The impact of non-interest income on bank profitability in Vietnam

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Abstract: This study examines the impact of non-interest income on the profitability of Vietnamese commercial banks during 2010–2025. The linear results show that non-interest income has a negative and statistically significant effect on both ROA and ROE. However, after adding the squared term of non-interest income variable, the results reveal a significant inverted U-shaped relationship. This suggests that non-interest income improves profitability only up to an optimal level, beyond which its effect becomes negative. Overall, the findings indicate that moderate income diversification can enhance profitability, but excessive reliance on non-interest income may reduce bank profitability. The study provides useful implications for bank managers and policymakers in Vietnam.

Keywords: Non-interest income; bank profitability; income diversification; Vietnamese commercial banks; panel data.

1. INTRODUCTION

In recent decades, the income structure of commercial banks has undergone significant transformation. Traditionally, banks relied primarily on interest income generated from lending activities. However, increasing competition, financial liberalization, technological development, and narrowing net interest margins have encouraged banks to expand into non-traditional activities that generate non-interest income, such as fees and commissions, foreign exchange services, securities trading, and other operating income. As a result, non-interest income has become an increasingly important component of bank revenue and has attracted growing attention in banking research.

The expansion of non-interest income is often associated with income diversification. From a theoretical perspective, diversification may improve profitability by reducing banks' dependence on interest-based activities and by creating additional sources of revenue. In modern banking systems, the growth of retail banking, digital payments, transaction services, and fee-based products has made non-interest income an important strategic tool for banks seeking to maintain profitability under changing market conditions. However, the effect of non-interest income on profitability is not always straightforward. While moderate diversification may improve financial performance, excessive reliance on non-interest income may reduce profitability if such income is volatile, inefficient, or less sustainable than traditional lending income.

This issue is particularly relevant in the context of Vietnam. Over the last decade, the Vietnamese banking sector has experienced substantial structural changes, including post-crisis restructuring, rapid digitalization, expanding retail banking services, and greater competition in financial products. Vietnamese banks have increasingly developed non-interest income sources through payment services, foreign exchange activities, bancassurance, and other service-based operations. At the same time, pressure on net interest margins and changes in the macroeconomic environment have made it important for banks to find new drivers of profitability. These developments raise an important question: does greater reliance on non-interest income improve the profitability of Vietnamese commercial banks?

The existing literature does not provide a uniform answer. Some studies suggest that non-interest income supports profitability by broadening the revenue base and improving diversification. Other studies find that

non-interest income may weaken performance when banks rely too heavily on volatile or non-core activities. Moreover, several recent studies suggest that the relationship may be nonlinear, meaning that non-interest income may improve profitability only up to an optimal level, beyond which the effect becomes negative. In Vietnam, although a number of studies have examined bank profitability and income diversification, the evidence remains limited and not fully consistent, especially over a long sample period.

Against this background, this study examines the relationship between non-interest income and bank profitability in Vietnam using panel data from 16 Vietnamese commercial banks over the period 2010–2025. Bank profitability is measured by return on assets (ROA) and return on equity (ROE), while non-interest income is measured as the ratio of non-interest income to operating income. The study also includes a set of bank-specific and macroeconomic control variables, namely bank size, capital ratio, loan ratio, loan-to-deposit ratio, GDP growth, and inflation. In addition to the linear specification, the study further investigates whether the effect of non-interest income on profitability is nonlinear by introducing the squared term of non-interest income.

This study contributes to the literature in several ways. First, it provides updated empirical evidence on Vietnamese commercial banks over a relatively long period. Second, it focuses specifically on profitability rather than bank performance in a broad sense, thereby offering a more precise interpretation of how non-interest income affects returns. Third, by testing both linear and nonlinear specifications, the study helps clarify whether non-interest income is uniformly beneficial or whether its effect depends on the degree of reliance on it.

The remainder of the paper is structured as follows. The next section reviews the relevant literature on non-interest income and bank profitability. The following section describes the methodology, variables, data, and model specification. The empirical results are then presented and discussed. Finally, the paper concludes with the main findings and implications.

