

## Impacting Innovation Culture on Fintech Development and Financial Stability at Commercial Banks in Vietnam

Do Thi Lan Dai<sup>1</sup>, Phan Thanh Tam<sup>2\*</sup>

<sup>1</sup> Chairwoman, Board of Lac Hong University (LHU), Dong Nai Province, Vietnam, Email: [landaido@lbu.edu.vn](mailto:landaido@lbu.edu.vn); <https://orcid.org/0009-0007-5332-0402>

<sup>2</sup> Faculty of Postgraduate Studies, Lac Hong University (LHU), Dong Nai Province, Vietnam, [tampt@lbu.edu.vn](mailto:tampt@lbu.edu.vn); <https://orcid.org/0000-0003-2387-7756>

\*Corresponding Author: [tampt@lhu.edu.vn](mailto:tampt@lhu.edu.vn)

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### ABSTRACT

This study examines how Fintech development influences the financial stability of commercial banks in Vietnam, with particular attention to the mediating role of operational efficiency and the moderating effects of digitalization, risk management capability, and bank size. A mixed-methods design was employed: qualitative insights from interviews with 30 financial experts were used to refine measurement constructs, followed by a quantitative survey of 500 bank managers in Ho Chi Minh City and Dong Nai Province, yielding 474 valid responses. Data were analyzed using SmartPLS 4.0. The empirical results demonstrate that Fintech development significantly enhances both operational efficiency and financial stability. Among the antecedents of Fintech development, technological infrastructure exhibits the most decisive influence, followed by the legal framework, innovation culture, and customer behavior. Operational efficiency partially mediates the relationship between Fintech development and financial stability, while digitalization, risk management, and bank size significantly moderate key structural paths. The model explains substantial variance in Fintech development ( $R^2 = 0.483$ ), operational efficiency ( $R^2 = 0.221$ ), and financial stability ( $R^2 = 0.563$ ). These findings provide novel evidence on how Fintech expansion strengthens banking resilience in emerging markets. Policy recommendations are proposed for regulators and bank executives to enhance technological readiness, risk governance, and digital transformation strategies in Vietnam's banking sector.

**Keywords:** Innovation culture; fintech development; financial stability; digitalization; risk management.

### INTRODUCTION

There has been a dramatic shift in the delivery, consumption, and regulation of financial services due to the fast development of financial technology (Fintech) in the last several years. New financial ecosystems and business models have emerged from the increased efficiency of financial processes enabled by the integration of digital technologies such as blockchain, big data analytics, AI, and mobile platforms (Li et al., 2025; Chen et al., 2020). Fintech development has become a strategic pillar for enhancing financial inclusion, operational efficiency, and systemic resilience across both developed and emerging economies (Gomber et al., 2018). However, while Fintech innovation offers vast opportunities, it also poses potential risks to the stability and soundness of the banking system, especially in economies undergoing digital transition.

In emerging markets like Vietnam, the Fintech sector has expanded rapidly alongside the country's broader digital transformation strategy. According to the State Bank of Vietnam (SBV), more than 40 licensed Fintech

firms are currently providing payment, lending, and wealth management services, while most commercial banks are actively investing in digital platforms and technology partnerships (Hua & Huang, 2021; Khan et al., 2023). This transformation has accelerated during the post-COVID-19 period, driven by customer demand for contactless banking, regulatory encouragement for digital payments, and competitive pressures within the financial sector. Nevertheless, as Fintech becomes more embedded in banking operations, questions arise regarding its impact on financial stability; whether Fintech strengthens or undermines systemic robustness remains a central concern for regulators and scholars alike.

The existing literature has mainly focused on Fintech's role in financial inclusion, technological adoption, or innovation dynamics (Ali & Puah, 2018; Tian et al., 2024). However, empirical evidence on how Fintech development influences financial stability through operational and managerial mechanisms remains limited, particularly in emerging economies (Baber, 2020). The Vietnamese banking sector offers a unique setting to explore this relationship, given its dual characteristics: rapid Fintech adoption and evolving regulatory frameworks. Moreover, the role of moderating and mediating factors, such as digitalization level, risk management capability, and bank size, has been underexplored, even though these dimensions can fundamentally alter how Fintech translates into performance and stability outcomes.

To address these gaps, this study employs a data-driven analytical approach using SmartPLS 4.0 to examine the determinants and consequences of Fintech development in Vietnamese commercial banks. The conceptual framework integrates four antecedents: legal framework, technological infrastructure, innovation culture, and customer behavior that shape Fintech growth. It further examines how Fintech development enhances operational efficiency and financial stability, while accounting for the moderating effects of digitalization level, risk management level, and bank size.

The study contributes to the Fintech and banking literature in three main ways. First, it provides empirical evidence on the causal link between Fintech development and financial stability, an area still underexplored in emerging economies. Second, it introduces a multi-dimensional analytical model that captures both direct and indirect effects through operational efficiency. Third, by integrating moderating factors such as digitalization and bank scale, the study offers policy-relevant insights into how Fintech can be managed to enhance systemic stability rather than disrupt it.

The remainder of this paper is structured as follows. (1) Reviews the theoretical background and the development of hypotheses. (2) Presents the research methodology, including data collection and analytical techniques. (3) Reports the empirical results obtained through the SmartPLS 4.0 analysis. (4) Discusses the theoretical and policy implications, and (5) concludes with key insights and future research.

## LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

### Fintech Development

To improve efficiency, accessibility, and creativity in financial services, fintech development involves integrating advanced digital technologies like blockchain, AI, mobile apps, and big data analytics (Kanapiyanova et al., 2022). Fintech represents a paradigm shift that disrupts traditional banking models while fostering competition and inclusion. Recent studies (Meskovic et al., 2024) highlight that Fintech development not only accelerates financial transactions but also reshapes customer behavior, product design, and risk management practices. In emerging economies, the pace of Fintech adoption is driven mainly by technological readiness, institutional support, and customer demand for convenience. Therefore, assessing Fintech development provides an essential foundation for understanding its operational and systemic implications for the banking sector.

### Operational Efficiency

Operational efficiency (OE) refers to the extent to which financial institutions utilize their resources, such as technology, human capital, and financial assets, to maximize output while minimizing costs and risks. In the banking context, higher operational efficiency reflects streamlined internal processes, improved cost-to-income ratios, and effective digital transformation (Kanapiyanova et al., 2022). Fintech innovations play a crucial role in enhancing operational efficiency through automation, data analytics, and customer self-service platforms. According to Mashoene et al. (2025), banks adopting Fintech solutions experience faster transaction speeds, greater accuracy, and more personalized services. Therefore, operational efficiency serves as an essential performance indicator linking Fintech development to broader financial and organizational outcomes, including financial stability and competitiveness.

