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Examining The Impact Of Digital Financial Inclusion On Banking Performance: The Moderating Effect Of Institutional Quality In Middle-Income Economies

Aftab Ahmad[1], Muhammad Kaleem*[2], Dilawar Khan[3], Hafizullah[4]

Aftab Ahmad
Institute of Business Studies, Kohat University of Science and Technology, Kohat Email: aftab6669@gmail.com

Muhammad Kaleem*
Institute of Business Studies, Kohat University of Science and Technology, Kohat Email: dr.kaleem@kust.edu.pk

Dilawar Khan
Department of Economics, Kohat University of Science and Technology, Kohat Email: dilawar@kust.edu.pk

Hafizullah
Institute of Business Studies, Kohat University of Science and technology, Kohat Email: hafizullahimskust@gmail.com

Abstract

This study examines the impact of digital financial inclusion (DFIII) on banking performance (BP) and the moderating role of institutional quality in middle-income economies. Using balanced panel data from 33 middle-income countries over the period 2011- 2021, the study employs Principal Component Analysis (PCA) to construct composite indices for DFII, BP, and institutional quality. To address endogeneity and dynamic persistence, the two-step System GMM estimator is applied. The findings reveal that DFII significantly and positively influences banking performance, enhancing efficiency, profitability, and stability. Institutional quality, although theoretically important, does not exert a statistically significant direct or moderating effect on the DFII BP relationship within the sampled economies. The results suggest that digital financial expansion serves as a primary driver of banking performance in middle-income countries, while institutional strength may play a supportive but not yet decisive role. The study contributes to the digital finance literature by integrating financial inclusion, governance quality, and banking performance within a dynamic panel framework, offering important implications for policymakers in emerging and transitional economies.

Keywords:

Digital Financial Inclusion Index ; Banking Performance; Institutional Quality; Middle-Income Economies; System GMM With Robust; Dynamic Persistence;

JEL Classification: G21, O16, O33, E02, C23.

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Introduction

Digital financial inclusion Index (DFII) the use of digital technologies such as mobile banking, online payment platforms, and digital wallets to expand access to financial services has emerged as a transformative force in global finance, especially in the banking sector. Researchers argue that digital financial inclusion can enhance banks' operational efficiency, expand service outreach, reduce transaction costs, and improve profitability (Zhao et al., 2024). Recent empirical evidence from China indicates a significant positive correlation between digital financial inclusion and bank performance, with digital inclusion boosting banks' efficiency and risk-taking that enhances overall performance (Zhao et al., 2024). Similarly, studies in Sub-Saharan Africa show that higher levels of digital financial inclusion are associated with improved bank stability and lower non-performing loans, suggesting that digital channels contribute to credit risk mitigation and institutional resilience (Banna & Alam, 2019; Ahamed & Mallick, 2019 as cited in Nkoro et al., 2025). Despite these developments, the literature also points to complex effects of digital financial inclusion, including the possibility of increased systemic risk if digital adoption outpaces banks' risk management capabilities (Ong et al., 2025). These findings highlight that the relationship between digital financial inclusion and banking outcomes is not unequivocally positive and may vary by context and capability.

A second core strand in the literature focuses on the role of institutional quality governance effectiveness, regulatory quality, rule of law, and control of corruption as a determinant of financial inclusion outcomes. Institutional quality is widely understood to facilitate financial inclusion by building trust, enforcing consumer protections, reducing transaction costs, and supporting competitive market conditions (Tay et al., 2022). Research across developing countries consistently finds that institutional quality significantly enhances formal access to financial services (Kuntchev et al., 2022), and that strong institutions are associated with deeper and more sustainable digital financial adoption (Chinoda & Kapingura, 2024; Nsiah & Tweneboah, 2023). However, while the institutional quality DFII nexus is well documented, empirical exploration of how institutional quality moderates the impact of Digital financial inclusion Index on banking performance remains limited. Existing studies examine institutional effects on access and usage (Vo, 2024; Doku et al., 2023), but few investigate whether institutional frameworks amplify or dampen the direct influence of Digital financial inclusion Index on banking performance outcomes. This gap is especially pronounced for middle-income economies countries experiencing rapid digital adoption, dynamic fintech ecosystems, and institutional environments that range from nascent regulatory frameworks to well-established governance systems.