2. LITERATURE REVIEW.

The changing structure of bank income has become a major topic in banking research. Traditionally, commercial banks derived most of their earnings from interest income generated through lending activities. Over time, however, competitive pressure, financial liberalization, digitalization, and the compression of net interest margins have encouraged banks to expand into non-traditional activities that generate non-interest income, such as fees and commissions, foreign exchange services, payment services, trading income, and other operating income. In this context, non-interest income is commonly viewed as an important component of income diversification and a potential driver of bank profitability (Stiroh, 2004; Demirgüç-Kunt & Huizinga, 2010).

From a theoretical perspective, the relationship between non-interest income and bank profitability can be explained through the diversification argument. According to this view, banks that broaden their income sources beyond traditional lending may reduce their dependence on interest margins and strengthen their ability to generate earnings under changing market conditions. Non-interest income can provide an additional stream of revenue when loan growth slows, interest spreads narrow, or credit conditions become less favorable. This is especially relevant in modern banking systems, where technology-based services, transaction banking, bancassurance, and foreign exchange operations are becoming increasingly important. Under this argument, a higher share of non-interest income should contribute positively to profitability, particularly when profitability is measured by indicators such as return on assets (ROA) and return on equity (ROE) (Smith et al., 2003; Demirgüç-Kunt & Huizinga, 2010).

However, the literature does not unanimously support the view that non-interest income always improves bank profitability. One of the earliest influential studies, Stiroh (2004), finds that a greater reliance on non-interest income does not automatically produce better performance. In the U.S. banking sector, he shows that higher non-interest income, especially trading-related revenue, is associated with lower risk-adjusted profits. Although Stiroh's study also considers volatility, its profitability implication is important: diversification into non-interest activities does not necessarily guarantee stronger returns if those activities are volatile or less efficient than traditional intermediation. This study laid the foundation for later work by suggesting that the profitability effect of non-interest income depends on both the composition and the stability of the new revenue streams (Stiroh, 2004).

A broader international perspective is offered by Demirgüç-Kunt and Huizinga (2010), whose study is among the most widely cited in this field. Using an international sample of banks from 101 countries, they find that expansion into non-interest income-generating activities can increase the rate of return on assets. Their evidence supports the argument that non-interest income may enhance profitability by complementing traditional interest-based activities. At the same time, their study also suggests that the gains from diversification may be limited when banks become excessively reliant on such income. For profitability-focused research, this study is particularly useful because it establishes a direct empirical link between non-interest income and improved accounting returns, while also implying that the relationship may not be strictly linear (Demirgüç-Kunt & Huizinga, 2010).

Subsequent studies have reinforced the idea that the profitability effect of non-interest income may differ across banking systems and business models. Smith et al. (2003), studying European banking systems, report that the growing role of non-interest income contributed to greater income stability for most categories of banks. Although their main focus is income stability, the study is relevant to profitability because more stable income streams can support stronger and more sustainable financial performance. Their findings suggest that diversification may improve profitability when non-interest income complements, rather than simply replaces, traditional bank activities. In other words, the effect of non-interest income on profitability may be positive when banks are able to integrate new services efficiently into their core business model (Smith et al., 2003).

More recent literature has shifted toward examining the profitability effect of non-interest income in different institutional and regional contexts. In the MENA region, Abu Khalaf et al. (2024) find that non-interest income has a significant positive effect on commercial bank profitability. Their results support the view that non-interest income can be an important source of earnings growth, particularly in environments where banks seek to reduce dependence on lending margins. Likewise, Saklain et al. (2024), using a large global sample covering banks from 126 countries, report that both non-interest income and a more market-based financial structure are positively associated with bank profitability. These findings suggest that the profitability benefits of non-interest income remain relevant in recent banking systems, especially when banks operate in financial environments that support diversified revenue generation (Abu Khalaf et al., 2024; Saklain et al., 2024).

At the same time, more recent evidence also points to the possibility that the relationship between non-interest income and profitability is nonlinear. Nguyen (2021), in a study of 28 Vietnamese commercial banks over the period 2010–2018, finds that non-interest income affects bank profitability and that the relationship may be nonlinear. This is an important finding for the present study because it suggests that a moderate increase in non-interest income may improve profitability, but excessive reliance on this income source may not continue to generate the same benefits. In other words, there may be an optimal level of non-interest income beyond which the profitability gains diminish. This nonlinear perspective is increasingly relevant in studies of bank diversification because it captures the idea that diversification is beneficial only up to a point (Nguyen, 2021).