## **Financial Stability**

When all parts of the financial system of banks, stocks, and exchanges are working together well and can weather unexpected events without causing significant problems for the economy, we say that the financial system is stable (Bai et al., 2024). A stable financial system ensures confidence in financial intermediaries, maintains liquidity, and supports sustainable economic growth. However, rapid technological disruption and digital transformation may introduce new vulnerabilities, including cybersecurity risks, market volatility, and regulatory gaps (Akhtar et al., 2024).

Recent empirical studies suggest that Fintech can both strengthen and challenge financial stability, depending on the level of technological governance and risk management (Ahmad et al., 2020). Hence, evaluating the relationship between Fintech development and financial stability is vital for balancing innovation and systemic resilience. Therefore, financial stability is a state in which the financial system, including financial intermediaries, financial markets, and related market infrastructure, can withstand shocks and economic and financial imbalances.

## **Hypotheses Development**

### ***Legal Framework***

A supportive legal framework (LF) plays a crucial role in fostering Fintech development by providing clarity, regulatory certainty, and consumer protection within the financial system. An adaptive regulatory environment encourages innovation while maintaining financial integrity and stability (Dar & Ahmed, 2021). In emerging economies, comprehensive Fintech regulations covering digital payments, data privacy, cybersecurity, and anti-money laundering lay a foundation for trust and innovation (Ding & Sun, 2025). Conversely, regulatory uncertainty may deter investment and slow technology adoption among financial institutions. Empirical research demonstrates that banks operating under well-defined legal frameworks exhibit higher digital transformation readiness and Fintech collaboration (Buchak et al., 2018). Therefore, a transparent and flexible legal system is expected to promote Fintech adoption and expansion in the banking sector. The authors proposed the hypotheses presented in H1 in Figure 1.

### ***Technological Infrastructure***

Technological infrastructure (TI) constitutes the backbone of Fintech development, encompassing digital payment systems, internet connectivity, data centers, and information security networks. Robust infrastructure enables financial institutions to deploy digital innovations efficiently and securely (Fuster et al., 2019).

In emerging economies, the diffusion of mobile banking, cloud computing, and blockchain technologies has significantly accelerated financial innovation and inclusion (Gomber et al., 2018). The technological readiness not only reduces operational barriers but also enhances customer accessibility and service delivery. Conversely, inadequate infrastructure limits Fintech scalability and increases systemic risks (Kayani et al., 2025). In Vietnam, the government's investment in digital infrastructure and the expansion of 4G/5G networks have created favorable conditions for Fintech expansion. The authors proposed the hypotheses presented in H2 in Figure 1.

### ***Innovation Culture***

Innovation culture (IC) reflects an organization's shared values, attitudes, and behaviors that encourage creativity, experimentation, and technological adoption. In the banking sector, a strong innovation culture enables firms to integrate new technologies, redesign processes, and respond quickly to market changes (Agarwal & Zhang, 2020). Fintech thrives in environments where employees are empowered to test new ideas and collaborate with technology partners. Studies indicate that banks that foster an innovative mindset achieve faster digital transformation and customer-centric product development (Elgadi & Ghardallou, 2022; Liu et al., 2022). In emerging economies such as Vietnam, the ability to cultivate innovation within banks determines the success of Fintech integration and ecosystem growth. The authors proposed the hypotheses presented in H3 in Figure 1.

### ***Customer Behavior***

Customer behavior (CB) plays a pivotal role in shaping Fintech development, as consumer demand and adoption willingness directly determine the success of digital financial services. According to the diffusion of innovation theory, technology adoption depends on users' perceived usefulness, ease of use, and trust in digital systems (Hasan et al., 2024). In the financial context, customers' preference for convenience, speed, and personalized experiences drives banks to innovate and integrate Fintech solutions. The highlight is that younger, digitally literate populations are more inclined to use mobile banking, e-wallets, and online lending platforms, accelerating Fintech diffusion (Liu et al., 2021; Tiwari & Suresha, 2021). In Vietnam, the rapid rise of cashless payment users and digital consumers has become a critical force stimulating Fintech innovation and transformation in the banking industry. The authors proposed the hypotheses presented in H4 in Figure 1.

### ***Fintech Development and Operational Efficiency***

Fintech development (FD) enhances operational efficiency (OE) by leveraging digital innovations to automate processes, reduce transaction costs, and improve decision-making accuracy. The operational efficiency is achieved when financial institutions optimize resource allocation while maintaining service quality and risk control (Ovenc & Nabiyeu, 2025). Fintech enables real-time analytics, process automation, and digital customer interactions, thereby streamlining internal operations and eliminating redundant procedures (Bartolacci et al., 2022; Xu et al., 2024). Moreover, technologies such as blockchain and artificial intelligence improve transparency and speed in payment and lending systems, significantly boosting banks' operational performance. In emerging markets like Vietnam, Fintech adoption helps banks overcome traditional inefficiencies caused by manual processes and legacy systems. The authors proposed the hypotheses presented in H5 in Figure 1.

### ***Operational Efficiency and Financial Stability***

Operational efficiency (OE) is a key determinant of financial stability (FS) because efficient institutions are better equipped to manage costs, mitigate risks, and maintain profitability under volatile market conditions. The banks with higher operational efficiency exhibit stronger balance sheets, lower non-performing loans, and greater resilience to external shocks (Alfadli & Rjoub, 2020). Fintech-driven efficiency gains further enhance system stability by improving liquidity management, credit monitoring, and risk assessment. Studies also suggest that digitization reduces operational and information asymmetry risks, thereby reinforcing overall financial soundness (Buchak et al., 2018). Consequently, operational efficiency serves as a critical transmission mechanism through which Fintech contributes to long-term banking stability. The authors proposed the hypotheses presented in H6 in Figure 1.

