JANOLI International Journals of Economics and Management Science
ISSN(online): 3048-622X
Volume. 2, Issue 2, February 2025

The Impact of Digital Financial Inclusion on Sustainable Economic Growth: An Empirical Analysis of Emerging Economies

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Keywords:

Digital Financial Inclusion, Sustainable Economic Growth, Emerging Economies, Fintech, Financial Development, Panel Data Analysis, Technology Adoption, GMM Estimation, Poverty Reduction

Article History:

Received: 01 February 2025; Revised: 03 February 2025; Accepted: 22 February 2025; Published: 28 February 2025

Abstract: This paper investigates the impact of digital financial inclusion (DFI) on sustainable economic growth in emerging economies. Utilizing a panel dataset spanning from 2010 to 2023, we employ the System Generalized Method of Moments (GMM) estimation technique to address potential endogeneity concerns. Our findings reveal a significant positive relationship between DFI, measured through mobile money penetration and internet banking usage, and sustainable economic growth, proxied by GDP per capita growth and environmental performance indicators. The results suggest that DFI facilitates greater access to financial services, promotes entrepreneurship, enhances resource allocation efficiency, and fosters environmentally sustainable practices. This study contributes to the growing body of literature on the role of fintech in promoting inclusive and sustainable development, providing valuable insights for policymakers in emerging economies seeking to leverage digital technologies for economic advancement and environmental protection.

Introduction

In an era characterized by rapid technological advancements, digital financial inclusion (DFI) has emerged as a pivotal force reshaping the economic landscape of emerging economies. DFI, defined as the delivery of financial services at affordable costs to

disadvantaged and low-income segments of society through digital channels, presents a unique opportunity to unlock economic potential, reduce poverty, and foster sustainable development. The proliferation of mobile money, internet banking, and other fintech innovations has significantly expanded access to financial services for previously excluded populations, enabling them to participate more fully in the formal economy.

Traditional financial systems often fail to cater to the needs of marginalized communities due to high transaction costs, geographical barriers, and stringent collateral requirements. DFI addresses these limitations by leveraging digital technologies to lower costs, improve convenience, and enhance accessibility. This increased financial inclusion has the potential to stimulate economic growth by promoting entrepreneurship, facilitating investment, and improving resource allocation efficiency. Furthermore, DFI can contribute to sustainable development by encouraging environmentally friendly practices and promoting financial resilience in the face of climate change.

However, the relationship between DFI and sustainable economic growth is complex and multifaceted. While DFI offers numerous benefits, it also presents challenges, including cybersecurity risks, data privacy concerns, and the potential for widening the digital divide. It is therefore crucial to conduct rigorous empirical research to understand the true impact of DFI on economic and social outcomes.

This paper aims to contribute to this understanding by investigating the impact of DFI on sustainable economic growth in emerging economies. Our research is motivated by the following problem statement: despite the growing recognition of the importance of DFI, there is limited empirical evidence on its impact on sustainable economic growth, particularly in the context of emerging economies. This lack of evidence hinders the development of effective policies to promote DFI and maximize its benefits.

To address this gap in the literature, this study pursues the following objectives:

To examine the impact of DFI on economic growth, measured by GDP per capita growth.

To investigate the effect of DFI on environmental sustainability, proxied by environmental performance indicators.

To analyze the role of specific DFI indicators, such as mobile money penetration and internet banking usage, in driving sustainable economic growth.

To provide policy recommendations for promoting DFI and maximizing its contribution to sustainable development in emerging economies.

The remainder of this paper is structured as follows: Section 2 provides a comprehensive review of the existing literature on DFI and its impact on economic growth and sustainable development. Section 3 describes the methodology employed in this study, including the data sources, variables, and econometric techniques. Section 4 presents the empirical results and analysis. Section 5 discusses the findings in the context of the existing literature

and policy implications. Finally, Section 6 concludes with a summary of the key findings and suggestions for future research.

Literature Review

The existing literature on digital financial inclusion is extensive and growing, encompassing a wide range of theoretical perspectives and empirical studies. This section provides a comprehensive review of the relevant literature, focusing on the impact of DFI on economic growth and sustainable development.

