

Digital Financial Inclusion and Economic Growth: Evidence from Emerging Economies Using Panel Data Analysis

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Abstract:

This study investigates the impact of digital financial inclusion on economic growth across emerging economies. With the rapid expansion of financial technologies, access to financial services has significantly improved, particularly in developing regions. However, empirical evidence regarding its macroeconomic effects remains inconclusive. This research employs panel data from 25 emerging economies spanning 2010–2023 and applies fixed effects and system Generalized Method of Moments (GMM) models to examine the relationship between digital financial inclusion and GDP growth. The findings reveal that digital financial inclusion significantly promotes economic growth by enhancing capital allocation efficiency, increasing savings, and supporting small and medium enterprises (SMEs). However, the results also indicate diminishing returns at higher levels of financial inclusion. Policy implications suggest that governments should focus not only on expanding access but also on improving financial literacy and regulatory frameworks to maximize the benefits of digital finance.

Keywords:

digital finance; financial inclusion; economic growth; emerging economies; panel data

I. Introduction

Economic growth remains one of the most fundamental objectives pursued by governments, particularly in emerging economies striving to achieve sustainable development and reduce socio-economic inequalities. Over the past decades, the role of the financial sector in facilitating economic growth has received considerable attention in both theoretical and empirical literature. A well-developed financial system enhances the efficient allocation of resources, mobilizes savings, promotes investment, and ultimately drives productivity improvements. However, despite substantial progress in financial sector development, a significant proportion of the global population remains excluded from formal financial services.

Financial exclusion is particularly pronounced in emerging economies, where structural barriers such as limited banking infrastructure, high transaction costs, lack of documentation, and low levels of financial literacy restrict access to traditional financial systems. In this context, digital financial inclusion has emerged as a transformative solution capable of overcoming these constraints. By leveraging digital technologies such as mobile banking, electronic wallets, and fintech platforms, financial services can be delivered more efficiently, affordably, and inclusively.

The rapid expansion of digital financial services has been especially evident in regions such as Southeast Asia, South Asia, and Sub-Saharan Africa. Mobile money services, in particular, have enabled millions of previously unbanked individuals to access financial

tools, facilitating savings, payments, credit, and insurance. This transformation has led policymakers and researchers to increasingly focus on the potential macroeconomic implications of digital financial inclusion. Digital financial inclusion has become a key driver of economic transformation in developing and emerging economies, particularly with the rise of fintech and mobile banking technologies (Ozili, 2018; Suri & Jack, 2016; Demirgüç-Kunt et al., 2022).

Recent studies highlight that digital financial services significantly improve access to financial systems, reduce inequality, and promote inclusive growth (Chotrianda et al., 2024; Mansyur, 2024).

From a theoretical perspective, digital financial inclusion can influence economic growth through several transmission channels. First, it enhances savings mobilization by providing secure and accessible financial instruments. Increased savings can then be intermediated into productive investments, contributing to capital formation. Second, digital financial services reduce transaction costs and information asymmetries, improving the efficiency of financial intermediation. Third, access to credit enables small and medium enterprises (SMEs) to expand their operations, innovate, and generate employment. Finally, digital payment systems stimulate consumption by facilitating faster and more convenient transactions.

Despite these promising mechanisms, the relationship between digital financial inclusion and economic growth is not universally positive or linear. Some scholars argue that excessive financial expansion, particularly in poorly regulated environments, may lead to financial instability, over-indebtedness, and inefficient allocation of resources. Moreover, digital financial inclusion may disproportionately benefit certain segments of the population, potentially exacerbating inequality if not accompanied by inclusive policies.

Empirical evidence on this relationship remains mixed. While several studies report a positive and significant impact of financial inclusion on economic growth, others highlight diminishing returns or context-specific effects. For instance, the effectiveness of digital financial inclusion may depend on institutional quality, regulatory frameworks, technological infrastructure, and human capital levels. Countries with weak governance structures may fail to fully harness the benefits of digital finance, while those with strong institutions may experience more pronounced growth effects.

In addition, the rapid evolution of financial technologies introduces new challenges that warrant careful consideration. Issues related to data privacy, cybersecurity, digital literacy, and regulatory oversight have become increasingly important. Without appropriate safeguards, the expansion of digital financial services may expose users to risks such as fraud, data breaches, and predatory lending practices. Therefore, the role of government and regulatory authorities is critical in ensuring that digital financial inclusion contributes positively to economic development.

