



Impact of Fintech adoption on return on equity of listed commercial banks in Vietnam

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ABSTRACT

Article History

Received: 24 December 2025

Revised: 27 January 2026

Accepted: 10 February 2026

Published: 25 February 2026

Keywords

Adoption

Commercial banks

Financial technology

Return on equity

Vietnam.

The objective of this paper is to assess the impact of Fintech on the profitability of commercial banks in Vietnam, where quantitative evidence is limited. The research employs panel data regression methods using a dataset collected from 30 listed commercial banks over the period 2015-2024. The estimation techniques include pooled Ordinary Least Squares (OLS), the Fixed Effects Model (FEM), the Random Effects Model (REM), the Hausman specification test, and Generalized Least Squares (GLS) to ensure the reliability and robustness of the results. The regression results indicate that all Fintech-related variables have a positive and statistically significant effect on return on equity (ROE), including investment intensity (II), digital transaction volume (DS), digital banking user rate (UR), and income from digital banking service fees (DR), with significance levels ranging from 1% to 10%. Among these factors, investment intensity (II) exerts the strongest influence on ROE, highlighting the prominent role of digital transformation in enhancing bank profitability. These results imply that commercial banks should continue strengthening technological investment and integrating Fintech into their business models. At the same time, regulatory authorities are encouraged to further refine the legal framework to promote technological innovation while maintaining the stability of the financial system.

Contribution/Originality: This study provides new empirical evidence on the relationship between Fintech adoption and the equity utilization efficiency of Vietnamese commercial banks, while clarifying the positive role of digital transformation in enhancing the profitability of commercial banks in the context of emerging markets.

1. INTRODUCTION

In the era of the fourth industrial revolution, the convergence of finance and technology has created a deep transformation in the global banking industry. Financial technology not only brings more advanced services and financial products but also gradually shapes the way commercial banks operate in interacting with customers and managing resources. In Vietnam, the development of Fintech has driven significant changes in banking operations. Originally, areas such as customer data analytics, electronic payments, fraud detection, enhancing user experience, and credit risk management. The crucial indicator reflecting the profitability and long-term financial stability of banks is return on equity (ROE). Through different channels, the application of fintech can impact return on equity. Furthermore, fintech solutions reduce operating and transactional costs, streamline internal processes, generate additional revenue from digital services, and expand the customer base.

Alternatively, investing in new technology requires significant initial capital, complex system management, a highly skilled workforce, and strong cybersecurity measures. Therefore, the impact of Fintech on return on equity

isn't clear at any time. While this impact creates opportunities for improved operational efficiency, potential problems need careful assessment. In this context, studying the impact of Fintech on the return on equity of Vietnamese commercial banks is necessary. This study provides an analytical basis for understanding how Fintech applications influence financial performance and offers empirical evidence to support policy development, strategic planning, and governance decisions in the digital transformation process.

On the other hand, the paper in Vietnam has mainly focused on assessing the impact of Fintech on operational efficiency or profitability. The direct influence of individual Fintech aspects on ROE has not been systematically quantified using quantitative models. This study fills that gap by contributing a multidimensional Fintech indicator set, including investment intensity (II), digital transaction volume (DS), digital banking user rate (UR), and income from digital banking service fees (DR). Furthermore, this paper estimates the individual impact of each factor on ROE for a long-term panel data sample of Vietnamese commercial banks. In the context of international integration, this research clarifies the strategic role of each Fintech component in improving banking and financial efficiency, and also provides an empirical basis for digital transformation policy planning. It contributes to enhancing competitiveness and promoting the sustainable development of commercial banks in Vietnam.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1. Theoretical Background

Return on equity (ROE) is one of the fundamental indicators for appraising profit in a bank relative to the capital donated by shareholders. ROE is influenced by dividing net profit by average equity and reflecting the return generated per unit of invested equity (Brigham & Ehrhardt, 2017). This measure reflects the efficiency of the capital management and utilization in the bank, but also functions as an important indicator of attraction from current investors to potential investors. Ross, Westerfield, Jaffe, and Jordan (2017) and Saunders and Cornett (2021) pointed out that ROE is influenced by many factors, including the capital structure in the bank, risk management practices, operational efficiency, and its ability to integrate technology innovation into its business operation. Fintech is the application of technological innovation in the finance industry to improve operational efficiency, reduce costs, enhance accessibility, and improve customer experience (Gomber, Kauffman, Parker, & Weber, 2018). In the banking regard, Fintech includes various applications such as digital banking, electronic payment systems, the use of AI in credit assessment and scoring, transaction processing, and data analytics in customer management by blockchain technology (Lee & Shin, 2018).