### ***Fintech Development and Financial Stability***

Fintech development (FD) has emerged as a transformative driver of financial stability (FS) by improving efficiency, transparency, and access within the economic system. Fintech contributes to systemic stability by enhancing risk assessment, diversifying funding channels, and expanding access to more inclusive financial services (Ioannou et al., 2024). Empirical studies indicate that Fintech-driven innovations, such as digital payments, peer-to-peer lending, and automated compliance, strengthen the resilience of banking operations and reduce liquidity shocks (Wang et al., 2020; Parmankulova et al., 2022). However, the positive effects of Fintech depend on adequate governance and technological safeguards to prevent cyber risks and operational disruptions. In emerging economies like Vietnam, where digital finance is rapidly expanding, Fintech development can foster sustainable growth and long-term financial stability if effectively regulated and integrated. The authors proposed the hypotheses presented in H7 in Figure 1.

### ***The Moderating Role of Risk Management Level, Digitalization Level, and Bank Size***

Effective risk management and digital transformation have become essential strategic capabilities for financial institutions navigating the Fintech era. The integration of risk management systems ensures that Fintech innovations enhance rather than undermine financial stability (Al-Majali et al., 2025). The higher risk management level (RML) enables banks to identify, assess, and mitigate technological and operational risks associated with Fintech adoption. Banks with strong risk governance are better positioned to manage cyber threats, data breaches, and compliance risks. The studies demonstrate that risk-oriented institutions achieve more stable Fintech outcomes (Faizulayev et al., 2021). Therefore, the stabilizing impact of Fintech development on financial systems is expected to be stronger when banks possess higher levels of risk management maturity.

H8: Risk management level (RML) moderates the relationship between Fintech development (FD) and financial stability (FS), with more potent effects at higher levels of RML.

Digital transformation is another crucial factor that shapes how Fintech affects banking performance. The digitalization level (DL) determines a bank's ability to integrate Fintech tools into its core operations (Bai et al., 2024). The digitally advanced banks achieve greater efficiency through automation, data analytics, and online platforms. In contrast, low digital readiness may constrain Fintech utilization and weaken operational improvements (Liberti et al., 2022; Juma et al., 2025). Thus, digitalization amplifies the positive effects of Fintech on performance outcomes.

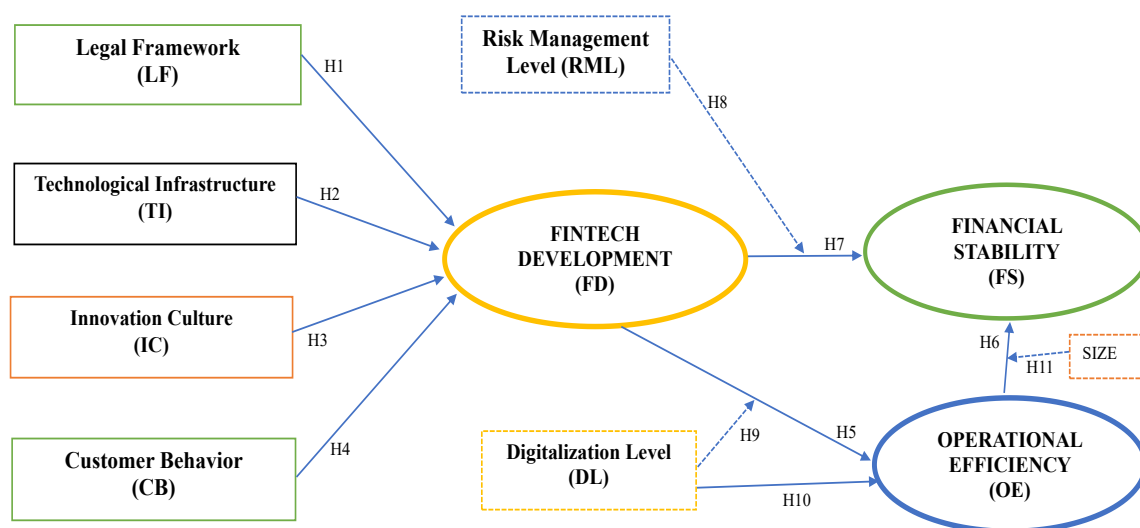
H9: Digitalization level (DL) moderates the relationship between Fintech development (FD) and operational efficiency (OE), with more potent effects at higher levels of DL. Moreover, digital transformation itself contributes directly to efficiency improvement, as digital tools enable cost reduction, real-time data processing, and customer self-service innovations.

H10: Digitalization level (DL) positively affects operational efficiency (OE).

Finally, bank size (SIZE) is an important contextual factor influencing how operational efficiency translates into financial stability. Large banks benefit from economies of scale, diversified portfolios, and greater technological investment capacity (Elmahdy et al., 2025; Siagian, 2023). Consequently, they can better leverage efficiency gains to sustain financial soundness.

H11: Bank size (SIZE) moderates the relationship between operational efficiency (OE) and financial stability (FS), with larger banks exhibiting more substantial positive effects.

The literature review and theoretical foundations highlight that Fintech development is shaped by multiple institutional, technological, and behavioral factors, which jointly influence financial performance and stability. Specifically, the legal framework (LF), technological infrastructure (TI), innovation culture (IC), and customer behavior (CB) are identified as the primary antecedents driving Fintech adoption in the banking sector (H1–H4). Fintech development (FD), in turn, enhances operational efficiency (OE) (H5) and directly contributes to financial stability (FS) (H7), while operational efficiency also serves as an intermediate mechanism linking Fintech to financial resilience (H6). Furthermore, the moderating effects of risk management level (RML), digitalization level (DL), and bank size (SIZE) are proposed to strengthen the model’s causal relationships. RML enhances the stabilizing role of Fintech (H8), DL reinforces the efficiency impact of Fintech (H9), and exerts a direct influence on operational outcomes (H10). At the same time, SIZE magnifies the link between efficiency and financial stability (H11).



**Figure 1.** Key factors affecting Fintech development and its impact on financial stability

Source: The authors proposed the model

Figure 1 integrates these direct, mediating, and moderating relationships, forming a comprehensive model for analysing how Fintech development drives financial stability through technological and managerial mechanisms in Vietnamese commercial banks.

## RESEARCH METHODS

### Research Design

This study adopts a mixed-methods approach that integrates qualitative exploration and quantitative validation to examine the determinants and consequences of Fintech development in Vietnamese commercial banks. The qualitative phase was employed to refine the conceptual framework and measurement scales through expert discussions, ensuring theoretical relevance and contextual adaptation. The subsequent quantitative phase empirically tested the proposed relationships among constructs using a structural equation modeling (SEM) approach based on the Partial Least Squares (PLS) technique (Hair et al., 2019).

This two-phase design allows for both depth and generalizability: the qualitative stage enhances conceptual accuracy, while the quantitative stage provides statistical validation of the causal paths (Hair et al., 2019). The overall research process aims to link Fintech development (FD) with operational efficiency (OE) and financial stability (FS), while accounting for both mediating and moderating influences.