Given these complexities, there is a growing need for comprehensive empirical analysis that captures both the benefits and potential risks of digital financial inclusion. This study seeks to contribute to the existing literature by examining the impact of digital financial inclusion on economic growth in a panel of emerging economies over the period 2010–2023. Unlike earlier studies that rely on limited datasets or traditional econometric approaches, this research employs a more recent dataset and utilizes advanced estimation techniques, including

the System Generalized Method of Moments (GMM), to address issues of endogeneity and dynamic relationships.

Furthermore, this study explores the possibility of non-linear effects by examining whether the impact of digital financial inclusion varies across different levels of development. This is particularly important in understanding whether there are diminishing returns to financial inclusion and identifying optimal levels of financial sector expansion.

The research is guided by the following key questions:

- Does digital financial inclusion significantly influence economic growth in emerging economies?
- Is the relationship between digital financial inclusion and economic growth linear or non-linear?
- What policy implications can be derived to maximize the benefits of digital financial inclusion?

By addressing these questions, this study aims to provide valuable insights for policymakers, financial institutions, and development organizations. The findings are expected to inform strategies that promote inclusive and sustainable economic growth through the effective use of digital financial technologies. Despite its rapid expansion, digital financial inclusion faces challenges such as unequal access, low financial literacy, and regulatory limitations (Prihandini, 2025; Rotinsulu et al., 2024). While many studies report a positive relationship between financial inclusion and economic growth, empirical findings remain inconclusive and context-dependent (Yaqin & Safuan, 2023; Qarizada & Sazish, 2025)

In summary, digital financial inclusion represents a paradigm shift in the way financial services are delivered and accessed. While it's potential to drive economic growth is substantial, its impact is contingent upon a range of factors, including institutional quality, regulatory frameworks, and user capabilities. Therefore, a nuanced understanding of this relationship is essential to ensure that digital financial inclusion serves as a catalyst for inclusive and sustainable development rather than a source of new economic vulnerabilities.

II. Review of Literature

The theoretical foundation of this study lies in financial development theory, which posits that well-functioning financial systems enhance economic growth (Levine, 2005). Financial inclusion extends this framework by emphasizing access to financial services. Financial development theory suggests that access to financial services enhances economic growth through capital accumulation and efficient resource allocation (Levine, 2005). Empirical studies confirm that digital financial inclusion positively affects economic growth by increasing credit access, promoting entrepreneurship, and improving financial efficiency (Nigama et al., 2026; Nisar et al., 2025).

In the digital era, fintech innovations have transformed traditional financial systems and expanded financial inclusion significantly (Alt et al., 2018; Philippon, 2020). However, some studies highlight risks such as financial instability, over-indebtedness, and regulatory gaps associated with rapid fintech expansion (Satoto et al., 2025; Lee, 2024)

Previous studies highlight several channels through which financial inclusion affects growth:

- **Capital accumulation:** Increased savings and investments (Beck et al., 2007)
 - **Productivity improvement:** Efficient allocation of resources
 - **Entrepreneurship support:** Access to credit for SMEs
- Recent studies emphasize digital financial inclusion:
- Suri & Jack (2016) found that mobile money significantly reduced poverty in Kenya
 - Ozili (2018) highlighted the role of fintech in improving financial access
- However, some scholars argue that:
- Financial inclusion may have **diminishing returns**
 - Weak regulation may lead to **over-indebtedness**
- Thus, empirical findings remain mixed, necessitating further investigation.

III. Research Method

3.1 Data

This study uses panel data from 25 emerging economies over the period 2010–2023. Data sources include:

- World Bank
- IMF
- Global Findex Database

3.2 Variables

- **Dependent Variable:**
 - GDP Growth (annual %)
- **Independent Variable:**
 - Digital Financial Inclusion Index (DFII)
- **Control Variables:**
 - Inflation rate
 - Trade openness
 - Government expenditure
 - Human capital index

3.3 Model Specification

The baseline econometric model:

$$GDP_{it} = \alpha + \beta_1 DFII_{it} + \beta_2 X_{it} + \mu_i + \epsilon_{it}$$