In the ASEAN context, Phan et al. (2023) examine the impact of non-interest income on the performance of commercial banks and find that the effect is not straightforward. Their study indicates that the influence of non-interest income depends on its share in total income, with threshold-like behavior in the profitability relationship. Although the study covers the ASEAN region rather than Vietnam alone, it is highly relevant because Vietnamese banks operate in a broadly similar regional environment characterized by strong retail banking growth, increasing service digitalization, and expanding non-credit income activities. The ASEAN evidence therefore provides useful regional support for the argument that non-interest income can contribute to profitability, but its effect may vary with the extent and structure of diversification (Phan et al., 2023).

Vietnam-focused evidence has grown in recent years and generally supports the importance of income diversification for profitability. Dat and Linh (2022), using a panel of 33 Vietnamese commercial banks from 2006 to 2020, find that the more diversified banks are in their revenue structure, the higher their financial performance. Their findings are directly relevant to profitability-based research because they suggest that Vietnamese banks benefit from moving beyond traditional lending income. Similarly, Phan (2022) reports that income diversification has a positive effect on the business performance of Vietnamese commercial banks during 2010–2020. These studies support the argument that in Vietnam, non-interest income may serve as an effective tool to improve

profitability in a banking sector facing increasing competition and structural change (Dat & Linh, 2022; Phan, 2022).

Further Vietnamese evidence also indicates that diversification is increasingly relevant to the performance of domestic banks. A 2024 Vietnamese study using data from 26 commercial banks over 2012–2022 finds that income diversification significantly affects financial outcomes, using standard panel methods such as pooled OLS, FEM, REM, and SGMM. Although this study is broader than a narrow non-interest-income measure, it reinforces the idea that diversified revenue sources are an important determinant of financial performance in Vietnam (Nhat & Anh, 2024).

Another important theme in the profitability literature concerns the role of bank-specific and macroeconomic control variables. Prior studies commonly include bank size, capitalization, loan intensity, liquidity structure, cost efficiency, GDP growth, and inflation when explaining profitability. Larger banks may benefit from economies of scale and broader service capacity, suggesting a positive relationship between size and profitability. Higher capitalization may improve confidence and funding capacity, although the effect may vary across contexts. Loan intensity often remains positively associated with profitability because lending is still a major earnings source, while a high cost-to-income ratio is generally expected to reduce profitability because it reflects weaker operational efficiency. At the macro level, stronger GDP growth is usually associated with better bank profitability, while the effect of inflation depends on whether banks can adjust their pricing and costs efficiently. This framework is consistent with the specification used in many bank profitability studies and is highly suitable for research on Vietnamese commercial banks (Demirgüç-Kunt & Huizinga, 2010; Nguyen, 2021).

Overall, the literature suggests that non-interest income has the potential to improve bank profitability by diversifying revenue sources, reducing dependence on net interest margins, and creating new earnings opportunities through services and market-based activities. At the same time, the empirical evidence indicates that the magnitude and even the direction of this effect may depend on institutional context, business model, and the degree of diversification. International studies generally show that non-interest income can support profitability, but not in a uniform or unlimited way. Regional and Vietnam-specific studies largely point toward a positive association between diversification and profitability, while also raising the possibility of nonlinear effects.

In spite of the growing literature, several gaps remain. First, many influential studies examine bank performance in broad international samples, which may not fully reflect the institutional characteristics of Vietnam. Second, some Vietnamese studies focus on general income diversification rather than non-interest income specifically. Third, existing Vietnam-based studies often cover earlier sample periods and may not fully capture the structural changes of the banking sector in recent years, including digital banking expansion, rising service income, and changes in competitive dynamics. These gaps justify a new study focused specifically on the relationship between non-interest income and bank profitability in Vietnam over the 2010–2025 period. Such a study can contribute updated evidence from a developing banking market and help clarify whether increasing non-interest income has become a sustainable source of profitability for Vietnamese commercial banks.