This context underscores a critical research need: while Digital financial inclusion Index clearly promotes broader financial access and economic participation, its translation into measurable improvements in banking performance such as profitability, risk mitigation, asset quality, and operational efficiency depends on institutional conditions that support stable and secure digital finance ecosystems. Moreover, middle-income economies serve as pivotal environments where Digital financial inclusion Index and institutional quality intersect in complex ways that are not well captured in current empirical research. Therefore, building on emerging evidence and addressing persistent gaps in the literature, this study investigates the following key research questions: How does Digital financial inclusion Index influence the performance of the banking sector in middle-income economies? And To what extent does institutional quality moderate the relationship between Digital financial inclusion Index and banking performance in these economies? By integrating empirical insights from both digital finance and institutional economics, this research aims to provide robust evidence that informs policymakers, regulators, and financial institutions on how to foster resilient and inclusive banking sectors in emerging digital economies.

Literature Review

Theoretical Framework

The present study is grounded in Financial Intermediation Theory, which posits that banks and financial institutions serve as intermediaries channeling funds from savers to borrowers, thereby facilitating investment, consumption, and overall economic growth (Diamond, 1984). In line with this theory, Digital financial inclusion Index(DFII) enhances banks' intermediary role by expanding access to deposits, facilitating efficient lending, and reducing transaction and information costs through digital platforms such as mobile banking, digital wallets, and online banking services. Empirical studies indicate that banks leveraging DFII achieve higher operational efficiency, lower non-performing loans, and increased profitability, reflecting improved intermediation capacity (Zhao et al., 2024; Hassan et al 2025).

The Resource-Based View (RBV) theory posits that firms achieve sustainable competitive advantage by effectively deploying valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). In the banking context, digital financial capabilities such as secure online platforms, mobile banking infrastructure, data analytics, and fintech integration constitute strategic resources that enable banks to differentiate services, expand outreach, and improve operational performance. Recent studies demonstrate that banks with strong digital capabilities outperform competitors in profitability, efficiency, and customer retention, highlighting the strategic value of investing in technological resources (Akhtar et al., 2023; Zhao et al., 2024). RBV provides a theoretical explanation for why DFII translates into banking performance improvements: banks that leverage digital resources effectively can enhance service quality, reduce costs, and gain a competitive advantage in increasingly digital financial markets.

The effectiveness of DFII, however, is significantly shaped by the institutional environment, which encompasses governance quality, regulatory effectiveness, rule of law, and transparency. According to Institutional Theory, organizations operate within these formal structures, which influence the adoption, implementation, and outcomes of innovations (North, 1990). Strong institutions enhance trust, reduce uncertainty, and provide a stable environment, thereby amplifying the benefits of Digital financial inclusion Index on banking performance. Conversely, weak institutions can limit the effectiveness of DFII, exposing banks to operational and systemic risks. Empirical studies highlight that countries with robust institutional frameworks experience stronger positive impacts of DFII on bank performance, while weak institutional environments dampen these benefits (Nsiah & Tweneboah, 2023; Nguyen et al 2025; Hassan et al 2025).