## Data Collection and Sampling Procedure

The qualitative stage involved semi-structured discussions with 30 financial experts in Ho Chi Minh City between November and December 2024. Participants included bank executives, Fintech professionals, and academic specialists in banking and finance. Their feedback was used to refine the measurement items, ensuring clarity, content validity, and contextual appropriateness.

The quantitative survey was conducted from January to May 2025 in Ho Chi Minh City and Dong Nai Province, targeting managers and department heads at commercial bank branches. A total of 500 questionnaires were distributed both in-person and online. After eliminating incomplete or inconsistent responses, 474 valid samples were retained for data analysis, yielding a response rate of 94.8%. The sample size meets the minimum requirement for SEM-PLS analysis, as recommended by Hair et al. (2019), ensuring statistical power for model testing. The respondents represented diverse departments, including operations, IT, finance, credit, and risk management, providing a holistic perspective on Fintech implementation within banks.

## Measurement Scales and Questionnaire Design

All constructs were measured using multi-item Likert scales ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). The initial items were adapted from previous validated studies and modified to suit the Vietnamese banking context based on expert consultation. The measurement framework comprises the following constructs: (1) Legal Framework (LF), capturing the adequacy, clarity, and adaptability of financial regulations supporting Fintech. (2) Technological Infrastructure (TI) assessing the robustness of digital systems, connectivity, and data security. (3) Innovation Culture (IC) measures openness to innovation, creativity encouragement, and managerial support for experimentation. (4) Customer Behavior (CB) evaluating customers’ willingness to adopt digital financial products. (5) Fintech Development (FD) reflecting the integration, adoption, and innovation level of Fintech applications in banking services. (6) Operational Efficiency (OE) focusing on productivity, cost-effectiveness, and process optimization through technology. (7) Financial Stability (FS) measures the bank’s resilience, risk control, and systemic robustness. (8) Risk Management Level (RML), Digitalization Level (DL), and Bank Size (SIZE): Assessed as moderating constructs, reflecting organizational capabilities that influence the intensity of Fintech effects.

Before the primary survey, a pilot test was conducted with 30 respondents to ensure the clarity and reliability of items. Minor linguistic and contextual adjustments were made in response to feedback.

## Data Analysis and Analytical Techniques

The dataset was analyzed using SmartPLS 4.0, a variance-based SEM tool suitable for predictive and exploratory research models with complex relationships and latent constructs. Based on the measurement model evaluation, (1) Reliability and internal consistency were tested using Cronbach’s Alpha and Composite Reliability (CR), ensuring values above 0.70. (2) Convergent validity was assessed via Average Variance Extracted (AVE), requiring values  $\geq 0.50$ . (3) The Fornell-Larcker criterion and the HTMT ratio were used to confirm discriminant validity, which ensures that each construct is empirically distinct.

The authors tested the structural model assessment based on (1) Path coefficients, t-statistics, and p-values were generated through bootstrapping (5,000 resamples) to test the hypotheses (H1–H11). (2) Model explanatory power was evaluated through  $R^2$  values for FD, OE, and FS, while  $Q^2$  indicated predictive relevance. (3) Effect sizes ( $f^2$ ) and moderation tests were conducted to measure the strength of relationships and interaction effects. (4) Post-hoc power analysis was also performed to verify that the sample size ( $n = 474$ ) provided sufficient statistical power ( $>80\%$ ) for detecting all significant paths, confirming the robustness of the good results.

## RESULTS

### Sample Description based on 474 Managers

A total of 474 valid responses were collected from managers and officers working at commercial bank branches, reflecting the sample's demographic characteristics and indicating a diverse, representative distribution of banking personnel. In terms of gender, male respondents accounted for 61.2% and female respondents for 38.8%, reflecting a relatively balanced gender distribution within the banking workforce. Regarding marital status, 61.8% of participants were single, whereas 38.2% were married.

The age distribution shows that respondents were primarily concentrated in the middle-working-age group. Specifically, 52.3% were aged 30 to 40, followed by 23.8% aged 25 to 30. Younger employees (under 25 years old) accounted for 7.6%, while 16.2% were aged 40 or older. This structure suggests that the sample consists mainly of experienced banking professionals actively involved in digital transformation.

Income levels were also well distributed: 39.7% of respondents earned between 20 and 30 million VND per month, 35.0% earned 20 million VND or above, and 20.3% earned between 15 and 20 million VND. Only 5.1% earned less than 15 million VND per month, indicating that most participants belonged to the mid- to high-income group.

In terms of work experience, 42.2% had 10–15 years of service, followed by 31.6% with over 15 years. Meanwhile, 19.6% had 5–10 years of experience, and only 6.5% had less than 5 years. This distribution confirms that the majority of respondents were seasoned professionals, ensuring reliable insights into Fintech development and financial stability issues.

In the era of global economic integration, driven by the convergence of finance and technology, the Fintech boom has transformed the entire financial services industry. Fintech is defined as financial innovations supported by technology to create new business models and products. Fintech has a substantial impact on financial markets, financial institutions, and the provision of financial services.

### Testing of Cronbach's Alpha for Key Factors Affecting Fintech Development and its Impact on Financial Stability

**Table 1.** Testing of Cronbach's alpha for key factors affecting Fintech development and its impact on financial stability

Items	Code	No. Items	Cronbach's alpha	Mean	Std. Deviation
Legal framework (LF)	LF1–LF3	3	0.755	3.152	0.901
Technological infrastructure (TI)	TI1–TI3	3	0.833	3.241	0.942
Innovation culture (IC)	IC1–IC4	4	0.827	3.121	0.905
Customer behavior (CB)	CB1–CB4	4	0.821	3.324	0.918
Fintech development (FD)	FD1–FD3	3	0.835	3.405	0.924
Operational efficiency (OE)	OE1–OE4	4	0.805	3.316	0.931
Financial stability (FS)	FS1–FS4	4	0.758	3.312	0.917

Source: own calculations in SmartPLS 4.0

Table 1 presents the results of reliability testing using Cronbach's Alpha for the central constructs in the research model. All factors exhibit alpha coefficients above the threshold of 0.70, confirming internal consistency and reliability of the measurement scales. The highest reliability is observed in Technological Infrastructure ( $\alpha = 0.833$ ) and Fintech Development ( $\alpha = 0.835$ ), while the lowest acceptable value is found in Legal Framework ( $\alpha = 0.755$ ). The mean values, ranging from 3.12 to 3.41, suggest that respondents generally agree with the measurement items, supporting the robustness of the constructs for further SEM analysis.