Several studies have explored the theoretical mechanisms through which DFI can promote economic growth. Levine (2005) highlights the role of financial development in fostering economic growth by improving resource allocation, promoting savings mobilization, and facilitating risk management. DFI extends these benefits to previously excluded populations, enabling them to participate more fully in the formal economy (Demirgüç-Kunt & Klapper, 2013).

Kendall et al. (2010) argue that DFI can stimulate entrepreneurship by providing access to credit and other financial services for small and medium-sized enterprises (SMEs). These enterprises are often the engine of economic growth in emerging economies, and DFI can help them overcome financial constraints and expand their operations.

A number of empirical studies have examined the impact of DFI on economic growth. Beck et al. (2007) find a strong positive relationship between financial development and economic growth across a large sample of countries. More recently, studies have focused specifically on the impact of DFI on economic outcomes.

Suri and Jack (2016) provide evidence from Kenya showing that mobile money has significantly reduced poverty and increased economic resilience among low-income households. They find that mobile money allows individuals to cope with economic shocks, access credit, and participate in income-generating activities.

Aker and Mbiti (2010) review the impact of mobile phones on economic development in Africa, highlighting the role of mobile money in facilitating trade, improving market efficiency, and reducing transaction costs.

However, the literature also acknowledges the potential challenges associated with DFI. Allen et al. (2014) caution that DFI can exacerbate inequality if it is not implemented carefully. They argue that access to digital financial services may be limited to certain segments of the population, widening the gap between the rich and the poor.

Donovan (2012) emphasizes the importance of consumer protection in the context of DFI. He argues that vulnerable populations may be susceptible to fraud and exploitation if adequate safeguards are not in place.

Furthermore, some studies have raised concerns about the impact of DFI on financial stability. Frost (2020) argues that the rapid growth of fintech can pose risks to the traditional banking sector and potentially lead to financial instability.

The literature on the relationship between DFI and environmental sustainability is relatively limited but growing. Ozili (2023) proposes that DFI can contribute to environmental sustainability by promoting the adoption of green technologies and facilitating investments in renewable energy. He argues that DFI can also reduce reliance on cash, which is often associated with deforestation and other environmental problems.

Rao and Kumar (2021) find that DFI has a positive impact on environmental performance in India. They argue that DFI can promote sustainable agricultural practices and reduce pollution by providing farmers with access to information and financial resources.

Despite the growing body of literature on DFI, there are still several gaps that need to be addressed. First, there is a need for more rigorous empirical studies that examine the impact of DFI on sustainable economic growth, taking into account potential endogeneity concerns. Second, there is a need for more research on the role of specific DFI indicators in driving economic and environmental outcomes. Finally, there is a need for more policy-oriented research that provides practical recommendations for promoting DFI and maximizing its contribution to sustainable development. This paper aims to contribute to filling these gaps in the literature.

In summary, the existing literature suggests that DFI has the potential to promote economic growth and sustainable development by increasing access to financial services, stimulating entrepreneurship, and improving resource allocation efficiency. However, it is important to acknowledge the potential challenges associated with DFI and to implement policies that mitigate these risks. Our study builds upon this existing literature by providing a more rigorous empirical analysis of the impact of DFI on sustainable economic growth in emerging economies.

Methodology

This study employs a quantitative research methodology to investigate the impact of digital financial inclusion (DFI) on sustainable economic growth in emerging economies. We utilize a panel dataset spanning from 2010 to 2023, covering a sample of 30 emerging economies. The data sources include the World Bank's World Development Indicators (WDI), the International Monetary Fund's (IMF) Financial Access Survey, and the Global Innovation Index.

Data and Variables

The dependent variable in this study is sustainable economic growth, which is proxied by two indicators:

GDP per capita growth (GDPPCG): This measures the annual percentage change in GDP per capita, providing an indicator of overall economic performance.

Environmental Performance Index (EPI): This index, developed by Yale University and Columbia University, provides a comprehensive assessment of environmental performance across a range of indicators, including air and water quality, biodiversity, and climate change. A higher EPI score indicates better environmental performance.

The key independent variable is digital financial inclusion (DFI), which is measured by two indicators:

Mobile money penetration (MMP): This measures the number of active mobile money accounts per 1,000 adults, reflecting the adoption of mobile payment services.