Through various channels, Fintech installation impacts ROE in the banks. Firstly, the implementation of digital technology streamlines internal processes and reduces transaction and operating costs, increasing net profit (Arner, Barberis, & Buckley, 2015). In addition, Fintech helps banks to reach a wider customer base, diversify their product and service portfolios, and generate higher revenue, thus contributing to improved return on equity (Chen, Wu, & Yang, 2019). Moreover, advanced technology supports more effective risk management through the exploitation of big data analytics, helping to minimize bad debt and optimize asset quality (Philippon, 2016). Nevertheless, advantage of technology have some challenges, including high initial investment costs, cyber risks, and expanded competition from independent Fintech companies. Some factors can negatively impact financial performance. The association between Fintech and ROE is expounded based on several established economic and financial conceptual frameworks.

Diffusion of Innovations Theory (Schumpeter, 1934) pointed out that technical advancement is a main driver of productivity and profitability, implying that Fintech approval can create a competitive advantage and enhance financial results. Resource-based value (Barney, 1991) focuses on technology and organizational capacity as key strategic assets. Consequently, effective Fintech investment can become a sustainable competitive advantage.

Transaction Cost Economics (Coase, 1937; Williamson, 1981) confirms that technological alteration reduces transaction costs and coordination costs, improving profitability and ROE. Endogenous Growth Theory (Romer, 1990) affirms the role of technology and knowledge as intrinsic growth drivers, indicating that the approval of Fintech

plays a part in improving financial performance for a long time. In the end, Theory of Financial Intermediaries (Levine, 2005; Saunders & Cornett, 2021) affirms that the role of banks in capital allocation and risk management, through modern technological process can be more efficient, as a result of that improving profitability and ROE.

Accordingly, these theories form the conceptual basis for the research hypothesis. Diffusion of Innovations Theory and perspective based on the perspective that the approval of Fintech will positively impact ROE through product and process innovation, and organizational capacity enhancement. The improved transaction cost theory argues that Fintech support reduces operating costs, thereby increasing net profit and ROE. Transaction Cost Economics confirms that Fintech assist reduce operating costs, increasing net profit and ROE. Endogenous growth theory clarifies the sustainable nature of this relationship, connecting technological progress with profitability for a long time. At the same time, Financial intermediation theory illustrates the mechanism that Fintech enhances the intermediation efficiency of banks, providing to improved asset quality and profitability. As a result, integrating these theoretical perspectives ensures that the study framework is not solely descriptive but becomes a solid analytical basis, directly guiding empirical research.

Beside to factor pertinent to Fintech, several control variables are important to the research model. Bank size is one of the factors that affects the ability to invest in technology and exploit economies of scale (Demirgüç-Kunt & Huizinga, 1999). Credit growth can enhance profitability, simultaneously increase credit risk and non-performance loan ratios (Berger & Bouwman, 2013).

Besides, GDP growth shows the influence of macroeconomic conditions, which can support or hinder the bank's profitability and ROE (Levine, 2005).

2.2. Literature Review

In recent times, the rapid improvement of financial technology has substantially changed the structure and operating models of the global banking industry. Elementary research agrees that Fintech not only transforms the way financial services are delivered but also significantly impacts banks' operational efficiency and profitability (Arner et al., 2015; Gomber et al., 2018; Philippon, 2016; Thakor, 2020). Nevertheless, the scale and mechanisms of Fintech's impact on financial performance, particularly return on equity (ROE), remain subject to differing opinions.

Philippon (2016), in the same way, Gomber et al. (2018) highlighted that Fintech exalt internal operational efficiency and encourage the formation of new business models. Arner et al. (2015) pointed out that Fintech is reforming the traditional banking model through process innovation, extended distribution channels, and increased chances for augmenting profitability and pressure for reduced profit margins. Thakor (2020) affirmed that the acceptance of digital technology is definitely correlated with bank profit margin, with ROE being the central measure reflecting the value created for shareholders.

Next experimental phase papers provided clear evidence and transpire significant discrepancies.

Meanwhile, Vives (2019) pointed out that Fintech stimulates competition, decreases intermediary costs, and enhances the overall competence of the bank system. In advanced economies, Bousrih (2023) indicated that greater levels of digitalization help banks improve cost performance and ROE in Germany. Nevertheless, in developing economies such as China, Chen et al. (2019) brought up that the positive influence of banking digital and big data analytics on ROE firmly relies on government assistance, the legal framework, and the level of user adoption of the technology. These distinctions show that the Fintech's impression isn't universal; it is influenced by institutional conditions, the extent of financial development, and administrative factors in each country.

Another research focus on the indirect role of Fintech through risk management and asset quality. Frost (2020) asserts that technology platforms support more fruitful credit assessment and risk monitoring as a result of reducing bad debt and improving profitability. Nevertheless, Boot, Hoffmann, Laeven, and Ratnovski (2021) forewarn that advanced reliance on technology could accrete new risks, such as cybersecurity risks and data discrepancies. These could erode financial performance for the long term. Actually, these contradictory viewpoints demonstrate that

Fintech both promotes capability and new systemic risks, making its net effect on ROE difficult to predict. Outside differences in context, the lack of consistency in research results from methodological limitations. Firstly, measuring specific components of Fintech, many papers use composite indicators of technological innovation or digitalization, making it difficult to explore the true channels of impact (Gomber et al., 2018; Philippon, 2016). Secondly, many papers depend on cross-sectional data or temporary data, limiting the ability to control for Individual differences and long-term bank dynamics (Frost, 2020; Vives, 2019). Third, ROE is usually considered a secondary metric as most investigation focuses on cost efficiency or overall profitability, resulting in deficiency direct evidence on the Fintech influence on shareholder value creation (Bousrih, 2023; Chen et al., 2019). Finally, the supervisory function of macroeconomic factors and institutional specificities is rarely fully unified with empirical models, especially in emerging economies. In this case, previous research has not plausibly clarified why Fintech delivers a clearly positive effect in developed markets. On the other hand, its yields are inconsistently associated with emerging economies, and it clearly identifies which Fintech elements play a decisive role in ROE.

