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The Impact of Noninterest Income on the Performance of Vietnamese Commercial Banks

Khanh Ngoc Nguyen*

PhD Student, Lecturer, Banking Academy, HaNoi, Vietnam

Email: khanhnguyensaxion@gmail.com

Abstract

This paper uses the generalized method of moments (GMM) to analyze the impact of noninterest income on the performance of 28 Vietnamese commercial banks in the period from 2010 to 2018. GMM modeling uses techniques to deal with endogeneity, variance, and autocorrelation in the research model. This study provides evidence of nonlinear links between noninterest income and the profitability of bank. The regression shows an inverse relationship between noninterest income and the performance of Vietnamese commercial banks. Many studies have found that the development of noncredit services by U.S. banks and the banks of some developing countries increase bank income and significantly improve performance. This difference between banks in Vietnam and banks elsewhere stems from differences in the income structure of the Vietnamese banking system and those of developed countries in which noninterest income accounts for a high proportion of income, even surpassing net interest income. Banks can maximize the benefit of traditional noninterest income when they increase the proportion of noninterest income, especially when net interest income is lower than gross income. Noninterest income can significantly improve profitability. The larger the size of a bank's assets, the more likely it is to increase revenue and profit, expand its assets, and use capital more efficiently than small banks. At the same time, the faster the growth of a bank's assets, the more stable is its profit growth. The more liquid banks are, the more profitable credit institutions are, even as credit risk increases. Credit risk is adjusted to reduce the profit of a bank. The ratio of equity to total assets increases, reducing dependence on funding flows and enabling banks to become more profitable. This trend in modern banking seems to be suitable only for banking operations in developed economies .

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* Corresponding author.

In developing countries that still face many challenges, anxieties require banks to strengthen their urgent solutions promptly in order to increase their competitiveness in the marketplace.

Keywords: revenue diversification; bank performance; netinterest income; noninterest income; Viet Nam commercial banks.

1. Introduction

Over the last two decades, the banking industry has changed structurally because of reduction of financial regulation and a rapid increase in information, communication, and technology in the financial markets. These competitive pressures have resulted in lower net interest margins and weak profitability, with many banks changing their business model by pursuing new banking activities. Noninterest income has become a legitimate activity of banks; indeed, according to [1], such income now makes up 40% of all operating income in the commercial banking industry of the United States. More and more, banks are depending on noninterest income to generate revenue and profit [2]. The Vietnam banking system is also working to increase its proportion of noninterest income, but its ability to do so is relatively undeveloped. Noncredit activities like payment, investment, trading on foreign exchanges, and financial counseling, as well new modern banking products, are underdeveloped or still being tested. Yet as the state bank tightens currency, traditional banking operations are no longer a source of high income for the banks. They have no choice but to increase the proportion of noninterest income to interest income and to find new products and services that can generate income. The invasion of the domestic market by foreign banks has also increased competitive pressure on Vietnamese banks. Noncredit services are fee-based services that do not involve offering the credit that a lending institution typically offers to customers. By providing significant revenue for banks, income from noncredit services can limit the erosion of profitability when net interest margins are squeezed by declining interest rates. The increasing proportion of noninterest income reflects the banks' diversification into noncredit products and services [3]. Many studies of the growth of noninterest income have measured the impact of noninterest activities on performance. Reference [1, 2] concluded that increasing the noninterest income of commercial banks enhances bank performance. Some research suggests that noncredit activity and better risk adjustment can improve the efficiency and profits of banks [4, 6]. Studying the banks of 29 Asia Pacific countries, Reference [7] demonstrated a positive relationship between diversification of noninterest income and business performance. On the other hand, other studies have shown that expanding this kind of income can hurt performance. For example, Reference [8] argued that an increase in noninterest income cannot fully offset losses of income from other sources. Moreover, some studies have shown that noninterest income and performance are negatively correlated, and that the instability of noninterest income can reduce profitability. Authors in [9] highlighted the negative relationship between noninterest income and the net profit of Mexican banks. To examine the relationship between noninterest income and earning ability. The authors of [10] analyzed the condition and structure of the noninterest income of China's commercial banks from several angles, using data from 2005 to 2009 of ten banks . The article concludes that noninterest income has had an important impact on the profitability of banks and proposes a strategy of promoting further development of noninterest income. In Vietnam, research investigating the impact of diversification on operational efficiency and the stability of banking has increased in both quantity and quality, including the quality of research methods. Despite this, the number of studies on the impact of noncredit earnings on the business