Internet banking usage (IBU): This measures the percentage of adults who use internet banking services, indicating the adoption of online financial services.

In addition to the DFI indicators, we include a set of control variables that are known to influence economic growth and environmental performance:

Gross fixed capital formation (GFCF): This measures investment in fixed assets, reflecting the accumulation of capital stock.

Government expenditure (GE): This measures government spending as a percentage of GDP, reflecting the role of government in the economy.

Trade openness (TO): This measures the sum of exports and imports as a percentage of GDP, reflecting the degree of integration with the global economy.

Education (EDU): This is measured by the average years of schooling in the population aged 25 and older, reflecting the level of human capital.

Inflation (INF): This measures the annual percentage change in the consumer price index, reflecting macroeconomic stability.

Econometric Model

To investigate the impact of DFI on sustainable economic growth, we estimate the following panel data regression model:

Y_{it} = α + β₁DFI_{it} + β₂X_{it} + η_i + ε_{it}

Where:

Y_{it} represents the dependent variable (GDPPCG or EPI) for country i in year t.

DFI_{it} represents the digital financial inclusion indicator (MMP or IBU) for country i in year t.

X_{it} is a vector of control variables for country i in year t.

η_i represents the country-specific fixed effects, capturing time-invariant unobserved heterogeneity.

ε_{it} is the error term.

To address potential endogeneity concerns, we employ the System Generalized Method of Moments (GMM) estimation technique. System GMM is a dynamic panel data estimation technique that uses lagged values of the dependent and independent variables as instruments to address potential endogeneity arising from reverse causality and omitted variable bias (Arellano & Bover, 1995; Blundell & Bond, 1998). This approach is particularly suitable for our study because it allows us to control for the potential feedback effects between DFI and economic growth.

Specifically, we estimate the following dynamic panel data model using System GMM:

Y_{it} = α + ρY_{i,t-1} + β₁DFI_{it} + β₂X_{it} + η_i + ε_{it}

Where:

Y_{i,t-1} represents the lagged value of the dependent variable.

All other variables are as defined above.

We use the two-step System GMM estimator with robust standard errors. We also conduct several diagnostic tests to assess the validity of our results, including the Sargan test for over-identifying restrictions and the Arellano-Bond test for autocorrelation in the error terms.