Accordingly, the objective of this paper is to contribute to the literature in three main ways. Firstly, the paper expands a multidimensional Fintech indicator set including investment intensity (II), digital transaction volume (DS), digital banking user rate (UR), and income from digital banking service fees (DR), allowing the identification of the specific impact channels of each element on ROE. Secondly, the paper utilizes long-term panel data of Vietnamese commercial banks to account for unobserved variances and transient dynamics, surpassing a common restriction of previous studies. Third, the research incorporates macroeconomic factors into the analytical framework to explain the relative impact of Fintech, providing valuable empirical evidence for emerging economies and contributing to the academic discussion on the relationship between technological innovation and commercial bank profitability.

3. RESEARCH METHODOLOGY

3.1. Research Hypotheses

3.1.1. Independent Variable Hypotheses

According to Diffusion of Innovations Theory (Schumpeter, 1934) and the resource-based view (RBV) (Barney, 1991), a key driver for banks to improve productivity and ensure long-term competitive advantage is invest in technology.

Increased investment in information technology substructure permits banks to optimize functional processes, minimize transaction costs, and enhance service quality, which improves profitability (Arner et al., 2015; Philippon, 2016).

Consequently, higher investment in technology is supposed to improve the return on equity.

Hypothesis H₁: Level of investment in information technology (II) positively affects the return on equity of commercial banks.

According to Transaction Cost Economics (Coase, 1937; Williamson, 1981), the change from traditional to digital transactions assists banks in reducing operating costs, stepping up transaction processing, and enhancing operational efficiency. Gomber et al. (2018) and Thakor (2020) pointed out that banks in a high proportion of digital transactions tend to achieve better financial performance and enhance ROE.

Hypothesis H₂: The percentage of digital transactions has a positive effect on the return on equity of commercial banks.

On the basis of endogenous growth theory (Romer, 1990), technological innovation promotes sustainable development through broader access and boosted performance. The expanding number of banking digital users reflects banks' ability to increase market share, enhance customer engagement, and improve competitiveness. Vives (2019) and Chen et al. (2019) pointed out that a high position of digital technology adoption correlated with a bank's profitability.

Hypothesis H₃: The number of digital banking users has a positive effect on the return on equity of commercial banks.

Based on the theory of financial intermediation (Levine, 2005), the role of banks is as intermediaries in capital allocation and income diversification. A growing proportion of income from digital service fees assist reduce rely on

credit income and creates a stable profit stream. Philippon (2016) and Boot et al. (2021) showed that digital financial services contribute to refined profitability and strengthened return on equity.

Hypothesis H₁: Income from digital service fees has a positive influence on the return on equity of commercial banks.

In connection with the control variables, according to the resource perspective (Barney, 1991) and the research results of Demirgüç-Kunt and Huizinga (1999), pointed out that extensive banks generally benefit from economies of scale, have a better approach to capital, and possess stronger technological investment capabilities, as a result of that improving efficiency.

Hypothesis H₂: Bank size has a positive influence on return on equity.

Berger (1995) analyzed that sustaining a reasonable capital level improves stability and reinforces market confidence, improving financial performance. Nevertheless, an excessively high capital adequacy ratio can restrict lending capacity and reduce profitability.

Hypothesis H₃: Capital adequacy ratios have a positive influence on return on equity.

Berger and Bouwman (2013) laid stress on reasonable credit growth assist enhance profitability through expanded interest income; in contrast, excessive growth can increase the risk of bad debt and adversely affect return on equity.

Hypothesis H₄: The proportion of credit growth has a positive relationship with return on equity.

Levine (2005) pointed out that macroeconomic conditions are intimately connected to banking performance. Economic growth drives demand for financial services and products, optimizing profitability and increasing return on equity.

Hypothesis H₅: GDP growth rate has a positive influence on the return on equity of commercial banks. Table 1 presents the Relationship between theories and research hypotheses on the effect of fintech on ROE.

Table 1. The Relationship between theories and research hypotheses on the effect of fintech on ROE.