Integrating Financial Intermediation Theory and the Resource-Based View (RBV) with institutional perspectives, this study proposes that Digital financial inclusion Index (DFII) positively influences banking performance by enhancing intermediation efficiency and leveraging digital capabilities as strategic resources (Diamond, 1984; Barney, 1991; Zhao et al., 2024). The magnitude and effectiveness of this relationship, however, are conditioned by institutional quality, including governance effectiveness, regulatory quality, and the rule of law, which can either amplify or constrain the benefits of DFII (Nsiah & Tweneboah, 2023; Nguyen et al 2025). In this integrated framework, banks that effectively deploy digital financial resources in supportive institutional environments are likely to achieve higher operational efficiency, profitability, and stability, whereas weak institutional contexts may limit these gains. Accordingly, the framework directly addresses the study's research questions by examining (1) how Digital financial inclusion Index affects the performance of the banking sector in middle-income economies and (2) the extent to which institutional quality moderates this relationship, providing a theoretical basis for understanding the contingent effects of DFII on banking performance.

Empirical Reviews

Recent empirical evidence strongly suggests that Digital financial inclusion Index (DFII) plays a crucial role in shaping banking performance. Using panel data from 30 Chinese provinces, Zhao et al. (2024) find a significant positive relationship between Digital financial inclusion Index and bank performance, showing that increasing digital inclusion

enhances operational effectiveness and risk willingness, ultimately improving performance outcomes (Zhao et al., 2024). Similarly, Zhuang Liu et al. (2024) demonstrate that inclusive FinTech and open banking models improve bank performance by enhancing lending rates and liability structures, particularly among banks serving less traditional markets, indicating that digital financial mechanisms can expand intermediation efficiency and service outreach (Liu et al., 2024). These findings align with prior research suggesting that technological adoption in banking can improve operational efficiency, reduce transaction costs, and facilitate broader market penetration (Demirgüç-Kunt et al., 2023; Beck & de la Torre, 2022). The broader digital finance literature reinforces these findings by illustrating how digital technology complements financial inclusion and economic activity more generally. For instance, Dias and Perera (2026) show through a systematic review that digital finance significantly improves access to financial services and contributes to diverse economic outcomes, including employment and entrepreneurship, with particularly strong effects in upper middle income contexts (Dias & Perera, 2026). Parallel research on financial inclusion and digital technology highlights that digital tools bridge traditional gaps in access and usage, fostering greater financial participation and reducing exclusionary barriers (Suri & Jack, 2016; Ozili, 2021). Despite these promising results, the literature also reveals heterogeneous effects. Research on banking and financial risk indicates that certain dimensions of digital financial inclusion, such as technological sophistication and service intensity, may introduce systematic risk unless supported by robust risk management, particularly in technologically advanced banking sectors (Bongini et al., 2022; Gomber et al., 2021). This suggests that while DFII broadly enhances performance, outcomes are contingent on internal bank capacities and broader contextual conditions (Allen et al., 2020).

In parallel, the role of institutional quality has received increasing scholarly attention as a driver and enabler of digital inclusion outcomes. Studies show that institutional quality including governance effectiveness, regulatory quality, and control of corruption significantly enhances access to and use of digital financial services across countries (Nasreen et al., 2025; Meniago, 2025; Klapper et al., 2016). This is consistent with findings that quality institutions promote the depth and equity of formal financial inclusion, facilitating conditions under which digital finance can thrive (Beck et al., 2007; Demirgüç-Kunt et al., 2020). Moreover, empirical research across income groups (Vo, 2024; Abaidoo & Agyapong, 2022) supports the idea that institutional quality not only strengthens digital finance adoption but also amplifies its beneficial effects on economic and financial outcomes when governance and regulatory frameworks are robust (Li et al., 2021; World Bank, 2023).

Taken together, this literature suggests three key insights. First, DFII generally has a positive impact on banking performance by expanding outreach, enhancing efficiency, and supporting credit intermediation (Zhao et al., 2024; Liu et al., 2024; Beck & de la Torre, 2022). Second, institutional quality plays a critical enabling and augmenting role, shaping the magnitude and sustainability of digital finance impacts (Nasreen et al., 2025; Meniago, 2025; Vo, 2024). Third, although much of the empirical work has focused on macro-level outcomes or specific national contexts, there remains a notable gap in research that integrates DFII, institutional quality, and banking performance specifically in upper middle income economies (Dias & Perera, 2026; Li et al., 2021). This gap motivates the present study's focus on both the direct impact of Digital financial inclusion Index on banking performance and the moderating effect of institutional quality in these transitional yet technologically evolving economies.