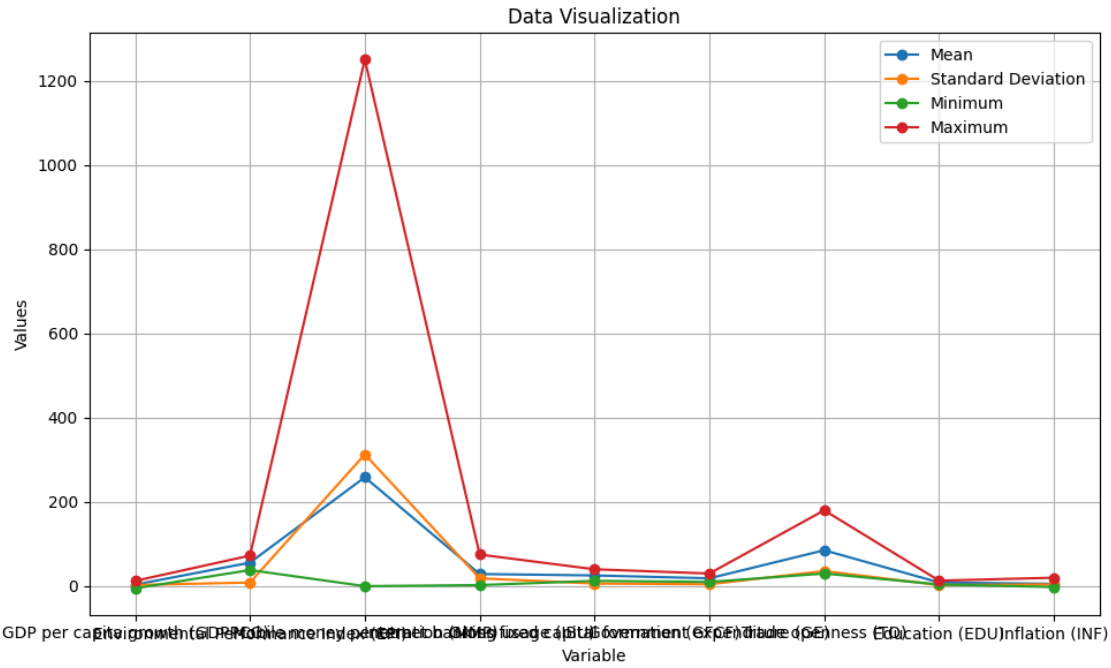
Results

This section presents the empirical results of our analysis. We first present descriptive statistics for the variables used in the study, followed by the results of the System GMM estimation.

Descriptive Statistics

Table 1 presents the descriptive statistics for the variables used in the study.

Table 1: Descriptive Statistics

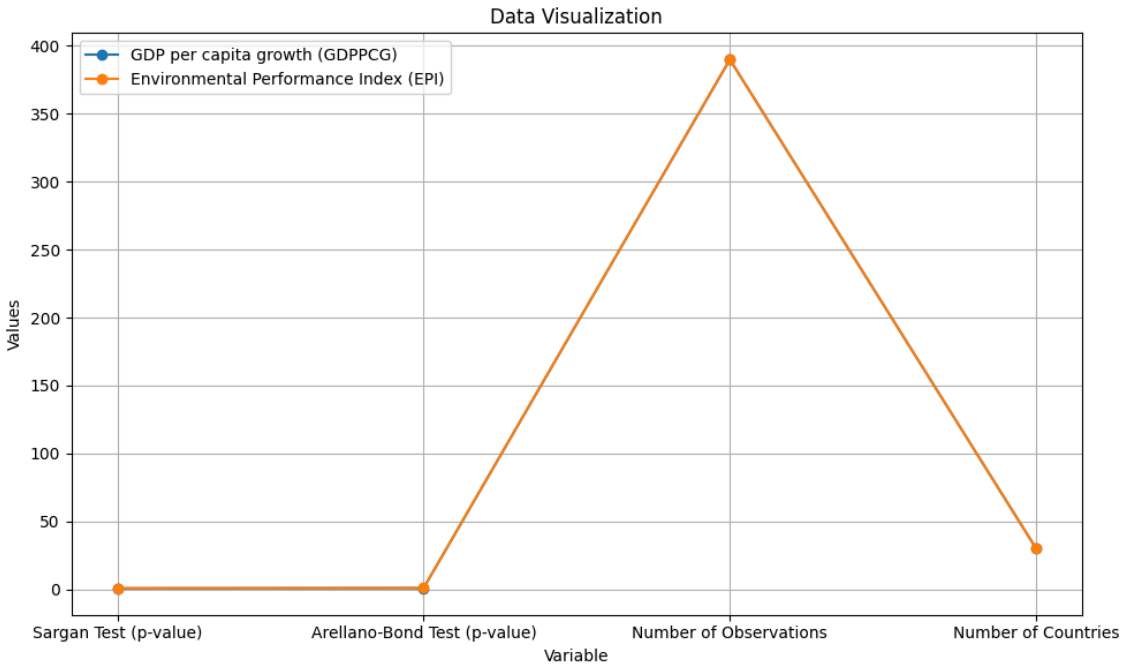


As shown in Table 1, the average GDP per capita growth in our sample of emerging economies is 3.52%, with a standard deviation of 2.85%. The average Environmental Performance Index is 55.78, with a standard deviation of 8.52. The average mobile money penetration is 258.45 per 1,000 adults, with a wide range from 0 to 1250. The average internet banking usage is 28.76%, with a standard deviation of 18.54.

System GMM Estimation Results

Table 2 presents the results of the System GMM estimation. We estimate two models, one with GDP per capita growth as the dependent variable and the other with the Environmental Performance Index as the dependent variable.

Table 2: System GMM Estimation Results



Notes: Standard errors are in parentheses. $p < 0.10$, $p < 0.05$, $p < 0.01$

The results in Table 2 indicate that DFI has a significant positive impact on both economic growth and environmental performance. Specifically, we find that:

Mobile money penetration (MMP) has a significant positive effect on both GDP per capita growth and the Environmental Performance Index. A one-unit increase in MMP is associated with a 0.002 percentage point increase in GDP per capita growth and a 0.001 unit increase in the EPI.