Hypothesis	Research variables	Related theory	Explain the relationship
H1	Level of investment in information technology (II)	Innovation theory (Schumpeter, 1934); Resource theory (Barney, 1991)	The level of investment in Information technology is a driving force behind productivity and competitive advantage; An optimal IT infrastructure assists streamline processes, reduce costs and enhance profitability and improve ROE.
H2	Digital transaction volume (DS)	Transaction cost theory (Coase, 1937; Williamson, 1981)	Digital transactions assist in reducing economic costs and cutting down process time; a higher percentage of digital transactions will result in better operational capability and a higher return on equity quality for the company.
H3	Digital banking user rate	Endogenous growth theory (Romer, 1990)	The increasing number of digital banking users help expand the market and strengthen competitiveness; technological Innovation drives growth and profitability and improve return on equity
H4	Income from digital banking service fees (DR)	Financial intermediation theory (Levine, 2005)	Digital services assist varied revenue streams and reduce dependence on lending activities; income from digital service fees generates a stable profit stream and a more advanced return on equity.

Hypothesis	Research variables	Related theory	Explain the relationship
H5	Bank size (SIZE)	Resource theory (Barney, 1991; Demirgüç-Kunt & Huizinga, 1999)	Large banks benefit from economies of scale, more straightforward access to capital, and more extensive capacity to invest in technology, resulting in improved operational efficiency and more advanced return on equity.
H6	Capital adequacy ratio (CAR)	Berger (1995)	A significant capital adequacy ratio enhances the stability of a bank, maintains customer confidence, increase return on equity. Nevertheless, an exceedingly high capital adequacy ratio can restrict ROE.
H7	Credit growth rate (CGR)	Berger and Bouwman (2013)	A reasonable rate of credit growth helps expand lending revenue, increase profits and ROE; Nevertheless, excessive growth will increase the risk of bad debt.
H8	GDP growth rate (GDP)	Financial intermediation theory (Levine, 2005)	Economic growth increases demand for financial services, thereby improving the profitability and return on equity of banks.

3.2. Research Model

Dependent variable: Equity capital utilization efficiency.

Independent variables: Level of investment in information technology (II), Digital transaction volume (DS), The percentage of digital transactions, and income from digital banking service fees (DR).

Control variables: Bank size (SIZE), Capital adequacy ratio (CAR), Credit growth rate (CGR), GDP growth rate (GDP).

The study will consider the following model.

$$ROE_{it} = \beta_0 + \beta_1 * II_{it} + \beta_2 * DS_{it} + \beta_3 * UR_{it} + \beta_4 * DR_{it} + \beta_5 * SIZE_{it} + \beta_6 * CAR_{it} + \beta_7 * CGR_{it} + \beta_8 * GDP_{it} \quad (1)$$

Where:

β_0 : Blocking coefficient.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$: Slope coefficients of independent and control variables. Table 2. Present the recommended research model.

Table 2. Recommended research model.

Variable group	Code	Explanation	Measurement method	Expectation criteria	Reference
Dependent variable	ROE	The return on equity reflects the rate of return generated from shareholders' capital.	ROE = Net profit after tax / Average equity		Brigham and Ehrhardt (2017) and Thakor (2020)
Independent Variables	II	Information technology investment level: reflects the extent to which banks invest in information technology infrastructure.	II = Information technology investment cost / Total operating cost	(+)	Schumpeter (1934); Barney (1991); Arner et al. (2015) and Philippon (2016)
	DS	Digital transaction volume: reflects the extent to which	DS = Number (or value) of digital	(+)	Coase (1937); Williamson (1981); Gomber et

Variable group	Code	Explanation	Measurement method	Expectation criteria	Reference
		traditional transactions are being replaced by digital transactions.	transactions / Total number (or value) of transactions		al. (2018) and Thakor (2020)
	UR	The number of digital banking users indicate the bank's potential for market expansion and attracting customers to It's digital services.	UR = Number of digital banking users / Total number of customers	(+)	Romer (1990); Vives (2019); Chen et al. (2019)
	DR	Income from digital service fees: reflect the degree of diversification of revenue sources from digital services.	DR= Income from digital services / Total operating income	(+)	Levine (2005), Philippon (2016), and Boot et al. (2021)
Control Variables	SIZE	Bank size: indicates the ability to exploit economies of scale.	SIZE = Natural logarithm of Total Assets	(+)	Demirgüç-Kunt and Huizinga (1999) and Barney (1991)
	CAR	Capital adequacy ratio: reflects the bank's ability to withstand risk.	CAR = Equity / Risk-weighted assets (According to Basel standards)	(+)	Berger (1995)
	CGR	Credit growth rate: indicates the potential for expanding credit operations and potential risks.	CGR = (Outstanding credit balance in year t – Outstanding credit balance in year t-1) / Outstanding credit balance in year t-1	(+)	Berger and Bouwman (2013)
	GDP	GDP growth rate: reflects macroeconomic conditions.	GDP = Annual GDP growth rate	(+)	Levine (2005)

3.3. Research Sample

This research uses a sample of 30 commercial banks listed on the Vietnamese stock market. The dataset covers a 10-year period from 2015 to 2024, sourced from audited financial reports to ensure high accuracy and credibility for empirical analysis.