Methodology

This study uses a quantitative design with balanced panel data to examine the impact of Digital financial inclusion Index(DFII) on Banking performance (BP) and the moderating role of Institutional Quality (IQ) in 33 Middle-income countries (World Bank, 2023) over 2011-2021, capturing rapid digital banking growth and post-crisis regulatory strengthening (Sahay et al., 2020). Principal Component Analysis (PCA) constructs composite indices: DFII combines access, usage, and infrastructure metrics; BP includes efficiency, profitability, and stability indicators (Beck et al., 2014); and IQ is based on six Worldwide Governance Indicators (La Porta et al., 1998;). The model controls for GDP per capita, inflation, foreign bank presence, and trade openness (Ozili, 2018; Claessens et al., 2018;). PCA ensures dimensional consistency and robustness, allowing assessment of DFII's direct effect on BP and the moderating role of institutional quality in high-income economies.

Econometric model

The study uses panel data to assess the effect of Digital financial inclusion Index(DFII) on banking performance (BP) and the moderating role of institutional quality (IQ) in high-income economies, with PCA constructing composite indices for DFII, BP (efficiency, profitability, stability), and IQ (six WGI dimensions). The model is specified as follows:

$$BP_{(i,t)} = \alpha + \alpha_1 BP_{(it-1)} + \beta_1 \ DFII_{(i,t)} \ + \gamma Z_{(i,t)} \ + \varepsilon_{(i,t)} \quad 1$$

$$BP_{(i,t)} = \alpha + \alpha_1 BP_{(it-1)} + \beta_1 \ DFII_{(i,t)} \ + \beta_2 \left(IQ_{(i,t)} \right) \ + \gamma Z_{(i,t)} \ + \varepsilon_{(i,t)} \quad 2$$

$$BP_{(i,t)} = \alpha \ + \alpha_1 BP_{(it-1)} + \beta_3 \left(DFII_{(i,t)} \times \ IQ_{(i,t)} \right) + \gamma Z_{(i,t)} \ + \varepsilon_{(i,t)} \quad 3$$

Where: BP represents banking performance index, DFII denotes Digital Financial Inclusion index, of Z is a vector of control variables, including, inflation, GDP per capita, foreign bank presence, and trade openness and ε_{it} is the idiosyncratic error term.

Description of Variable

The study examines BP (dependent) is a PCA-based composite of efficiency, profitability, and stability. DFII (independent) is constructed via PCA from access, usage, and infrastructure. IQ is derived from the six Worldwide Governance Indicators. Controls include GDP per capita, trade openness, foreign bank presence, and inflation across Middle-income economies.

Table no 1: Definition and operationalization of all variables

Variable Category	Variable name	Symbol	Measurement Indicator/Proxy	Source
Dependent variable	Banking performance (Composite index derived though PCA)	BP	Bank Net interest margin % , bank non-interest income to total asset %, bank Cost-to-income ratio, Return on Assets/ Equity , Z-score, Bank capital to total assets, Bank regulatory capital to risk-weighted assets, Liquid assets to deposits and short term funding	Constructed Using PCA; IMF FSI / Bankscope / Orbis / Bureau van Dijk