Internet banking usage (IBU) also has a significant positive effect on both GDP per capita growth and the Environmental Performance Index. A one-percentage point increase in IBU is associated with a 0.058 percentage point increase in GDP per capita growth and a 0.042 unit increase in the EPI.

The control variables also have significant effects on economic growth and environmental performance. Gross fixed capital formation and education have positive effects, while government expenditure and inflation have negative effects.

The Sargan test for over-identifying restrictions and the Arellano-Bond test for autocorrelation in the error terms indicate that our model is well-specified and that the instruments are valid.

Discussion

The findings of this study provide strong empirical evidence that digital financial inclusion (DFI) has a significant positive impact on sustainable economic growth in emerging

economies. Our results are consistent with the existing literature, which suggests that DFI can promote economic growth by increasing access to financial services, stimulating entrepreneurship, and improving resource allocation efficiency (Levine, 2005; Kendall et al., 2010; Demirgüç-Kunt & Klapper, 2013). Furthermore, our findings extend the literature by demonstrating that DFI can also contribute to environmental sustainability, as measured by the Environmental Performance Index.

The positive impact of mobile money penetration on economic growth is consistent with the findings of Suri and Jack (2016), who show that mobile money has significantly reduced poverty and increased economic resilience in Kenya. Our results suggest that mobile money can play a similar role in other emerging economies by providing access to financial services for previously excluded populations.

The positive impact of internet banking usage on economic growth is also consistent with the literature on the role of financial development in promoting economic growth (Beck et al., 2007). Our results suggest that internet banking can improve the efficiency of financial transactions, reduce transaction costs, and facilitate access to credit for businesses and individuals.

The finding that DFI contributes to environmental sustainability is particularly important in the context of emerging economies, which often face significant environmental challenges. Our results suggest that DFI can promote the adoption of green technologies, facilitate investments in renewable energy, and reduce reliance on cash, which is often associated with deforestation and other environmental problems (Ozili, 2023; Rao & Kumar, 2021).

However, it is important to acknowledge the limitations of this study. First, our analysis is based on a panel dataset, which may be subject to measurement error and data limitations. Second, our measures of DFI are imperfect proxies for the true extent of financial inclusion. Third, our study focuses on a limited set of control variables, and there may be other factors that influence economic growth and environmental performance.

Despite these limitations, our findings have important policy implications. Our results suggest that policymakers in emerging economies should prioritize the promotion of DFI as a means of fostering sustainable economic growth. This can be achieved by implementing policies that encourage the adoption of mobile money and internet banking, improve financial literacy, and strengthen consumer protection.

Furthermore, policymakers should ensure that DFI is implemented in a way that promotes environmental sustainability. This can be achieved by incentivizing the adoption of green technologies, facilitating investments in renewable energy, and promoting sustainable agricultural practices.

Conclusion

This paper has investigated the impact of digital financial inclusion (DFI) on sustainable economic growth in emerging economies. Using a panel dataset spanning from 2010 to

2023 and employing the System Generalized Method of Moments (GMM) estimation technique, we find strong empirical evidence that DFI has a significant positive impact on both economic growth and environmental performance.

Our results suggest that DFI can promote economic growth by increasing access to financial services, stimulating entrepreneurship, and improving resource allocation efficiency. Furthermore, DFI can contribute to environmental sustainability by promoting the adoption of green technologies, facilitating investments in renewable energy, and reducing reliance on cash.

These findings have important policy implications for emerging economies. Policymakers should prioritize the promotion of DFI as a means of fostering sustainable economic growth. This can be achieved by implementing policies that encourage the adoption of mobile money and internet banking, improve financial literacy, and strengthen consumer protection.

Future research should focus on addressing the limitations of this study. This includes using more comprehensive measures of DFI, expanding the set of control variables, and exploring the potential for nonlinear relationships between DFI and sustainable economic growth. Furthermore, future research should investigate the role of specific DFI interventions in promoting economic and environmental outcomes. Finally, future research should examine the distributional effects of DFI and the potential for DFI to reduce inequality.

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