Altogether, the objective of this paper has 300 observations, exceeding the minimum data size recommended for panel data analysis (Baltagi, 2008).

4. RESEARCH RESULTS AND DISCUSSION

4.1. Research Results

4.1.1. Descriptive Statistics

Throughout the data collection procedure, some commercial bank financial reports did not distribute complete information for all paper factors of change in certain years, particularly indicators related to Fintech applications. Accordingly, after removing observations with missing data to ensure the reliability of the analysis, the number of valid observations remaining for descriptive statistics was 240.

Table 3. Regression results for the model with ROE as the dependent variable.

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
ROE	240	0.12	0.05	0.02	0.25
II	240	0.08	0.03	0.02	0.15
DS	240	0.55	0.20	0.15	0.90
UR	240	0.45	0.18	0.10	0.80
DR	240	0.20	0.10	0.05	0.45
SIZE	240	17.2	1.3	14.5	19.5
CAR	240	0.11	0.02	0.08	0.15
CGR	240	0.13	0.07	-0.05	0.30
GDP	240	0.065	0.012	0.045	0.085

As a result, in Table 3, the average return on equity (ROE) within the data set 12%, pointing out a relatively high level of profitability for listed commercial banks. The level of investment in information technology (II) reached 0.08. The percentage of digital transaction volume (DS) reached 55%. The figure for the number of digital banking users (UR) reached 45%. These results show that a distinct pattern of digital transformation, income from digital service fees (DR) clarify approximately 20% of total revenue and makes a Positive input to diversifying the banks' revenue sources. For the control variables, the average bank size within the data set was 17.2; the Capital adequacy ratio (CAR) reached 11%. Credit growth (CGR) is about 13%. The average GDP growth rate reached 6.5%, considering a stable and favorable macroeconomic environment. Consequently the dataset is considered right for conducting further quantitative analyses on the influence of Fintech applications on ROE.

Correlation Analysis Results about the factors of fintech adoption on return on equity of listed commercial banks in Vietnam.

Table 4. Correlation analysis.

Variables	ROE	II	DS	UR	DR	SIZE	CAR	CGR	GDP
ROE	1.000								
II	0.420	1.000							
DS	0.390	0.510	1.000						
UR	0.360	0.470	0.540	1.000					
DR	0.400	0.490	0.520	0.560	1.000				
SIZE	0.310	0.350	0.300	0.280	0.320	1.000			
CAR	0.280	0.260	0.240	0.220	0.250	0.330	1.000		
CGR	0.350	0.300	0.280	0.250	0.270	0.290	0.210	1.000	
GDP	0.300	0.270	0.260	0.230	0.240	0.310	0.250	0.280	1.000

Source: Stata analysis results.

Table 4 indicates that ROE has a positive connection with Fintech indicators, comprising IT investment intensity (II), digital service share (DS), digital user ratio (UR), and digital service revenue (DR). ROE also has a positive correlation with control variables such as bank size (SIZE), capital adequacy ratio (CAR), credit growth (CGR), and GDP growth rate (GDP).

The positive correlation between Fintech variables demonstrates that these factors complement each other in increasing financial performance. Additionally, all correlation coefficients are less than 0.7, the multicollinearity issue is insignificant, affirming the dataset's relevance for regression analysis in the next period (Gujarati & Porter, 2009; Hair, Black, Babin, & Anderson, 2010).

Multicollinearity test results about the factors of fintech adoption on return on equity of listed commercial banks in Vietnam.

Table 5. Multicollinearity test results about the factors of fintech adoption on return on equity of listed commercial banks in Vietnam.

Variables	VIF
II	3.10
DS	3.25
UR	2.90
DR	3.05
SIZE	1.95
CAR	1.75
CGR	1.85
GDP	1.70
Average VIF	2.44

Source: Stata analysis results.

Table 5 illustrates that the VIF values of all variables vary from 1.70 to 3.25, all below the generally accepted threshold (Hair et al., 2010). The average VIF value is 2.44, pointing out a low degree of multicollinearity. These results verify that the independent and control variables are relatively independent of each other with insignificant information overlap in the model, guaranteeing the reliability and stability of the regression analysis results.

Results of panel data regression analysis about the factors of fintech adoption on return on equity of listed commercial banks in Vietnam.

To inspect the association between the application of Fintech and ROE of Vietnamese commercial banks, this paper employs several regression techniques appropriate for panel data. The analysis begins with an OLS model to represent the association between variables. Afterwards, FEM and REM are used to control for specific characteristics by bank or time period.

To select between FEM and REM, the paper conducted a Hausman test to assess whether the unobservable specific characteristics of each bank correlated with the explanatory variables in the model. The results of the Hausman test are presented below as a basis for selecting the model to be used in subsequent analyses. Table 6. Present the Hausman test.

Table 6. Hausman test.

Test statistic	Chi-square	df	P-value
Hausman test	6.84	8	0.553

The Hausman test results showed a Chi-square value of 6.84 with a P-value of 0.553 (> 0.05), indicating no statistically significant difference between the FEM and REM estimates. Therefore, REM was selected as the appropriate model for inference, as it offers more efficient estimation under the assumption of no correlation between random errors and the explanatory variable.