The development of Fintech companies directly competes with the financial products of commercial banks. Commercial banks face competitive pressure from Fintech companies offering similar products. Businesses that offer tailored financial services through this cutting-edge innovation are more efficient and cost-effective than ever before. They pose a threat to conventional banks by luring customers away, potentially reducing bank revenues and encouraging them to increase risk-taking.

Overall, the results provide strong empirical evidence for the multidimensional and mediating pathways through which Fintech development contributes to operational and financial outcomes in the banking sector. Fintech is revolutionizing the financial industry in Vietnam, improving access to financial services, enhancing transaction efficiency, and promoting investment. However, to maximize the benefits of Fintech, Vietnam needs appropriate policies to protect users and ensure financial market stability. Moreover, the development of financial technology has had a substantial impact on the Vietnamese financial market. The support of Fintech businesses has expanded people's access to financial services, thereby increasing financial coverage.

**Table 2.** Testing of composite reliability, average variance extracted (AVE)

Code	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
CB	0.821	0.917	0.872	0.633
FD	0.835	0.846	0.901	0.752
FS	0.758	0.764	0.847	0.581
IC	0.827	1.000	0.878	0.645
LF	0.755	0.766	0.860	0.672
OE	0.805	0.807	0.873	0.633
TI	0.833	0.860	0.898	0.747

Source: own calculations in SmartPLS 4.0.

Table 2 evaluates construct reliability and convergent validity using Composite Reliability (CR) and Average Variance Extracted (AVE). All constructs demonstrate strong reliability, with CR values ranging from 0.847 to 0.901, exceeding the recommended threshold of 0.70. The AVE values (0.581–0.752) are all above 0.50, confirming adequate convergent validity and indicating that the items effectively capture each construct. Notably, Fintech Development (FD) and Technological Infrastructure (TI) show the highest AVE values, suggesting strong explanatory power of their indicators. Overall, the results support the robustness of the measurement model and suitability for subsequent SEM analysis.

### Testing Key Factors Affecting Fintech Development and Its Impact on Financial Stability

**Table 3.** Testing of the discriminant validity of intercorrelations and AVEs

Code	CB	FD	FS	IC	LF	OE	TI
CB							
FD	0.18						
FS	0.17	0.851					
IC	0.105	0.130	0.115				
LF	0.096	0.555	0.759	0.095			
OE	0.201	0.412	0.602	0.115	0.671		
TI	0.154	0.754	0.59	0.085	0.633	0.5	

Source: own calculations in SmartPLS 4.0.

Table 3 presents the discriminant validity assessment using the Fornell–Larcker criterion, comparing the square roots of the AVEs (diagonal values) with the inter-construct correlations. The square root of each construct's AVE (FD = 0.851; LF = 0.759; OE = 0.671) is higher than its correlations with other constructs, confirming adequate discriminant validity. This indicates that each construct is empirically distinct and captures unique aspects of the research model. The correlations show meaningful relationships; for instance, TI exhibits strong correlations with FD (0.754) and LF (0.633), reflecting their theoretical linkages. Overall, the discriminant validity results support the suitability of all constructs for structural model testing in SEM–PLS.

**Table 4.** Testing of HTMT analysis for key factors affecting Fintech development and its impact on financial stability

Path	Path Coefficient ( $\beta$ )	T-Statistic	P -Value	Supported
CB $\rightarrow$ FD	0.135	3.784	0.000	Yes
DL $\rightarrow$ OE	0.288	6.672	0.000	Yes
DL x FD $\rightarrow$ OE	0.186	3.078	0.002	Yes
FD $\rightarrow$ FS	0.608	21.595	0.000	Yes
FD $\rightarrow$ OE	0.209	4.245	0.000	Yes
IC $\rightarrow$ FD	0.158	3.737	0.000	Yes
LF $\rightarrow$ FD	0.173	4.895	0.000	Yes
OE $\rightarrow$ FS	0.296	9.936	0.000	Yes
RML x FD $\rightarrow$ FS	0.109	3.345	0.001	Yes
SIZE x OE $\rightarrow$ FS	0.068	2.659	0.008	Yes
TI $\rightarrow$ FD	0.560	19.231	0.000	Yes

Source: own calculations in SmartPLS 4.0.

Table 4 reports the results of hypothesis testing using the HTMT structural analysis, confirming that all proposed paths in the model are statistically significant. The most substantial effect is observed in the relationship FD  $\rightarrow$  FS ( $\beta = 0.608$ ,  $t = 21.595$ ,  $p < 0.001$ ), highlighting the central role of Fintech development in enhancing financial stability. Among the antecedents of Fintech development, Technological Infrastructure (TI  $\rightarrow$  FD) demonstrates the highest influence ( $\beta = 0.560$ ), followed by Legal Framework (LF  $\rightarrow$  FD) and Innovation Culture (IC  $\rightarrow$  FD), supporting the theoretical expectation that institutional and technological readiness drive Fintech growth. Moderation effects are also confirmed: RML strengthens FD  $\rightarrow$  FS, DL reinforces FD  $\rightarrow$  OE, and bank size enhances OE  $\rightarrow$  FS, all with significant t-statistics. These findings validate the model's complexity and demonstrate that contextual organizational factors amplify the impact of Fintech adoption on banking performance and stability.

Previous studies have shown that the development of Fintech affects bank stability, and the extent of the impact remains under empirical investigation, which is also the focus of this study. The contrasting results regarding the trend of competition or cooperation between banks and Fintech imply opposing hypotheses about the impact of Fintech development on bank stability.

Commercial banks benefit from a stable financial system because it improves their operating efficiency, thereby boosting their profitability and market position. The hybrid nature of financial technology poses a bigger threat to the long-term viability of traditional banking institutions. Accordingly, for digital financial services to develop strongly in the near future, it is necessary to build and refine the legal framework for digital financial services; financial service providers, especially banks, need to research and develop a comprehensive roadmap to shift their models to digital finance.