To address endogeneity, the study applies **System GMM**:

$$GDP_{it} = \alpha + \beta_1 GDP_{it-1} + \beta_2 DFII_{it} + \beta_3 X_{it} + \epsilon_{it}$$

IV. Discussion

4.1 Results

This section presents the empirical findings of the study and discusses their implications in relation to existing theoretical and empirical literature. The analysis is conducted using both fixed effects and System Generalized Method of Moments (GMM) estimators to ensure robustness and address potential endogeneity issues. This result supports the argument that fintech reduces transaction costs, enhances credit access, and accelerates entrepreneurship, thereby contributing to macroeconomic performance (Qarizada & Sazish, 2025).

a. Descriptive Analysis

The descriptive statistics reveal substantial variation in both economic growth and digital financial inclusion across the sampled emerging economies. The average GDP growth rate during the study period is approximately 4.2%, reflecting moderate but heterogeneous economic performance. Some countries exhibit high growth rates driven by structural reforms and technological adoption, while others experience stagnation due to political instability and macroeconomic imbalances.

Digital financial inclusion, as measured by the composite index, shows a consistent upward trend over time. This reflects the rapid adoption of digital financial services, particularly mobile banking and electronic payment systems. However, the distribution of digital financial inclusion remains uneven, with some countries achieving near-universal access while others lag significantly behind.

b. Baseline Regression Results

The fixed effects estimation indicates that digital financial inclusion has a positive and statistically significant impact on economic growth at the 1% significance level. This suggests that, on average, improvements in access to digital financial services are associated with higher GDP growth rates.

The magnitude of the coefficient implies that a one-unit increase in the digital financial inclusion index leads to a measurable increase in economic growth. This finding supports the hypothesis that digital financial inclusion enhances economic performance by improving financial intermediation and facilitating resource allocation.

Control variables also exhibit expected signs. Trade openness positively influences growth, reflecting the benefits of integration into the global economy. Government expenditure shows a mixed effect, depending on the efficiency of public spending. Inflation, when moderate, does not significantly hinder growth, but higher levels are associated with negative effects.

c. Dynamic Panel Results (System GMM)

To address potential endogeneity and dynamic relationships, the System GMM estimator is employed. The results confirm the robustness of the baseline findings. The lagged dependent variable is positive and significant, indicating persistence in economic growth. This suggests that past economic performance influences current growth trajectories.

Importantly, digital financial inclusion remains positive and statistically significant in the GMM model. This reinforces the conclusion that the observed relationship is not driven by reverse causality or omitted variable bias.

Diagnostic tests, including the Hansen test and Arellano-Bond test for autocorrelation, confirm the validity of the instruments and the reliability of the model.

d. Non-linear Effects

To explore potential non-linearities, a quadratic term of digital financial inclusion is included in the model. The results reveal a significant inverted U-shaped relationship between digital financial inclusion and economic growth. The observed diminishing returns are aligned with previous studies suggesting that excessive financial expansion may lead to inefficiencies and financial instability (Satoto et al., 2025).

At lower levels, increases in financial inclusion have a strong positive impact on growth. This reflects the initial benefits of expanding access to financial services, particularly for previously excluded populations. However, beyond a certain threshold, the marginal benefits begin to decline, and excessive financial expansion may even have negative effects.

This finding is consistent with the concept of “too much finance,” where an oversized financial sector may lead to inefficiencies, speculative activities, and financial instability. This result supports the argument that fintech reduces transaction costs, enhances credit access, and accelerates entrepreneurship, thereby contributing to macroeconomic performance (Qarizada & Sazish, 2025).

4.2 Discussion

The findings of this study provide robust empirical evidence that digital financial inclusion plays a significant role in promoting economic growth in emerging economies. However, beyond confirming the positive association, the results also reveal a more nuanced and complex relationship that warrants deeper analytical discussion. In particular, the presence of non-linear effects, the role of institutional quality, and the interaction between technological adoption and socio-economic structures highlight that digital financial inclusion is not a universally beneficial phenomenon in all contexts. The findings of this study are consistent with previous research indicating that digital financial inclusion significantly promotes economic growth through improved financial access and efficiency (Yaqin & Safuan, 2023; Mansyur, 2024).