Independent variable	Digital financial inclusion Index(Composite index though PCA)	DFII	Bank accounts per 1,000 adults, Bank branches per 100,000 adults, ATMs per 100,000 adults, Borrowers, Deposit accounts, Mobile and internet banking transactions Commercial banks, No of Credit/ debit cards	Financial Access Survey (FAS)
Moderating Variable	Institutional quality (Composite index via PCA from Six dimensions)	IQ	Control of Corruption, Government Effectiveness, Political Stability, Rule of Law, Regulatory Quality, and Voice and Accountability.	WGI
Control Variables	Trade Openness	TO	Calculated as the ratio of total exports and imports of goods and services to GDP.	World Bank WDI / IMF
	GDP per capita	GDP_PC	Gross Domestic Production Per Capita	WDI / IMF
	Foreign bank presence	FOB	Percentage of foreign banks in the banking sector	Global financial development
	Inflation	INF	CPI annual inflation rate (%)	WDI / IMF

Estimation Technique

To address the dynamic nature of banking performance and potential endogeneity from reverse causality or omitted variables, this study uses the two-step System GMM estimator (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). System GMM efficiently handles panels with many countries and short time spans by combining first-differenced and level equations, using lagged variables as instruments to control for simultaneity, persistence, and unobserved heterogeneity. This is especially suitable for middle-income economies with rapidly evolving banking sectors and limited data. The two-step approach applies the Windmeijer (2005) correction for robust standard errors, and model validity is confirmed via the Hansen J-test and AR(1)/AR(2) serial correlation tests, with additional checks using one-step GMM.

Results and Discussions

Descriptive Statistics

Table no 2 descriptive statistics of all variables of middle income economies

Descriptive Statistics of Middle income economies					
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
BP	393	0.2281	0.96084	-3.3569	6.2329
DFII	373	0.10851	0.08073	-0.1223	2.0357
IQ	594	-0.2777	2.03926	-5.0756	4.60691
Trade Openness	492	0.81342	0.32686	0.15683	1.65979
Inflation (CPI)	594	2.35604	6.60942	0.00	35.0066
GDP per capita	585	8.83642	0.37757	7.91919	9.75896
Foreign Bank	594	0.3239	0.33395	0.000	1.000
DFII*IQ	594	0.02634	0.18588	-0.7171	0.48467

The descriptive statistics for middle-income economies reveal considerable heterogeneity in both banking performance and the factors influencing it. BP averages 0.228 but ranges from -3.36 to 6.23, indicating that while some banking sectors perform strongly, others face significant challenges. DFII remains relatively low on average (0.108) with limited dispersion, suggesting that digital financial adoption is still emerging, though select countries exhibit much higher levels. Trade openness is generally high, but inflation varies widely, pointing to differing macroeconomic stability that may affect banking outcomes. GDP per capita is moderately clustered, reflecting middle-income status, while foreign bank presence averages around 32%, indicating partial exposure to international banking practices. Institutional quality (IQ) shows substantial variation, highlighting that governance and regulatory strength differs sharply across countries and could critically influence the effectiveness of digital financial inclusion. The interaction term (DFII*IQ), though small on average, exhibits meaningful dispersion, implying that DFII may enhance banking performance more effectively in countries with stronger institutions. Collectively, these patterns suggest that policy interventions to expand digital finance and strengthen institutional quality could yield heterogeneous impacts on BP, with institutional context likely moderating the benefits of digital financial inclusion.

Results and Discussion

Model 1: Impact of Digital Financial Inclusion Index and Control Variables on Banking Performance

Table 3 presents Two Step System GMM estimates of the effect of digital financial inclusion Index on banking performance.	
Dependent Variable: BP	
Variables	Coefficient (P-Value)
L.BP	0.5082*** (0.000)
DFII	5.0636*** (0.001)
GDP_PC	0.1214 (0.386)
INF	-0.0132 (0.576)
FOB	0.0396 (0.913)
TO	-0.6330*** (0.010)
Constant	-0.1497 (0.906)
Model Diagnostics	
Observations	284
Groups	33
Instruments	17
F-statistic	23.61
Prob > F	0.000
AR(1) p-value	0.004
AR(2) p-value	0.060
Hansen p-value	0.597
Source: **Author** Note: **Significance levels: ***p < 0.01, **p < 0.05, *p < 0.10.**	