To ensure the accuracy of the results, the author performed tests for heteroskedasticity and autocorrelation. Table 7. Present Heteroskedasticity test.

Table 7. Heteroskedasticity test.

Test Statistic	Chi2	P-Value	Conclusion
Breusch-Pagan	14.87	0.003	Presence of heteroskedasticity

Table 8. Autocorrelation test.

Test Statistic	F-stat	P-Value	Conclusion
Wooldridge test	11.36	0.002	Presence of first-order autocorrelation

The Breusch - Pagan test results submitted in Table 8 show a P-value of 0.003, less than 5%, demonstrating heteroskedasticity in the model. Equally, the Wooldridge test yields a P-value of 0.002, less than 0.05, implying first-order autocorrelation. The simultaneous presence of these two issues reduces the effectiveness of conventional estimation methods such as OLS, FEM, or REM.

To overcome these limitations, the author uses the Generalized Least Squares (GLS) method to improve the accuracy and dependability of the estimates.

Table 9. Summary of panel data regression analysis results about the factors of fintech adoption on return on equity of listed commercial banks in Vietnam.

Variables	(1) OLS	(2) FEM	(3) REM	(4) GLS
II	0.0385*** [3.95]	0.0352** [3.50]	0.0367*** [3.75]	0.0361*** [3.68]
DS	0.0258** [2.85]	0.0234* [2.50]	0.0245** [2.70]	0.0240** [2.65]
UR	0.0312*** [4.10]	0.0285** [3.65]	0.0297** [3.90]	0.0291** [3.82]
DR	0.0195* [1.95]	0.0178* [1.80]	0.0186* [1.88]	0.0182* [1.85]
SIZE	0.0127*** [5.20]	0.0115** [4.25]	0.0122*** [4.85]	0.0119** [4.60]
CAR	0.0085 [1.20]	0.0072 [1.00]	0.0079 [1.10]	0.0076 [1.05]
CGR	0.0142* [1.90]	0.0125* [1.70]	0.0133* [1.85]	0.0130* [1.80]
GDP	0.0108** [2.60]	0.0095* [2.25]	0.0101* [2.40]	0.0098* [2.35]
_cons	0.180*** [5.10]	0.165*** [4.55]	0.172*** [4.85]	0.168*** [4.70]
N	240	240	240	240
R-sq	0.685	0.275	0.360	0.735

Note: t-statistics in brackets.
* p<0.1, ** p<0.05, *** p<0.01.

The results demonstrated in Table 9 show that most of the research hypotheses regarding the impact of independent and control variables on return on equity are approved with statistical significance levels including from 1% to 10%.

Specifically, the independent variables related to Fintech, including investment intensity (II), digital transaction volume (DS), digital banking user rate (UR), and digital banking service fee (DR), are all statistically significant, indicating that hypotheses H1, H2, H3, and H4 are accepted. For the control variables, bank size (SIZE), credit growth rate (CGR), and GDP growth rate (GDP) are all statistically significant; hypotheses H5, H7, and H8 are accepted. Conversely, the capital adequacy ratio (CAR) is not statistically significant, so hypothesis H6 is rejected.

The GLS model demonstrated that the highest coefficient of determination (R-sq) reached 0.735, indicating an explanatory power of 73.5% for the variation in ROE. The regression equation of the GLS model is expressed as follows:

$$ROE = 0.168 + 0.0361 * II + 0.0240 * DS + 0.0291 * UR + 0.0182 * DR + 0.0119 * SIZE + 0.0130 * CGR + 0.0098 * GDP \quad (2)$$

The GLS model believes that promoting Fintech applications has a significant economic influence on the return on equity of listed commercial banks in Vietnam. Especially, the coefficient of 0.0361 implies that when the level of IT investment associated with total expenses increases by 1 percentage point. The bank's ROE increases by approximately 3.61 percentage points. The average ROE of the Vietnamese banking industry is about 11-13%, this increase is equal to a relative improvement of about 3%, pointing out that technology investment is not only

calculatedly substantial in the long term but also produces measurable financial benefits in the short and medium term.

Similarly, the 0.0240 coefficient for the digital transaction weighting (DS) demonstrates that when the proportion of transactions conducted through digital channels increases by 1 percentage point.

ROE increases by approximately 2.4 percentage points. This reflects recently shifting transactions from counters to digital channels assist banks save operating costs, optimizing labor resources, and improving processing efficiency, improve profitability.

The 0.0291 coefficient for the number of digital banking users (UR) implies that when the percentage of customers using digital banking services increases by 1 percentage point, the bank's ROE rises by about 2.91 percentage points. The industry's average ROE is about 12%, this increase represents a relative improvement of virtually 2.4%, pondering that expanding the digital customer base not only increases transaction volume but also enhances service delivery efficiency and cross selling and sustainably improves profitability.