3. METHODOLOGY

3.1. Research design

This study examines the impact of non-interest income on the profitability of Vietnamese commercial banks. To achieve this objective, the study employs a quantitative research approach using panel data collected from 16 Vietnamese commercial banks over the period from 2010 to 2025. Panel data are appropriate for this study because they allow the analysis to capture both cross-sectional differences among banks and time-series variation over the sample period. This approach also helps improve estimation efficiency and provides a more comprehensive understanding of how non-interest income affects bank profitability in the Vietnamese banking sector.

The study focuses on profitability rather than overall bank performance in a broader sense. Specifically, profitability is measured by return on assets (ROA) and return on equity (ROE), which are among the most widely used indicators in the banking literature. Non-interest income is treated as the main explanatory variable, while

bank-specific and macroeconomic variables are included as controls to reduce omitted variable bias and to better isolate the effect of non-interest income on profitability.

3.2. Sample and data collection

The sample consists of 16 Vietnamese commercial banks observed over the period 2010–2025. The study period is long enough to capture structural changes in the Vietnamese banking sector, including post-crisis adjustment, banking restructuring, expansion of retail banking services, and the growing importance of non-interest income in banks' revenue structures.

Secondary data are collected from the website of Vietstock (http://finance.vietstock.vn). Macroeconomic data, including GDP growth and inflation, are obtained from World Bank database (https://data.worldbank.org/).

3.3. Variables

Dependent variables

In this study, bank profitability is measured by return on assets (ROA) and return on equity (ROE)**.** These two indicators are among the most widely used measures of bank profitability in the empirical banking literature because they reflect profitability from two complementary perspectives. ROA captures how efficiently a bank uses its assets to generate net income, while ROE reflects the rate of return earned on shareholders' equity. Both measures have been extensively used in prior studies on bank profitability, including Demirgüç-Kunt and Huizinga (2010), Athanasoglou et al. (2008), and Nguyen (2021).

Independent variables

The main explanatory variable in this study is non-interest income (NII), while the remaining variables are included as control variables following the bank profitability literature.

Non-interest income (NII) is measured as the ratio of non-interest income to operating income. This variable captures the extent to which a bank relies on non-traditional revenue sources such as fees and commissions, foreign exchange income, securities-related income, and other operating income. It is one of the most important variables in recent studies on bank profitability and income diversification.

Bank size (SIZE) is measured by the natural logarithm of total assets. This variable is commonly used in bank profitability studies because it reflects economies of scale, market power, and the broader ability of large banks to diversify services. Athanasoglou et al. (2008) include size as a standard bank-specific determinant of profitability. Petria et al. (2015) also treat size as an important determinant in European banks. In Vietnam-related studies, size is frequently included in profitability models as well. The direction of the effect is often expected to be positive, as larger banks may enjoy scale economies and stronger market presence. However, some studies note that the sign can become weak or insignificant if banks become excessively large and face managerial inefficiencies.

Capital ratio (CAP) is measured as total equity divided by total assets. This variable reflects bank capitalization and financial strength. It has been widely used in profitability studies because well-capitalized banks may enjoy lower funding costs, greater depositor confidence, and stronger resilience. Athanasoglou et al. (2008) find a positive relationship between capital and profitability. Sufian (2012) also reports capitalization as one of the key determinants of bank profitability. In the Vietnamese and emerging-market literature, capital is often found to have a positive effect on profitability, although in some cases a high equity ratio may lower ROE mechanically because larger equity reduces leverage.

Loan ratio (LOAN) is measured as total loans divided by total assets. This variable captures the extent to which banks allocate assets to lending activities, which remain the core source of income for commercial banks. In Demirgüç-Kunt and Huizinga (2010), loans relative to assets are positively associated with profitability in several specifications, consistent with the idea that lending is a higher-yield asset category. Many profitability studies

therefore treat loans as a major positive driver of returns. In general, the literature suggests a positive relationship between LOAN and profitability, provided that loan quality remains under control.

