", *African Journal of Economic and Management Studies*, Vol. 15 No. 1, pp. 145-158.
- Ferrata, L. (2019), "Digital financial inclusion—an engine for "leaving no one behind", *Public Sector Economics*, Vol. 43 No. 4, pp. 445-458.
- Ghouse, G., Aslam, A. and Bhatti, M.I. (2022), "The impact of the environment, digital–social inclusion, and institutions on inclusive growth: a conceptual and empirical analysis", *Energies*, Vol. 15 No. 19, p. 7098.
- Global Findex (2021), *Global Financial Inclusion Database*, World Bank Publications, Washinton DC.
- Gomber, P., Koch, J.A. and Siering, M. (2017), "Digital finance and FinTech: current research and future research directions", *Journal of Business Economics*, Vol. 87 No. 5, pp. 537-580.
- Helms, B. (2006), *Access for All: Building Inclusive Financial Systems*, World Bank Publications, Washington, DC.
- Kabeer, N. (1999), "Resources, agency, achievements: reflections on the measurement of women's empowerment", *Development and Change*, Vol. 30 No. 3, pp. 435-464.
- Khan, M.Z. (2022), "Role of Central bank digital currency (CBDC) for financial inclusion in organization of Islamic cooperation (OIC) countries", Master's thesis, Hamad Bin Khalifa University, Qatar.
- King, R.G. and Levine, R. (1993), "Finance and growth: Schumpeter might be right", *The Quarterly Journal of Economics*, Vol. 108 No. 3, pp. 717-738.
- Levine, R. (1997), "Financial development and economic growth: views and agenda", *Journal of Economic Literature*, Vol. 35 No. 2, pp. 688-726.
- Mensah, L., Bokpin, G. and Boachie-Yiadom, E. (2018), "External debts, institutions and growth in SSA", *Journal of African Business*, Vol. 19 No. 4, pp. 475-490.
- Mensah, L., Yiadom, E.B. and Dziwornu, R. (2021), "Does eurobond issuance influence FDI location? Evidence from Sub-Saharan africa", *African Journal of Economic and Management Studies*, Vol. 12 No. 2, pp. 336-355.
- Manyika, J., Lund, S., Singer, M., White, O. and Berry, C. (2016), *Digital Finance for All: Powering Inclusive Growth in Emerging Economies*, McKinsey Global Institute, London, pp. 1-15.
- Matekenya, W., Moyo, C. and Jeke, L. (2021), "Financial inclusion and human development: evidence from Sub-Saharan Africa", *Development Southern Africa*, Vol. 38 No. 5, pp. 683-700.
- Mondal, S. (2020), "Digital financial inclusion and inclusive development of India", *International Journal of Innovative Science and Research Technology*, Vol. 5 No. 3, pp. 1054-1059.
- Ofosu-Mensah Ababio, J., Yiadom, E.B., Sarpong-Kumankoma, E. and Boadi, I. (2023), "Financial inclusion: a catalyst for financial system development in emerging and frontier markets", *Journal of Financial Economic Policy*, Vol. 15 No. 6, pp. 530-550, doi: [10.1108/JFEP-06-2023-0155](https://doi.org/10.1108/JFEP-06-2023-0155).

-
- Ozili, P.K. (2018), "Impact of digital finance on financial inclusion and stability", *Borsa Istanbul Review*, Vol. 18 No. 4, pp. 329-340.
- Pouw, N. and Gupta, J. (2017), "Inclusive development: a multi-disciplinary approach", *Current Opinion in Environmental Sustainability*, Vol. 24, pp. 104-108.
- Robinson, M.S. (2001), *The Microfinance Revolution: Sustainable Finance for the Poor*, The World Bank, Washington, DC.
- Samans, R., Blanke, J., Corrigan, G. and Drzeniek, M. (2015), *The Inclusive Growth and Development Report 2015*, Vol. 13 World Economic Forum, Geneva.
- Sen, A. (1999), *Development as Freedom*, Oxford University Press, Oxford.
- Siddik, M.N.A. and Kabiraj, S. (2020), "Digital finance for financial inclusion and inclusive growth", *Digital Transformation in Business and Society: Theory and Cases*, Springer, New York, NY, pp. 155-168.
- USAID (2023), "Inclusive development", available at: www.usaid.gov/inclusivedevelopment
- Wang, W., He, T. and Li, Z. (2023), "Digital inclusive finance, economic growth and innovative development", *Kybernetes*, Vol. 52 No. 9, pp. 3064-3084.
- Wang, Y.C. and Wen, T. (2020), "Research on economic growth effect and heterogeneity of digital finance", *Modern Economic Research*, No. 11, pp. 56-69.
- World Bank (2023), *World Development Indicators Database*, World Bank Publications, Washington, DC.
- World Economic Forum (2022), *Inclusive Development Index Database*, World Bank Publications, Washington, DC.
- Wysokinska, Z. (2023), "Global and European foreign trade during the COVID-19 pandemic", *Comparative Economic Research*, Vol. 26 No. 2, pp. 85-104.
- Yiadom, E.B., Dziwornu, R.K. and Yalley, S. (2021), "Financial inclusion, poverty and growth in Africa: can institutions help?", *African J. of Economic and Sustainable Development*, Vol. 8 No. 2, pp. 91-110.
- Yiadom, E.B., Mensah, L. and Bokpin, G.A. (2023), "Environmental risk and foreign direct investment: the role of financial deepening, access and efficiency", *Sustainability Accounting, Management and Policy Journal*, Vol. 14 No. 2, pp. 369-395.
- Yiadom, E.B., Mensah, L. and Bokpin, G.A. (2022), "Environmental risk and foreign direct investment: the role of financial sector development", *Environmental Challenges*, Vol. 9, p. 100611.
- Yiadom, E.B. and Abdul-Mumuni, A. (2022), "Pandemics and stock markets reactions: a panel analysis of emerging markets", *African Journal of Economic and Management Studies*, Vol. 13 No. 4, pp. 636-650.
- Yiadom, E.B., Mawutor, J.K.M., Amankwa, R.F. and Yalley, S. (2020), "The effect of capital structure on organizational performance of listed Ghana club 100 companies", *IUP Journal of Accounting Research and Audit Practices*, Vol. 19 No. 3, pp. 7-21.
- Zhang, X., Wan, G., Zhang, J. and He, Z. (2020), "Digital economy, financial inclusion, and inclusive growth", *China Economist*, Vol. 15 No. 3, pp. 92-105.
- Zhu, Y. (2022), "Research on the impact of digital inclusive finance on high-quality economic development", *Frontiers in Business, Economics and Management*, Vol. 4 No. 3, pp. 38-43.

Corresponding author

Eric Boachie Yiadom can be contacted at: boachie.eric@upsamail.edu.gh

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgrouppublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com