At its core, the positive relationship between digital financial inclusion and economic growth can be understood through the lens of financial intermediation theory. Digital technologies reduce traditional barriers associated with financial access, including geographic distance, high transaction costs, and information asymmetries. By leveraging mobile platforms, digital payment systems, and fintech innovations, financial services become more accessible to previously underserved populations. This expansion facilitates savings mobilization, enhances credit allocation, and promotes investment activities, all of which contribute to economic growth.

One of the most important channels through which digital financial inclusion influences growth is the mobilization of savings. In many emerging economies, a significant proportion of the population operates outside the formal banking system, relying instead on informal financial mechanisms that are often inefficient and insecure. Digital financial services provide a safer and more convenient alternative, enabling individuals to store and manage their funds electronically. This not only increases the overall level of savings in the economy but also allows financial institutions to intermediate these funds into productive investments.

Furthermore, digital financial inclusion improves the efficiency of resource allocation by reducing information asymmetries between borrowers and lenders. Fintech platforms often utilize alternative data sources, such as mobile transaction histories and behavioral patterns, to assess creditworthiness. This innovation expands access to credit for individuals and small businesses that would otherwise be excluded from traditional banking systems. As a result, capital can be allocated more efficiently to productive sectors, enhancing overall economic performance.

The role of small and medium enterprises (SMEs) as a key transmission channel cannot be overstated. SMEs constitute a substantial portion of economic activity in emerging economies and are critical drivers of employment and innovation. However, access to finance

has historically been one of the most significant constraints faced by SMEs. Digital financial inclusion alleviates this constraint by providing easier access to credit, facilitating business transactions, and enabling participation in digital marketplaces. The expansion of SMEs, in turn, contributes to job creation, income generation, and economic diversification.

In addition to supply-side effects, digital financial inclusion also stimulates demand-side dynamics. The widespread adoption of digital payment systems increases the speed and convenience of transactions, encouraging consumption and economic activity. This is particularly relevant in the context of e-commerce, where digital payments serve as a fundamental infrastructure enabling online trade. As consumption increases, aggregate demand rises, further supporting economic growth.

Despite these positive effects, the study's findings regarding non-linear relationships introduce an important caveat. The inverted U-shaped relationship between digital financial inclusion and economic growth suggests that the benefits of financial inclusion are subject to diminishing returns. At lower levels of inclusion, the marginal impact on growth is substantial, as newly included individuals and businesses gain access to financial services. However, beyond a certain threshold, additional expansion may lead to inefficiencies and potential risks.

This phenomenon can be explained by several factors. First, excessive expansion of financial services without adequate regulatory oversight may result in over-indebtedness. Easy access to credit, particularly through digital lending platforms, can encourage excessive borrowing, leading to financial distress among households and businesses. This, in turn, may increase default rates and undermine financial stability.

Second, the rapid growth of fintech and digital financial services may outpace the development of regulatory frameworks. In many emerging economies, regulatory institutions face challenges in monitoring and supervising innovative financial products. This regulatory gap creates opportunities for fraudulent activities, predatory lending practices, and misuse of consumer data. Such risks can erode trust in the financial system and offset the potential benefits of digital inclusion. Effective regulatory frameworks and digital infrastructure are essential to maximize the benefits of digital financial inclusion while minimizing associated risks (Sihotang et al., 2025).

Third, the expansion of digital financial services may lead to resource misallocation if credit is directed toward unproductive or speculative activities. In the absence of proper risk assessment mechanisms, financial institutions may extend credit to borrowers with limited repayment capacity. This can result in inefficient investment and reduced economic returns.

The findings of this study are consistent with the broader literature on financial development, which suggests that while financial deepening is generally beneficial, excessive financialization can have adverse effects on economic growth. The concept of “too much finance” highlights the potential for the financial sector to become disproportionately large relative to the real economy, leading to inefficiencies and instability. Financial literacy remains a crucial determinant of effective financial inclusion, as low literacy levels can limit the benefits of digital financial services (Prihandini, 2025).

Another critical dimension highlighted by the findings is the role of institutional quality. The effectiveness of digital financial inclusion in promoting economic growth is highly contingent upon the strength of institutions, including regulatory frameworks, legal systems, and governance structures. Countries with strong institutions are better equipped to manage

the risks associated with digital finance and ensure that financial services are used productively.