Loan-to-deposit ratio (LDR) is measured as total loans divided by total deposits. This variable reflects the intensity with which banks transform deposits into loans. It is commonly used as a liquidity and intermediation indicator in bank profitability research. A higher LDR may improve profitability because it indicates more aggressive utilization of deposit funding for income-generating loans. At the same time, if LDR becomes too high, funding pressure and liquidity constraints may offset the profitability gains. For this reason, the literature does not provide a fully uniform sign. In many empirical studies, the coefficient on liquidity-related variables is either positive or mixed, depending on the banking environment and model specification.

GDP growth (GDP) is measured as Vietnam's annual real GDP growth rate. It is included to capture the macroeconomic environment in which banks operate. In the profitability literature, GDP growth is usually expected to have a positive effect because stronger economic activity increases demand for credit, improves borrowers' repayment capacity, and supports banking business expansion. Athanasoglou et al. (2008) find that the business cycle has an important influence on bank profitability.

Inflation (INFLATION) is measured as Vietnam's annual inflation rate. Inflation is a standard macroeconomic control in bank profitability models, but its impact is less uniform than that of GDP growth. If banks are able to adjust lending rates, service fees, and margins faster than their operating costs rise, inflation may have a positive effect on profitability. However, if inflation raises costs and erodes real repayment capacity, the effect may become negative. Athanasoglou et al. (2008) and later studies include inflation as a macro determinant, often finding mixed evidence depending on the country and period studied.

Table 3.1: Measurements of variables

Variable type	Variable	Symbol	Definition / Measurement
Dependent variables	Return on Assets	ROA	Net profit after tax divided by total assets
	Return on Equity	ROE	Net profit after tax divided by total equity
Independent variable	Non-interest income ratio	NII	Non-interest income divided by operating income
Control variables	Bank size	SIZE	Natural logarithm of total assets
	Capital ratio	CAP	Total equity divided by total assets
	Loan ratio	LOAN	Total loans divided by total assets
	Loan-to-deposit ratio	LDR	Total loans divided by total deposits
	GDP growth	GDP	Annual real GDP growth rate
	Inflation	INFLATION	Annual inflation rate

3.4. Estimation methods

The models are as follows:

$$ROA_{it}/ROE_{it}=\beta_0+\beta_1 NII_{it}+\beta_2 SIZE_{it}+\beta_3 CAP_{it}+\beta_4 LOAN_{it}+\beta_5 LDR_{it}+\beta_6 GDP_t+\beta_7 INFLATION_t+\varepsilon_{it} \quad (1)$$

To test the non-linear relationship between NII and bank profitability, we include the quadratic term (NII^2_{it}) in equation (1):

$$ROA_{it}/ROE_{it}=\beta_0+\beta_1 NII_{it}+\beta_2 NII^2_{it}+\beta_3 SIZE_{it}+\beta_4 CAP_{it}+\beta_5 LOAN_{it}+\beta_6 LDR_{it}+\beta_7 GDP_t+\beta_8 INFLATION_t+\varepsilon_{it} \quad (2)$$

The study uses panel data estimation techniques. First, pooled ordinary least squares (Pooled OLS) is estimated as a benchmark model. However, because panel data may contain unobserved bank-specific characteristics that affect profitability, the study also estimates fixed effects and random effects models.

The fixed effects model controls for time-invariant bank-specific characteristics, such as business culture, ownership structure, or long-term management style, that may affect profitability but are not directly observed.

The random effects model, on the other hand, assumes that the unobserved individual effect is uncorrelated with the explanatory variables.

To determine whether fixed effects or random effects are more appropriate, the Hausman test is employed. If the Hausman test indicates that the individual effects are correlated with the regressors, the fixed effects model is preferred. Otherwise, the random effects model may be considered more efficient.

4. RESEARCH FINDINGS AND ANALYSIS

4.1. Descriptive statistics of variables and correlation matrix

Table 4.1: Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Median	Max
ROA	256	0.0111	0.0078	-0.0551	0.0100	0.0324
ROE	256	0.1315	0.0864	-0.8201	0.1346	0.2808
NII	256	0.2405	0.8488	-6.8282	0.2146	11.6667
SIZE	256	12.6707	1.0842	9.6238	12.6822	15.0187
CAP	256	0.0849	0.0295	0.0406	0.0814	0.2195
LOAN	256	0.5909	0.1255	0.1448	0.6182	0.7881
LDR	256	0.9290	0.1884	0.3633	0.9360	1.4752
GDP	256	0.0625	0.0158	0.0260	0.0655	0.0850
Inflation	256	0.0495	0.0421	0.0063	0.0341	0.1868

The mean value of ROA is 0.0111, indicating that Vietnamese commercial banks generated an average return of approximately 1.11% on total assets during the study period. The mean value of ROE is 0.1315, implying an average return of 13.15% on equity. However, both ROA and ROE show negative minimum values, suggesting that some banks experienced losses in certain years.