**Table 5.** Testing the SEM model for key factors affecting Fintech development and its impact on financial stability

Indirect Path	Effect ( $\beta$ )	T-Statistic	P-Value	Support
CB $\rightarrow$ FD $\rightarrow$ FS	0.082	3.789	0.000	Yes
CB $\rightarrow$ FD $\rightarrow$ OE	0.028	2.450	0.014	Yes
IC $\rightarrow$ FD $\rightarrow$ FS	0.096	3.623	0.000	Yes
LF $\rightarrow$ FD $\rightarrow$ FS	0.105	5.136	0.000	Yes
TI $\rightarrow$ FD $\rightarrow$ OE $\rightarrow$ FS	0.035	3.796	0.000	Yes
IC $\rightarrow$ FD $\rightarrow$ OE	0.033	3.020	0.003	Yes
DL $\times$ FD $\rightarrow$ OE $\rightarrow$ FS	0.055	3.377	0.001	Yes
LF $\rightarrow$ FD $\rightarrow$ OE	0.036	3.249	0.001	Yes
TI $\rightarrow$ FD $\rightarrow$ FS	0.340	13.039	0.000	Yes
LF $\rightarrow$ FD $\rightarrow$ OE $\rightarrow$ FS	0.011	2.916	0.004	Yes
TI $\rightarrow$ FD $\rightarrow$ OE	0.117	4.096	0.000	Yes
CB $\rightarrow$ FD $\rightarrow$ OE $\rightarrow$ FS	0.008	2.357	0.018	Yes
IC $\rightarrow$ FD $\rightarrow$ OE $\rightarrow$ FS	0.010	2.877	0.004	Yes
DL $\rightarrow$ OE $\rightarrow$ FS	0.085	5.117	0.000	Yes
FD $\rightarrow$ OE $\rightarrow$ FS	0.062	3.900	0.000	Yes

Source: own calculations in SmartPLS 4.0.

Table 5 presents the indirect effects in the SEM model, highlighting the mediating mechanisms through which Fintech development influences operational efficiency and financial stability. All indirect paths are statistically significant, confirming the robustness of the proposed mediation structure. Notably, TI  $\rightarrow$  FD  $\rightarrow$  FS demonstrates the most substantial indirect impact ( $\beta = 0.340$ ), emphasizing that technological infrastructure enhances financial stability primarily through

Fintech advancement. Several multi-step mediations, such as TI  $\rightarrow$  FD  $\rightarrow$  OE  $\rightarrow$  FS ( $\beta = 0.035$ ) and LF  $\rightarrow$  FD  $\rightarrow$  OE  $\rightarrow$  FS ( $\beta = 0.011$ ), show that operational efficiency acts as an essential transmission channel linking Fintech adoption to stability outcomes.

The moderation–mediation pathways also hold, with DL  $\times$  FD  $\rightarrow$  OE  $\rightarrow$  FS ( $\beta = 0.055$ ) indicating that higher digitalization amplifies the efficiency gains from Fintech, which subsequently stabilizes financial performance. Similarly, customer behavior (CB), innovation culture (IC), and the legal framework (LF) exert positive indirect effects through both FD and OE, confirming their foundational roles in shaping Fintech-driven performance improvements.

As they adapt to technological innovations, traditional commercial banks face both opportunities and risks, which negatively affect their stable development and customers' trust in banks. In general, in addition to traditional banking models, Fintech offers advantages in innovation and the ability to apply technology flexibly and effectively, helping reduce costs and expanding access to financial resources for many customer groups.

**Table 6.** Testing post-hoc minimum size sample

Factors	Path coefficients	Alpha 1%, power 80%	Alpha 5%, power 80%	Alpha 1%, power 90%	Alpha 5%, power 90%
CB $\rightarrow$ FD	0.135	547.000	337.000	710.000	467.000
DL $\rightarrow$ OE	0.288	122.000	75.000	158.000	104.000
DL $\times$ FD $\rightarrow$ OE	0.186	292.000	180.000	379.000	249.000
FD $\rightarrow$ FS	0.608	28.000	17.000	36.000	24.000
FD $\rightarrow$ OE	0.209	230.000	142.000	299.000	197.000
IC $\rightarrow$ FD	0.158	404.000	249.000	524.000	345.000
LF $\rightarrow$ FD	0.173	335.000	206.000	434.000	286.000
OE $\rightarrow$ FS	0.296	115.000	71.000	149.000	98.000

RML x FD → FS	0.109	841.000	518.000	1090.000	718.000
SIZE x OE → FS	0.068	2172.000	1338.000	2817.000	1853.000
TI → FD	0.560	33.000	20.000	42.000	28.000

Source: own calculations in SmartPLS 4.0.

Table 6 provides the post-hoc statistical power analysis based on path coefficients, assessing the minimum required sample size under various significance levels and power thresholds. The results reveal substantial variation in required sample sizes across structural paths. Strong relationships, such as FD → FS ( $\beta = 0.608$ ) and TI → FD ( $\beta = 0.560$ ), require relatively small minimum sample sizes (17–42 observations), indicating high statistical power even with modest sample sizes. Conversely, weak path coefficients, particularly SIZE × OE → FS ( $\beta = 0.068$ ) and RML × FD → FS ( $\beta = 0.109$ ), require much larger samples, ranging from 518 to over 2,800 observations, reflecting the inherently smaller effect sizes of moderating relationships.

Given the actual sample size of 474 respondents, the study comfortably satisfies the minimum sample size requirement for all direct relationships and most mediation paths. Although the moderating effects with very small coefficients typically require larger samples, the significant t-statistics obtained in Table 4 confirm adequate statistical power for hypothesis testing in this study. Overall, the post-hoc analysis supports the robustness and reliability of the SEM results.

Vietnam is a typical bank-based financing country; banks still account for the majority of the financial system and serve as the primary source of funding, suggesting that banking stability is more affected than in countries less dependent on banks. Currently, the Vietnamese Fintech market is growing rapidly, with many models such as mobile payments, peer-to-peer lending, personal financial management, and insurance technology. It is considered a potential market in the Asia-Pacific. Therefore, Fintech development has a greater impact on the financial system.