performance of commercial banks is limited. Most of the researchers' viewpoints support the increase in noninterest income, which will have a positive impact on the performance of commercial banks in Vietnam. For instance, researchs by [11, 12, 13] pointed out that noninterest income has no impact on risk but has a positive effect on the performance of commercial banks in the research period. Commercial banks have been focused on developing utility and modern banking services, increasing the proportion of noninterest income in total income. This trend is suitable for banking activities in developed economies to minimize risks and ensure the sustainable development of banks. However, there are still challenges and worries that require banks to strengthen urgent solutions in time to increase competitiveness in the market. In this study, the author will investigate the non-linearity in the relationship between Noninterest Income for commercial banks in Vietnam with data from 28 Vietnamese commercial banks over the period of 2010-2018.

2. Theoretical Background and Literature Review

Reference [14] while examining the diversification benefits in US banks from 1984 to 2001, finds noninterest income to be remarkably volatile and correlated with net interest income; banks relying heavily on noninterest income show also lower risk-adjusted profitability. Stiroh concluded that a greater reliance on noninterest income, particularly trading revenue, was associated with higher volatility and lower risk-adjusted profit in a cross-section of the bank. Author [15] studied the determinants of noninterest income and its impact on commercial bank financial performance. The authors have used a sample of commercial banks in Barbados between 1985 and 2001. Their results indicate that noninterest income is positively related to both bank profitability and earnings volatility. Authors in [16] reported that small European banks do not benefit from diversification. Higher noninterest income will lead to lower profits, increase risk and reduce risk-adjusted profits. Moreover, trading activities are risky and unprofitable. According to [17] banks with a high reliance on non-profit activities are at a higher risk of default than banks that mainly provide loans and show that the positive link they found between noninterest income and risk is mostly accurate for small banks. According to authors in [6] highlight the benefits of income diversification for developing countries. In a cross-country study conducted for a sample of listed banks from 11 emerging countries, they found that revenue diversification and profitability are positively related, diversification between interest and noninterest activities as well as within both types of activities increases profitability and reduces bank insolvency risk. Reference [18] found that banks that diversify away from interest income to noninterest income have lower insolvency risk but higher profitability. Author in [19] also highlighted the benefits of income diversification in emerging countries in Southeast Asia. Their results show that banks with strong market power can minimize the risk of diversification into non-credit activities. Reference [9] highlight the existence of a negative relationship between banks' interest margin and noninterest income in Mexico banks. Reference [20] argued that both fee income and transaction income have a significant positive impact on the bank's business performance. Authors in [5] used a unique dataset of Philippines' banks and found that moving towards noninterest activities increases bank risk-adjusted profits particularly when banks are more involved dealing in government securities (other noninterest income). Reference [21] studied the growing dependence on non-interest income of Chinese banks in 1986-2008, showed that noninterest income has a positive impact on the revenue of the banks, but it simultaneously increased the risks. Reference [7] also analyzed the effectiveness of the banks' increase in noninterest income by using panel data on commercial banks in 29 Asian countries from 1995 to