The main explanatory variable, NII, has a mean of 0.2405, showing that non-interest income accounted for about 24.05% of operating income on average. This suggests that although interest income remained the dominant source of revenue, non-interest income also played an important role in the income structure of Vietnamese banks. Nevertheless, the large standard deviation and the wide range between the minimum and maximum values indicate substantial variation across banks and years.

Among the control variables, SIZE has a mean of 12.6707, reflecting considerable differences in bank scale within the sample. CAP has an average value of 0.0849, meaning that equity represented about 8.49% of total assets on average. The average LOAN ratio is 0.5909, indicating that loans accounted for nearly 59.09% of total assets, confirming that lending remained the core business of Vietnamese commercial banks. Similarly, the mean LDR is 0.9290, implying that loans were equivalent to approximately 92.9% of deposits on average.

Finally, the macroeconomic variables show that Vietnam recorded an average GDP growth rate of 6.25% and an average inflation rate of 4.95% during the sample period.

Table 4.2: Correlation matrix

Variable	ROA	ROE	NII	SIZE	CAP	LOAN	LDR	GDP	Inflation
ROA	1								
ROE	0.856	1							

NII	-0.45	-0.582	1						
SIZE	0.209	0.359	-0.126	1					
CAP	0.435	-0.021	-0.031	-0.329	1				
LOAN	0.178	0.28	-0.18	0.687	-0.294	1			
LDR	0.466	0.335	-0.147	0.31	0.232	0.52	1		
GDP	-0.046	-0.019	-0.036	0.036	-0.048	0.007	0.049	1	
Inflation	-0.193	-0.18	0.154	-0.36	-0.033	-0.419	-0.073	0	1

The correlation results show that NII is negatively correlated with both ROA (-0.450) and ROE (-0.582) while SIZE, LOAN, LDR are positively correlated with bank profitability measures. CAP is positively correlated with ROA but negatively correlated with ROE.

To test for potential multicollinearity among variables, we perform Variance Inflation Factor (VIF) test and the results are presented in Table 4.3.

Table 4.3: Results of multicollinearity test

Variable	**VIF**
NII	1.051
SIZE	2.077
CAP	1.486
LOAN	2.848
LDR	1.833
GDP	1.012
Inflation	1.392

The VIF values are all well below the common threshold of 5, indicating that multicollinearity is not a serious concern in the model. Although LOAN and SIZE have relatively higher VIF values than the other variables, they still remain within an acceptable range.

4.2. Model results

4.2.1.Linear model results

Table 4.4: Results of linear model (including OLS, FE and RE regressions)

Variables	**ROA**			**ROE**		
	OLS (1)	**FE (2)**	**RE (3)**	**OLS (4)**	**FE (5)**	**RE (6)**
Constant	-0.0276***		-0.0112***	-0.1688**		-0.0917
NII	-0.0035***	-0.0035***	-0.0035***	-0.0545***	-0.0562***	-0.0554***
SIZE	0.0023***	0.0029***	0.0026***	0.0254***	0.0368***	0.0305***
CAP	0.1044***	0.0560***	0.0691***	-0.1500	-0.4192*	-0.3893*

LOAN	-0.0138***	-0.0004	-0.0070	-0.1474***	-0.0863	-0.0832
LDR	0.0139***	0.0124***	0.0143***	0.1285***	0.1264***	0.1166***
GDP	-0.0335	-0.0393**	-0.0380**	-0.3524	-0.4178	-0.3847
INFLATION	-0.0143	0.0072	-0.0036	-0.1105	-0.0109	0.0106
Observations	256	256	256	256	256	256
R-squared	0.541	0.592	0.574	0.472	0.626	0.471

Standard errors in parentheses
*** p < 0.01, ** p < 0.05, * p < 0.10.