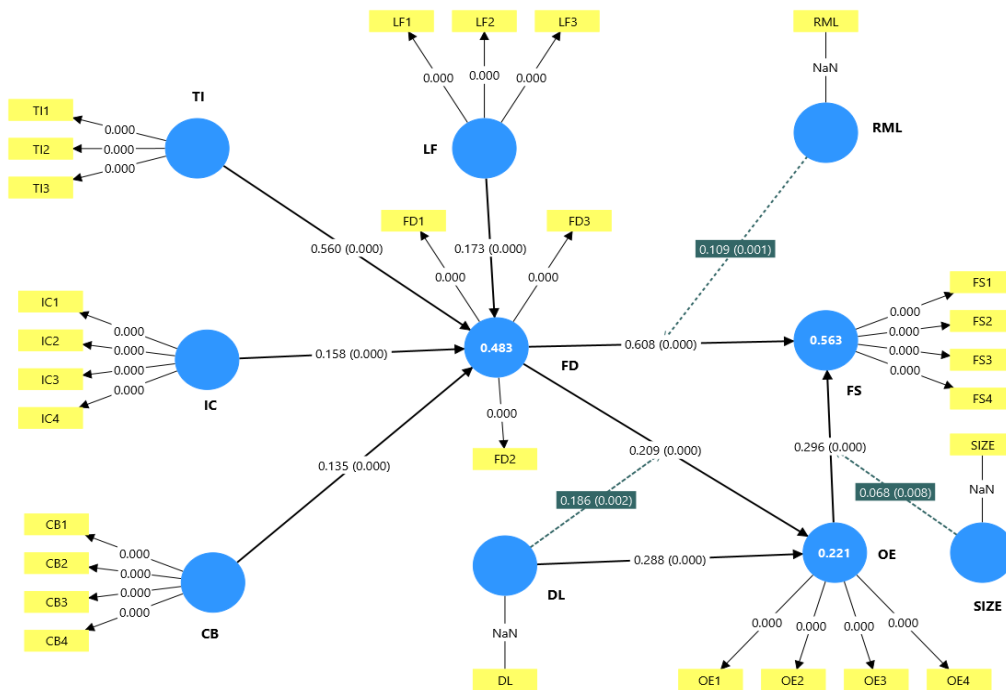


Figure 2. Testing the SEM for key factors affecting Fintech development and its impact on financial stability

Figure 2 presents the structural equation model (SEM) results illustrating the direct, mediating, and moderating effects among the key factors influencing Fintech development (FD), operational efficiency (OE), and financial stability (FS). The model explains substantial variance, with  $R^2 = 0.483$  for FD, 0.221 for OE, and 0.563 for FS, indicating strong predictive power.

Among the antecedents of FD, Technological Infrastructure ( $\beta = 0.560$ ,  $p < 0.001$ ) emerges as the most influential determinant, followed by Legal Framework ( $\beta = 0.173$ ), Innovation Culture ( $\beta = 0.158$ ), and Customer Behaviour ( $\beta = 0.135$ ). These results highlight that both institutional readiness and organizational culture play pivotal roles in driving Fintech adoption in Vietnamese banks. FD significantly enhances both Operational Efficiency ( $\beta = 0.209$ ) and Financial Stability ( $\beta = 0.608$ ), while OE also contributes positively to FS ( $\beta = 0.296$ ), confirming that Fintech affects stability both directly and indirectly through efficiency gains.

The moderating effects are also validated: Risk Management Level strengthens the impact of FD on FS ( $\beta = 0.109$ ), Digitalization Level amplifies the influence of FD on OE ( $\beta = 0.186$ ), and Bank Size enhances the OE–FS link ( $\beta = 0.068$ ). Finally, the SEM results provide strong empirical support for the proposed conceptual framework, demonstrating that Fintech development is a crucial driver of operational and financial performance in the banking sector.

## DISCUSSION OF FINDINGS

This study provides comprehensive empirical evidence on the determinants of Fintech development and its subsequent implications for operational efficiency and financial stability in the Vietnamese banking sector. The findings confirm the multifaceted nature of Fintech adoption, shaped simultaneously by institutional, technological, organizational, and behavioral factors. The results also highlight the critical role of moderating variables: risk management level, digitalization level, and bank size in amplifying the impact of Fintech on banking performance.

1. The study reveals that technological infrastructure is the strongest predictor of Fintech development. This aligns with the argument of Serkbayeva et al. (2024), who assert that reliable digital infrastructure underpins the diffusion of Fintech. In Vietnam, the expansion of broadband networks, mobile banking platforms, and cybersecurity capabilities has enabled commercial banks to integrate digital technologies more effectively. The significance of the legal framework underscores the vital role of regulatory clarity in promoting Fintech initiatives. The positive impact of the legal framework aligns with prior research by Kayani et al. (2025), which emphasizes that transparent, adaptive regulations foster innovation while safeguarding systemic integrity. Vietnam's ongoing legal reforms in digital finance, e-KYC, and payment systems have played an essential enabling role in this regard.
2. The study underscores the relevance of organizational factors, notably innovation culture, in nurturing Fintech development. Banks with stronger innovative cultures appear more open to technological experimentation and collaboration with Fintech firms, consistent with the assertions (Elgadi & Ghardallou, 2022; Liu et al., 2022). As banks face increasing pressure to digitalize, fostering an innovation-friendly internal environment becomes a strategic imperative. Similarly, customer behavior significantly shapes Fintech adoption, reflecting Vietnamese consumers' growing expectations for convenience, speed, and personalized digital services. This corroborates the diffusion of innovation theory, which posits that user acceptance is crucial in determining the success of technological solutions.
3. The results provide strong evidence that Fintech development enhances operational efficiency. This supports the view that digital technologies streamline workflows, reduce operational costs, and minimize human error (Ovenc & Nabiyev, 2025; Bartolacci et al., 2022). By automating processes such as payments, credit scoring, and risk monitoring, banks can redeploy resources toward more value-added activities. The positive linkage between operational efficiency and financial stability further demonstrates that efficiency is a vital mechanism enhancing resilience. This resonates with the argument that cost-efficient banks are better equipped to absorb market shocks and maintain sound financial conditions.
4. The study confirms a direct and substantial effect of Fintech development on financial stability, suggesting that digital transformation contributes not only to efficiency but also to systemic robustness (Wang et al., 2020; Parmankulova et al., 2022). Through enhanced transparency, improved risk analytics, and diversified financial channels, Fintech strengthens banks' ability to manage liquidity and credit risks. This finding is consistent with recent studies highlighting Fintech's potential to stabilize emerging market financial systems when accompanied by strong governance.
5. The moderating variables provide novel insights into the contextual conditions under which Fintech produces stronger outcomes. Risk management level (RML) significantly reinforces the relationship between Fintech and financial stability, underscoring the importance of mature risk governance to harness Fintech benefits without exposing banks to technological vulnerabilities (Al-Majali et al., 2025; Faizulayev et al., 2021). Likewise, the digitalization level (DL) enhances Fintech's impact on operational efficiency, underscoring the importance of internal digital readiness. Banks with advanced digital platforms are better positioned to maximize Fintech-driven gains. Finally, bank size strengthens the OE–FS relationship, suggesting that larger banks, due to economies of scale and more sophisticated infrastructures, can convert efficiency improvements into stability outcomes more effectively.