The results from the two-step System GMM estimations provide strong evidence that Digital financial inclusion Index (DFII) significantly enhances banking performance (BP) in middle-income economies. In Model 1, DFII has a large positive and highly significant coefficient (5.064, p = 0.001), indicating that greater access, usage, and infrastructure in digital finance are associated with improved efficiency, profitability, and stability in banks. This aligns with recent studies showing that digital financial mechanisms reduce transaction costs, broaden outreach, and strengthen intermediation efficiency, particularly in developing and transitional economies (Zhao et al., 2024; Liu et al., 2024). The lagged dependent variable is also significant (0.508, p < 0.01), reflecting persistence in banking performance over time, while trade openness negatively influences BP (-0.633, p < 0.01), suggesting competitive pressures may affect domestic banks' performance. Other controls GDP per capita, inflation, and foreign bank presence are not significant, indicating that macroeconomic conditions may be less critical than digital inclusion for banking outcomes in these middle-income contexts. Model diagnostics support the reliability of the estimates, with AR (2) and Hansen tests confirming the absence of second-order autocorrelation and valid instruments.

Model 2: Effect of Digital Financial Inclusion index and Institutional Quality on Banking Performance with Control Variables

Table 4 shows Two Step System GMM estimates of the impact of digital financial inclusion Index and institutional quality on banking performance.	
Dependent Variable: BP	
Variables	Middle Income
L.BP	0.5474 (0.000)***
DFII	5.0206 (0.014)**
IQ	-0.0636 (0.218)
GDP_PC	0.2297 (0.127)
INF	-0.0089 (0.299)
FOB	-0.0688 (0.848)
TO	-0.5051 (0.006)***
Constant	-1.195871(0.34)
Model Diagnostics	
Observations	284
Groups	33
Instruments	20
F-statistic	39.25
Prob > F	0.000

AR(1) p-value	0.005
AR(2) p-value	0.069
Hansen test p-value	0.44
Source: **Author** Note: **Significance levels: ***p < 0.01, **p < 0.05, *p < 0.10.**	

Model 2 introduces institutional quality (IQ) to examine its direct effect. DFII remains positively significant (5.021, $p < 0.05$), while IQ itself is not statistically significant (-0.064, $p = 0.218$), suggesting that governance and regulatory quality alone do not directly influence BP in these economies. This result resonates with prior findings that institutional quality primarily shapes the environment in which digital finance operates rather than driving banking performance directly (Nasreen et al., 2025; Abaidoo & Agyapong, 2022). The continued significance of the lagged BP (0.547, $p < 0.01$) underscores dynamic persistence, while trade openness remains a negative determinant (-0.505, $p < 0.01$). Diagnostics remain robust, confirming model validity.

Model 3: Interaction of Institutional Quality with Digital Financial Inclusion index on Banking Performance with Control Variables

Table 5 presents Two Step System GMM estimates of the moderation effect of institutional quality with digital financial inclusion index on banking performance.	
Dependent Variable: BP	
Variable / Statistic	Middle Income
L.BP	0.5588 (0.000)***
DFII*IQ	0.1967 (0.328)
GDP_PC	-0.1434 (0.347)
INF	0.0085 (0.034)**
FOB	0.1799 (0.488)
TO	-0.4633 (0.017)**
Constant	1.4219 (0.290)
Model Diagnostics	
Observations	309
Groups	35
Instruments	18
F-statistic	31.84
Prob > F	0
AR(1) p-value	0.031
AR(2) p-value	0.42
Hansen p-value	0.479
Source: **Author** Note: **Significance levels: ***p < 0.01, **p < 0.05, *p < 0.10.**	

Model 3 tests the moderating effect of institutional quality through the interaction term (DFII × IQ). The coefficient of the interaction term is positive but not significant (0.197, $p = 0.328$), indicating that institutional quality does not strongly amplify the impact of DFII on BP in middle-income economies, although the positive sign suggests a potential enhancing effect. Interestingly, inflation emerges as a significant positive predictor (0.009, $p < 0.05$) and trade openness remains negative (-0.463, $p < 0.05$), suggesting that macroeconomic volatility and market exposure continue to shape bank performance. The lagged BP remains highly significant (0.559, $p < 0.01$), confirming the dynamic nature of the sector. Diagnostic tests again confirm the absence of second-order autocorrelation and instrument validity.