The linear model (Equation 1) produces a consistent result across OLS, FE, and RE specifications: non-interest income has a negative and statistically significant effect on bank profitability. In the ROA regressions, the coefficient of NII is approximately -0.0035 in all three models and is significant at the 1% level. In the ROE regressions, the coefficient ranges from -0.0545 to -0.0562, also significant at the 1% level. This suggests that a higher reliance on non-interest income is associated with lower profitability among Vietnamese commercial banks. Among the control variables, SIZE has a positive and significant effect in all models, indicating that larger banks tend to be more profitable. This result is consistent with the argument that large banks benefit from economies of scale, broader service networks, and stronger market positions. LDR also shows a positive and significant relationship with both ROA and ROE, implying that banks with stronger intermediation activity relative to deposits tend to generate higher returns.

By contrast, LOAN is negative in the OLS models and becomes weaker in the FE and RE specifications. This result may suggest that a larger loan share does not necessarily improve profitability if loan quality or asset utilization is weak. CAP has a positive effect on ROA, but its effect on ROE is negative or insignificant, which may reflect the mechanical effect of higher equity lowering leverage-based returns. The macroeconomic variables, GDP and INFLATION, are generally insignificant, except that GDP becomes negative and weakly significant in the ROA panel models.

The Hausman test indicates that the random effects model is preferred for both ROA and ROE in the linear specification, since the p-values are greater than 0.05. Therefore, the linear-model evidence suggests that non-interest income is negatively associated with profitability, even after controlling for bank-specific and macroeconomic factors.

Table 4.5: Hausman test results

Dependent variable	Chi-square	df	p-value	Preferred model
ROA	10.441	7	0.165	Random Effects
ROE	6.748	7	0.456	Random Effects

4.2.2. Non-linear models

To examine whether the effect of non-interest income on profitability is nonlinear, the study adds the squared term of non-interest income (Equation 2).

Table 4.6: Results of non-linear model (including OLS, FE and RE regressions)

Variables	ROA			ROE		
	OLS (1)	FE (2)	RE (3)	OLS (4)	FE (5)	RE (6)
Constant	-0.0275***		-0.0151***	-0.1751**		-0.1236**
NII	0.0321***	0.0400***	0.0372***	0.4078***	0.5073***	0.4611***

NII^2	-0.0793***	-0.0829***	-0.0810***	-1.0508***	-1.1256***	-1.0847***
SIZE	0.0019***	0.0023***	0.0019***	0.0215***	0.0277***	0.0210***
CAP	0.1185***	0.0617***	0.0879***	0.0624	-0.4087*	-0.1154
LOAN	-0.0131***	0.0062	-0.0063	-0.1347**	0.0887	-0.0761
LDR	0.0127***	0.0117***	0.0142***	0.1127***	0.0783*	0.1174***
GDP	-0.0243	-0.0285	-0.0265	-0.2204	-0.2459	-0.2274
INFLATION	-0.0173*	0.0121	-0.0077	-0.1756	0.1802	-0.0866
Observations	256	256	256	256	256	256
R-squared	0.467	0.495	0.467	0.294	0.344	0.309

Table 4.7. Hausman test for the nonlinear model

Dependent variable	Chi-square	Df	p-value	Preferred model
ROA	13.721	8	0.089	Random Effects
ROE	19.632	8	0.012	Fixed Effects

The nonlinear results differ substantially from the linear findings. Across OLS, FE, and RE models, the coefficient of NII is positive and statistically significant, while the coefficient of its squared term is negative and statistically significant for both ROA and ROE. This pattern indicates a clear inverted U-shaped relationship between non-interest income and profitability.

For ROA, the coefficient of NII ranges from 0.0321 to 0.0400, while the coefficient of the squared term ranges from -0.0793 to -0.0829, all significant at the 1% level. For ROE, the coefficient of NII ranges from 0.4078 to 0.5073, and the coefficient of the squared term ranges from -1.0508 to -1.1256, again highly significant in all specifications. These results imply that non-interest income initially improves bank profitability, but once it exceeds a certain threshold, its effect becomes negative.