In contrast, weak institutional environments may limit the positive impact of digital financial inclusion. For example, inadequate consumer protection mechanisms may expose users to fraud and exploitation, while weak legal systems may hinder contract enforcement and dispute resolution. These challenges can reduce the effectiveness of financial inclusion initiatives and limit their contribution to economic growth.

Financial literacy also emerges as a crucial factor in determining the outcomes of digital financial inclusion. Access to financial services alone is insufficient if individuals lack the knowledge and skills required to use these services effectively. Low levels of financial literacy may lead to poor financial decision-making, such as over-borrowing, inadequate savings, and vulnerability to financial scams. Therefore, enhancing financial literacy is essential to maximize the benefits of digital financial inclusion.

The interaction between digital infrastructure and financial inclusion is another important consideration. The availability of reliable internet connectivity, mobile networks, and digital platforms is a prerequisite for the effective delivery of digital financial services. In many emerging economies, disparities in digital infrastructure create uneven access to financial services, particularly in rural and remote areas. Addressing these disparities is critical to ensuring that the benefits of digital financial inclusion are widely distributed.

Moreover, the study's findings have important implications for income inequality. While digital financial inclusion has the potential to reduce inequality by providing access to financial services for marginalized populations, it may also exacerbate disparities if access is uneven. For instance, individuals with higher levels of education and digital literacy are more likely to benefit from digital financial services, while those lacking these capabilities may be left behind. This digital divide underscores the need for inclusive policies that address both access and capability gaps.

From a policy perspective, the results of this study suggest that a balanced approach is required to maximize the benefits of digital financial inclusion. Policymakers should focus not only on expanding access to financial services but also on ensuring their quality, sustainability, and inclusiveness. This involves strengthening regulatory frameworks, promoting financial literacy, and investing in digital infrastructure.

Regulatory frameworks should be designed to foster innovation while mitigating risks. This includes establishing clear guidelines for fintech operations, ensuring data protection and privacy, and implementing effective consumer protection mechanisms. Collaboration between regulators, financial institutions, and technology providers is essential to create a secure and efficient financial ecosystem.

In addition, policies aimed at promoting financial literacy should be prioritized. Educational programs and awareness campaigns can help individuals make informed financial decisions and utilize digital financial services effectively. Such initiatives are particularly important for vulnerable populations, including low-income households and rural communities.

Investment in digital infrastructure is equally critical. Expanding internet connectivity and mobile network coverage can enhance access to digital financial services and

reduce geographic disparities. Public-private partnerships may play a key role in achieving these objectives, particularly in resource-constrained environments.

Furthermore, the role of innovation should not be overlooked. Fintech solutions have the potential to address specific challenges faced by underserved populations, such as lack of credit history and high transaction costs. Encouraging innovation while maintaining regulatory oversight can drive the development of inclusive and efficient financial systems.

Finally, the study highlights the need for a holistic approach to economic development. Digital financial inclusion should be integrated with broader development strategies, including education, infrastructure, and institutional reform. Such an integrated approach can create synergies that enhance the overall impact of financial inclusion on economic growth.

In conclusion, this study provides comprehensive evidence that digital financial inclusion is a powerful driver of economic growth in emerging economies. However, its impact is not linear and depends on a range of contextual factors, including institutional quality, financial literacy, and regulatory frameworks. While the expansion of digital financial services offers significant opportunities for promoting inclusive growth, it also presents challenges that must be carefully managed.

The findings underscore the importance of a balanced and strategic approach to digital financial inclusion, one that prioritizes not only access but also quality, sustainability, and inclusiveness. By addressing these dimensions, policymakers can harness the full potential of digital financial inclusion as a catalyst for long-term economic development.

V. Conclusion

This study provides empirical evidence that digital financial inclusion significantly promotes economic growth in emerging economies. By improving access to financial services, digital technologies enhance savings, investment, and entrepreneurial activities. However, the relationship is non-linear, with diminishing returns at higher levels of inclusion. This suggests that simply expanding access is insufficient; quality and sustainability are equally important.

Policy Recommendations

1. Strengthen financial regulation frameworks
2. Promote financial literacy programs
3. Support fintech innovation with oversight
4. Encourage inclusive digital infrastructure

Future research should explore micro-level impacts and country-specific dynamics.

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