For the digital service fee (DR), a coefficient of 0.0182 suggests that for every 1 percentage point increase in the proportion of income from digital services, ROE increases by approximately 1.82 percentage points. This indicates that digital banking products are becoming an important non-credit revenue source, assisting banks in reducing their dependence on traditional lending activities and improving profit quality.

For the control variables, the bank size (SIZE) is about 0.0119 indicates that for every 1 percentage point increase in size. ROE increases by roughly 1.19 percentage points. An average ROE of about 12%, this improvement is equivalent to nearly 1%, pondering economies of scale as larger banks can better allocate technology costs and efficiently leverage the digital ecosystem.

A credit growth (CGR) coefficient of 0.0130 shows that a 1 percentage point increase in credit expansion leads to an increase in ROE of approximately 1.30 percentage points and indicating that reasonable credit growth contributes to enhanced profitability.

A GDP growth coefficient of 0.0098 shows that for every 1 percentage point increase in the economy, the bank's ROE increases by approximately 0.98 percentage points, pondering the supportive role of a favorable macroeconomic environment in intensifying the positive impact of digital transformation on banking performance.

4.2. Discussion

4.2.1. Discussion of Research

The research results demonstrate that the application of financial technology has a positive and statistically significant influence on the return on equity of listed commercial banks in Vietnam. Particularly, the level of investment intensity (II), the proportion of digital transactions (DS), the number of digital banking users (UR), and revenue from digital banking service fees (DR) all positively influence ROE. This reflects the reality that Vietnamese banks are transitioning from a traditional banking model to a platform-based banking model, where profitability increasingly depends on leveraging customer data, digitizing processes, and developing a digital service ecosystem. Unlike developing markets where Fintech mainly drives innovation in complex financial products, in Vietnam, the positive impact of Fintech on ROE primarily results from reduced operating costs, expanded access to mass customers, and increased service income, especially given the uneven access to traditional banking services. As a result, this not only affirms the arguments of Arner et al. (2015), Philippon (2016), and Gomber et al. (2018) but also adds proof that Fintech in developing economies acts as an inclusive financial driver, enhances profitability through expanding operations and developing cost performance rather than through complex financial innovation as in developed countries.

For the control variables, the positive influence of bank size (SIZE), credit growth (CGR), and GDP growth (GDP) considers the fact that large banks operating in a favorable economic environment are better positioned to efficiently absorb and leverage Fintech investments. This indicates that Fintech does not function as a standalone

element. It is most effective when combined with organizational capabilities, customer networks, and favorable macroeconomic conditions. This result strengthens the role of digital transformation as an amplifier of banking performance rather than a tool to replace traditional business structures.

Especially in Vietnam, the capital adequacy ratio (CAR) was not statistically important in the model, proposing that sustaining capital levels higher than the regulatory limit has not improved ROE in the short term. This result may reflect the specifics of the Vietnamese banking system, where CAR is mainly adjusted to abide by Basel II/III requirements rather than serving as a strategic tool for optimizing capital structure. Increasing equity capital can reduce financial leverage and weaken ROE, while the benefits from reduced risk are not straight away reflected in accounting profits. This recommends that current capital adequacy regulations in Vietnam mainly serve to reinforce system stability rather than promote short-term profitability for banks.

In theory, the study results not only strengthen the approaches of Schumpeter (1934), Barney (1991), and Coase (1937) but also clarify that in the context of a transforming financial market like Vietnam, Fintech plays the position of a strategic resource that is more operational than technological innovation. Unlike many international research studies that emphasize Fintech as a factor changing the competitive structure in the financial industry, the results of this study indicate that Fintech in Vietnam is principally a tool to enhance the internal efficiency of banks through cost reduction, expand customer accessibility, and expand non-interest income sources. Consequently, the objective of this paper is not only to confirm international findings but also to add a point of view within the institutional context of emerging economies, where digital transformation in banking plays a dual role as a driver of growth and as a tool to reinforce the long-term stability and competitiveness of the banking system.

4.2.2. Limitations of the Study

The objective of this paper is based on data from listed commercial banks in Vietnam. Accordingly, the results acquired may not fully demonstrate the property of the entire banking system, including unlisted private banks or foreign division banks. The analysis was executed during the period 2015-2024, so long-term trends or lagged influences of Fintech acceptance may not be fully reflected.

Additionally, the research concentrates on several quantitative indicators to measure Fintech, such as the proportion of digital transactions, the level of technology investment, the number of digital banking users, and revenue from digital service fees. This study also considers qualitative factors such as service quality, customer satisfaction, and the readiness of employees and customers to adopt new technologies, which can affect the return on equity.

4.2.3. Directions for Further Study in the Future

In the future, studies could extend the scope of observation to include unlisted banks, foreign banks, and other financial institutions to test the generalizability of the paper's findings. Extending the observation period would allow for the analysis of the long-term and lagged influence of Fintech acceptance on ROE.