The estimated turning points further support this conclusion. For ROA, the turning point lies approximately between 20.2% and 24.1% of operating income[1]. For ROE, the turning point is approximately between 19.4% and 22.5%. Since the sample mean of NII is about 24.05%, this suggests that many banks in the sample may already be operating close to, or above, the optimal level of non-interest income. This helps explain why the linear model produced a negative average effect.

The control variables in the nonlinear model show similar patterns to those in the linear model. SIZE remains positive and significant in all regressions, indicating that larger banks continue to outperform smaller ones in terms of profitability. LDR is also positive and significant in most cases. The effects of CAP and LOAN are less stable across specifications, while GDP and INFLATION remain generally insignificant.

The Hausman test for the nonlinear specification shows different preferred models for the two profitability measures (Table 4.7). For ROA, the p-value is 0.089, so the random effects model is preferred at the 5% level. For ROE, the p-value is 0.012, indicating that the fixed effects model is more appropriate. Therefore, the nonlinear relationship should be interpreted mainly through the RE results for ROA and the FE results for ROE.

In summary, the nonlinear specification provides stronger and more nuanced evidence than the linear model. Rather than showing that non-interest income is uniformly harmful, the results indicate that its effect depends on the degree of reliance on it.

5. CONCLUSION

This study examines the relationship between non-interest income and bank profitability in Vietnam using panel data from 16 Vietnamese commercial banks over the period 2010–2025. Profitability is measured by return on assets (ROA) and return on equity (ROE), while non-interest income is measured as the ratio of non-interest

[1] The formula for turning point is: Turning point = $-\beta_1/2\beta_2$

income to operating income. The analysis is conducted using pooled OLS, fixed effects, and random effects models, with additional nonlinear estimation based on the squared term of winsorized non-interest income.

The empirical results provide several important findings. First, the linear models show that non-interest income has a negative and statistically significant effect on both ROA and ROE. This suggests that, on average, a higher reliance on non-interest income is associated with lower profitability among Vietnamese commercial banks. Second, after controlling for extreme values and introducing the squared term of non-interest income, the results reveal a clear inverted U-shaped relationship between non-interest income and profitability. Specifically, non-interest income has a positive effect on profitability at low or moderate levels, but this effect becomes negative once non-interest income exceeds a certain threshold.

The estimated turning point indicates that the profitability-maximizing level of non-interest income lies within a limited range, while the sample mean of non-interest income is already close to or slightly above that range. This finding suggests that many Vietnamese banks may have reached a level at which further expansion of non-interest income no longer improves profitability and may instead reduce it. Therefore, the study does not support the view that non-interest income is always beneficial. Rather, its effect depends on the degree of reliance on it.

The findings also show that bank-specific characteristics play an important role in determining profitability. Bank size and the loan-to-deposit ratio are positively associated with profitability in most specifications, while the effects of capitalization and loan intensity are less stable across models. Meanwhile, GDP growth and inflation are generally not statistically significant, suggesting that bank-level characteristics are more important than macroeconomic conditions in explaining profitability over the sample period.

This study contributes to the literature by providing updated evidence from Vietnam and by showing that the relationship between non-interest income and profitability is nonlinear rather than purely linear. The results imply that income diversification should be pursued with caution. For bank managers, non-interest income should be viewed as a complement to traditional lending income rather than a substitute for it. Banks should focus on developing stable and sustainable non-interest income sources, such as service fees and transaction banking, instead of relying excessively on volatile or irregular income components. For policymakers and regulators, the results suggest that changes in banks' income structure should be monitored carefully, especially as the Vietnamese banking sector continues to diversify in response to digitalization and competitive pressure.

Despite these contributions, the study has several limitations. First, the sample is limited to 16 commercial banks and may not fully represent the entire Vietnamese banking system. Second, non-interest income is examined as an aggregate measure, while different components of non-interest income may have different effects on profitability. Third, the study focuses only on profitability and does not incorporate risk or stability measures. Future research may therefore extend the analysis by separating non-interest income into its major components, expanding the sample, or examining the joint effect of non-interest income on both profitability and bank risk.

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