Finally, the discussion highlights that Fintech development represents a critical strategic driver for performance improvement and systemic stability in Vietnam's banking industry. However, its benefits depend on regulatory quality, technological readiness, organizational culture, and institutional capabilities. These insights provide valuable guidance for policymakers and bank managers seeking to accelerate digital transformation while ensuring financial resilience. The research results help commercial banks assess the impact of Fintech development

on their stability, thereby enabling them to make reasonable investment decisions in Fintech activities while also considering the competitive-cooperative relationship between banks and Fintech companies.

## CONCLUSIONS AND IMPLICATIONS

### Conclusions

This study provides a comprehensive empirical investigation into the determinants of Fintech development and its effects on operational efficiency and financial stability within Vietnamese commercial banks. By integrating institutional, technological, organizational, and behavioral perspectives, the study develops and validates a multidimensional structural model that explains how Fintech contributes to banking performance. The findings confirm that Fintech development is significantly driven by four key antecedents: legal framework, technological infrastructure, innovation culture, and customer behavior, highlighting the importance of both external regulatory conditions and internal organizational capabilities. The analysis further demonstrates that Fintech development plays a central role in enhancing operational efficiency and, subsequently, financial stability, with operational efficiency serving as a meaningful mediating mechanism linking technological advancement to systemic resilience. Additionally, the moderating effects of risk management level, digitalization level, and bank size reveal that the benefits of Fintech adoption are not uniform across institutions. Banks with stronger risk governance, greater digital readiness, and larger operational scale are better positioned to convert Fintech-driven improvements into stable financial outcomes. These insights enrich the theoretical understanding of Fintech's role in emerging markets, particularly in contexts undergoing rapid digital transformation. Overall, the study advances the literature by demonstrating that Fintech adoption is a strategic pathway for enhancing both performance and stability in the banking sector. The findings provide a strong foundation for policymakers and bank executives to design effective technological, regulatory, and organizational strategies that foster innovation while ensuring sustainable development of the financial system.

### Implications

(1) **Managerial Implications:** The findings offer several implications for bank managers and practitioners.

First, enhancing technological infrastructure should be a top strategic priority, as it is the strongest predictor of Fintech development. Banks should increase investment in cloud computing, data analytics, cybersecurity, and API connectivity to support scalable Fintech integration. Commercial banks need to expand investment in technology to address competition and the impact of Fintech, enhance information security, and strengthen risk management when applying technology to operational processes.

Second, building a supportive legal and governance environment is critical. Managers should proactively align internal policies with regulatory guidelines on digital banking, e-KYC, and data privacy, ensuring compliance while fostering innovation. Commercial banks need to develop comprehensive cooperation plans and strategies with Fintech companies to offer a broader range of products and services.

Third, cultivating an innovation-oriented culture is essential for successful Fintech adoption. Managers must encourage experimentation, cross-functional collaboration, and continuous learning to reduce resistance to technological change. Strengthening the training of quality human resources, proficient in information technology, to facilitate the application of advanced technologies in the working process, improving labor productivity, and actively contributing to the operational efficiency of commercial banks.

Fourth, the significant role of customer behavior suggests that banks should prioritize customer-centric design, user-friendly interfaces, and personalized digital services to accelerate adoption. Raising people's financial awareness also plays an essential role in fostering Fintech development. Financial education programs need to be widely deployed to help people better understand the risks and benefits of Fintech. This not only allows consumers to use financial services more safely but also promotes the transparent and healthy development of the digital financial market.

Finally, the positive effect of FD and OE on FS indicates that Fintech adoption should be positioned as a long-term strategic investment, not merely a technological trend. Strengthening operational efficiency through automation and data-driven decision-making enhances both competitiveness and resilience. Cooperation between Fintech companies and traditional banks is also an essential factor in the development of the digital financial ecosystem. Instead of competing directly, banks and Fintech companies can collaborate to leverage each other's strengths, thereby providing more comprehensive financial solutions to customers. This combination can help improve customer service, optimize transaction processes, and improve the operational efficiency of the economic system.

**(2) Policy Implications:** The results also provide important insights for policymakers and regulators.

First, a flexible and innovation-supportive legal framework is critical to promoting Fintech expansion while ensuring systemic safety. Regulators should continue modernizing digital finance regulations, strengthening consumer protection, and establishing regulatory sandboxes to encourage controlled experimentation. The Government needs to direct relevant ministries, departments, and branches to invest in and develop infrastructure and a safe and secure national data system, facilitating data sharing among stakeholders in the Fintech sector.

Second, government support in improving national digital infrastructure, including broadband expansion, digital identity systems, and cybersecurity, will create favorable conditions for Fintech growth, especially in less developed provinces. The Vietnamese government should complete the legal framework related to supporting Fintech development because the legal environment for Fintech activities is not yet complete, so that it will be complicated for the development of the Fintech ecosystem; at the same time, there needs to be priority policies to create a foundation and environment to encourage investment in Fintech.

Third, policies that enhance risk management capabilities across the banking sector are essential. Regulators should promote industry-wide risk-assessment standards and cyber-resilience frameworks, ensuring banks are adequately prepared to manage digital risks. The State Bank of Vietnam needs to continue building and refining support mechanisms and legal corridors to promote cooperation between commercial banks and Fintech companies in the future, and at the same time implement a testing mechanism to develop the relationship between Fintech and commercial banks.

Fourth, given the moderating role of bank size, policies that encourage digital upgrading for small- and medium-sized banks will help reduce performance gaps and contribute to overall financial system stability. In addition, the government needs policies to help Fintech businesses access capital and expand their markets. Investment funds dedicated to Fintech startups can help potential companies to develop quickly and expand their operations.

## LIMITATIONS AND FUTURE RESEARCH

Despite its contributions, the study has several limitations that suggest avenues for future research: (1) It focuses on two provinces in Vietnam; future studies may expand the sample geographically or compare findings across countries. (2) The use of cross-sectional data limits causal inference; longitudinal studies could examine dynamic changes in Fintech adoption over time. (3) Future research may incorporate additional constructs such as cybersecurity readiness, digital leadership, or ESG considerations to extend the model. (4) The qualitative case studies could provide deeper insights into how banks operationalize Fintech strategies in practice.

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