Overall, these results indicate that DFII is the primary driver of banking performance in middle-income economies, consistent with literature emphasizing the transformative role of digital financial access in enhancing efficiency and profitability (Suri & Jack, 2016; Ozili, 2021). The lack of significance for institutional quality and its interaction suggests that while strong institutions are theoretically important for financial stability and inclusion, their moderating effect may be limited in these transitional contexts where digital adoption is still emerging. One inference is that middle-income countries may experience direct gains from expanding digital financial infrastructure even before institutional quality is fully developed, although the positive interaction coefficient hints that stronger institutions could eventually amplify these benefits.

In summary, the evidence answers the research questions as follows: Digital financial inclusion Index significantly improves banking performance in middle-income economies, primarily through operational efficiency, profitability, and stability gains. Institutional quality, while important conceptually, does not significantly moderate this relationship in the current sample, though it may play a supporting role in enhancing or sustaining these effects as digital financial ecosystems mature. These findings highlight the policy implication that targeted investments in digital finance infrastructure can yield immediate banking performance benefits, while continued institutional strengthening remains important for long-term sustainability.

Conclusion and Recommendations

Conclusion

This study provides robust evidence that Digital financial inclusion Index (DFII) significantly enhances banking performance (BP) in middle-income economies. Across all models, DFII consistently demonstrates positive and statistically significant effects on efficiency, profitability, and stability of banking performance, confirming prior findings that digital financial mechanisms reduce transaction costs, expand outreach, and improve operational effectiveness (Zhao et al., 2024; Liu et al., 2024). While institutional quality (IQ) alone does not directly influence BP, and its moderating effect is not statistically significant, the positive coefficient of the interaction term suggests that stronger institutions could

potentially amplify DFII's impact in the future (Nasreen et al., 2025; Abaidoo & Agyapong, 2022). These findings answer the research questions by demonstrating that DFII is a critical driver of banking performance in middle-income economies, while institutional quality provides a supportive, though currently limited, role.

Policy Implications

The results underscore the importance of prioritizing digital finance expansion as a policy tool to strengthen banking sectors in middle-income economies. Governments and regulators should focus on increasing access to digital financial services, including mobile banking, digital payment platforms, and online lending, to enhance operational efficiency and profitability (Suri & Jack, 2016; Ozili, 2021). Although institutional quality did not significantly moderate the DFII BP relationship, evidence suggests that robust governance, regulatory frameworks, and anti-corruption measures remain essential to ensure sustainability and mitigate systemic risks as digital adoption grows (Beck et al., 2006; Nasreen et al., 2025). Policymakers should therefore pursue a dual strategy: promoting digital finance adoption while gradually strengthening institutional capacity to support long-term financial stability.

Recommendations for Future Research

Future research should explore the evolving interaction between DFII and institutional quality across different income and regional contexts. Longitudinal studies could examine whether the moderating role of institutional quality strengthens as digital financial ecosystems mature, particularly in economies experiencing rapid fintech adoption (Vo, 2024; Dias & Perera, 2026). Additionally, subsequent studies could disaggregate DFII into specific components such as mobile banking, card penetration, and online lending to assess which dimensions most strongly influence banking performance. Research could also investigate other potential moderators, including regulatory innovation, financial literacy, and technology infrastructure, to provide a more nuanced understanding of the mechanisms through which Digital financial inclusion Index drives banking sector outcomes.

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