At the same time, incorporating qualitative indicators alongside quantitative measures such as customer experience, technology adoption, and internal governance quality will help clarify the mechanisms by which Fintech influences equity utilization efficiency. Moreover, further study could examine the mediating position of risk management, product and service innovation, or digitalization strategies in the relationship between Fintech and ROE. As a result of that, providing a scientific basis for technology policy and strategy planning in Vietnamese commercial banks.

Additionally, tracking the same group of banks over a longer period will help capture the context and trends impacting Fintech across different stages of development, from initial adoption to digital maturity. This time series method can clarify both short-term and long-term effects, including lagged effects that cross-sectional research may struggle to detect.

Comparative papers across countries are essential as differences in legal frameworks, technological infrastructure, and financial service usage habits can result in variations in how Fintech affects banks' financial performance. Additionally, the use of qualitative methods, such as in-depth interviews with bank managers, customer surveys, or case studies, will support enriching the research results. This will better explain the underlying mechanisms of Fintech applications and identify challenges in practical implementation. These suggestions not only expand the scope of future studies but also contribute to building a more comprehensive understanding of the role of Fintech in enhancing banking performance within the context of international integration and digital transformation.

5. POLICY IMPLICATIONS

The regression analysis results show that all factors related to Fintech including the level of investment intensity (II), the proportion of digital transactions (DS), the number of digital banking user rate (UR) and revenue from digital banking service fees (DR), have a positive and statistically significant impact on ROE, with coefficients of 0.0361; 0.0240; 0.0291 and 0.0182 respectively.

This implies that policies encouraging investment in technology, promoting digital payments, and expanding the digital banking ecosystem not only support the modernization of banking operations but also directly improve the efficiency of equity capital utilization. Consequently, commercial banks need to prioritize allocating resources to digital transformation, while regulatory authorities should refine the legal framework assisting Fintech to maximize the function of technology in improving the efficiency and competitiveness of the banking system.

Grounded in these results, the first suggestion is that banks are required to increase investment intensity and digital banking initiatives, as a 1 percentage point increase in investment intensity can enhance ROE by about 0.0361 points. To sustain this process, the Government and the State Bank of Vietnam can execute preferential financial policies, tax incentives, and develop a synchronized digital transformation roadmap for the entire industry to protect consistent adoption of Fintech and maximize financial benefits. The research papers emphasize that indicators reflecting the level of digital activity (DS, UR, DR) have a strong positive influence on ROE.

Accordingly, the second suggestion is to encourage the development of digital transactions and online banking services, while promoting innovation in Fintech-based products and services to widen revenue from service fees. This strategy will not only expand profits but also enhance financial accessibility and strengthen customer trust. Nevertheless, investing in technology comes with high costs and cybersecurity risks.

The third suggestion is to incorporate Fintech strategies with risk management and cost control. Banks should create early warning systems for technological risks, standardize big data management, and improve cybersecurity capabilities. Concurrently, regulatory bodies need to issue minimum cybersecurity standards and carefully monitor compliance to ensure the safety of the entire system.

Moreover, to maximize the benefits from Fintech, enhancing the legal and institutional framework is essential. Regulatory bodies can allow constrained testing of new Fintech products, which means supporting safe innovation while acknowledging that the positive influence of Fintech on ROE may take time to stabilize and totally materialize.

The important effect bank size, credit growth, and GDP growth also emphasize the crucial function of human resources and management capabilities. Consequently, banks need to concentrate on investing in digital skills training for their staff, improving data analytics capabilities, and perfecting strategic management in the digital transformation process, which will result in turning Fintech into a sustainable growth driver.

Finally, predicated on the quantitative results and policy suggestions mentioned above, Vietnamese commercial banks need to improve for long term digital transformation strategy, incorporating Fintech into their overall business plans and regulating it with sustainable development goals, green finance, and comprehensive digital banking. This strategy will not only optimize ROE but also contribute to improving the competitiveness and reputation of the Vietnamese banking system in the context of international integration.

6. CONCLUSION

This study has examined the impact of financial technology (Fintech) applications on the return on equity of 30 listed commercial banks in Vietnam during 2015-2024. The results from testing the models of factors show that indicators representing Fintech, including investment intensity, digital transaction volume, the number of digital banking users, and income from digital banking service fees, all have a positive and statistically significant impact on ROE.

Moreover, bank size, credit growth, and GDP growth also support enhancing equity efficiency, whereas the capital adequacy ratio is not meaningful. The objective of this paper is to assist with new empirical evidence on the role of Fintech in banking financial performance in the Vietnamese context and to propose that digital transformation is a key driver for improving the competitiveness and profitability of commercial banks.

Funding: This study received no specific financial support.

Institutional Review Board Statement: The study involved minimal risk and adhered to ethical guidelines for social science fieldwork. Formal approval from an Institutional Review Board was not required under the policies of University of Labor and Social Affairs (ULSA), Vietnam. Informed verbal consent was obtained from all participants, and all data were anonymized to ensure participant confidentiality.

Transparency: The author states that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

Data Availability Statement: Vu Thuy Linh can provide the supporting data of this study upon a reasonable request.

Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

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