2009. The authors provided evidence of the positive impact of noninterest income on the countries with outstanding banking and financial systems. Using US banks' data, Reference [22] established that bank revenue diversification causes higher profits and less insolvency risk. Reference [23] assesses the role and importance of diversification for noninterest income of banks at national and international levels. Research results show that noninterest income has a positive impact on the profitability of commercial banks. The authors of [24] which has considered commercial Banks in India for the period 1998 to 2014, found that income diversification resulted in higher risk-adjusted profitability (stability) for these banks. The authors of [25] have used a dataset of 16 listed Chinese commercial banks, over the period of 2007 to 2013 to test the effect of noninterest income on bank performance. By performing a panel threshold model, empirical findings indicate that there is a nonlinear relationship between noninterest income and bank performance (U-shaped chart). The authors reported that noninterest income increases the bank's business efficiency to a certain extent will not yield a profit to the bank anymore. Authors [26] investigate the non-linearity in the relationship between Noninterest Income for banks in Pakistan and their profitability to exploit the optimal level of noninterest income ratio in order to diversify income profitably. The research suggests that banks can get the maximum benefit from a non-traditional source of income if they strive to take the proportion of their noninterest income up to a certain level especially in regimes of low-interest income when the low-interest margins can substantially affect profitability. A study done by authors in [27] analyzed the impact of noninterest income on the risks and profits of US banks in the 2007-2009 financial crisis. The research results show that noninterest income has a positive impact on banking risks and profits during the crisis. Authors in [28] specify factors such as bank characteristics and market conditions that impact the noninterest income of banks. Noninterest income has a positive impact to increase the efficiency of the bank's performance. Studies of [29] and [12] show that noninterest income that is correlated with financial performance and the risk-adjustment performance of the bank if income is increased from service activities, transactions, investments, the ability to profit will increase. Reference [30] pointed out that noninterest income has no impact on risks but has a positive impact on the profitability of commercial banks. Reference [27] analyzed the impact of noninterest income on the risks and profits of US banks in the 2007-2009 financial crisis. The research results show that noninterest income has a positive impact on banking risks and profits during the crisis. Many experimental international studies analyze the impact of noninterest income on banking operations such as [14, 15, 22]; author of [27] studying banks in the US; Reference [9] analyzing the banks in Mexico; Study the Chinese banks as research of [21],[25]; [25]. Meanwhile, studies of [16, 17, 6, 19, 20, 17, 7, 5, 23] are cross-country or geographic area studies. Despite studies with research spaces, the timing of the study, as well as the use of models with different variables, the overall point of the study, is approaching according to the different angles of the income diversification model, emphasizing the importance of converting the income structure from traditional credit activities to non-credit activities. So far, only [25] demonstrate the nonlinear relationship between noninterest income and bank performance. In Viet Nam, the research on the influence of diversification to operational efficiency and stable bank increasing in quantity, quality as well as methods, the direction of approach to research. Despite this, the number of studies on the impact of noncredit earnings on the business performance of commercial banks is limited.

3. Data and Methodology

3.1. Data Description

The data used in the study were collected from the audited financial statements and annual reports of 28 commercial banks in Vietnam in the period of 2010-2018. After that, the researcher selected banks owning full financial statements, including balance sheet, income statement, cash flow statement and notes to financial statements. In addition, data were also collected from the website http://finance.vietstock.vn, from the State Bank of Vietnam, websites of commercial banks under study, General Statistics Office of Vietnam, Ministry of Finance... After collection, the data were imported into an Excel file and edited and encoded in this file. The next step is to conduct data cleaning to detect errors, empty cells lack information, wrong information and complete the data matrix. Then, the researcher used Stata 13 software to calculate and process data according to the model.

3.2. Data Methodology

3.2.1. Model Specification

Many empirical studies approaching different directions have been conducted on domestic and transnational banks to analyze the impact of noninterest income on the bank's performance. Some studies suggest that noninterest activities can improve banking performance and profit-adjusted profits ([6, 4, 5, 7]. Sun and his colleagues (2017) demonstrate the nonlinear relationship between noninterest income and bank performance. This study applied a dynamic panel data approach proposed by [31,32] used GMM modeling techniques to solve endogenous problems, variance and autocorrelation. With the foundation of theoretical studies and empirical studies, like [33], [16, 17, 34, 7]. Authors in [25,35] the study to determine the following basic models:

$$Performance\ (ROA, SHROA)_{i,t} = \alpha_{i,t} + \beta_1 NII + \beta_2 NII^2 + \sum_{s=3}^{8} \beta_s \lambda_{i,t} + \varepsilon_{i,t} \qquad (1)$$

In which *i* i represents the number of banks in the research sample, i = 1…28; t represents the time (t = 2010–2018), β represents the regression coefficient λ which is the control variable matrix, ε which is the error. Measuring performance by *ROA, SHROA; NII* represents the noninterest income. Control variables include: natural logarithm of total assets; loan outstanding balance/asset ratio; equity/asset ratio; non-performing loan/loan outstanding balance ratio; asset growth; liquidity ratio (see Table 1). The study estimates the regression parameter for modeling the factors that impact with Pooled model, fixed effects model (FEM) and random effects model (REM), and GMM for the best equation that shows the relationships of the factors. Studies of [31, 32] have proposed a system GMM estimation tool to solve problems with differential GMM.The Hansen index (1982) is used to check the validity of instrument variables. Testing standards using t statistics and corresponding p-value, reliability is based on 95%, the p-value will be directly compared with 0.05 to conclude to approve or reject the research hypothesis.

3.2.2. Measurement of Variables

- **Measurement of bank performance (ROA, SHROA)**

Two alternative proxies for bank performance are employed. First, we use the return on assets (ROA), which is

defined as the ratio of net results from ordinary activity to total assets [36]. Profitability ratios are an indicator of financial performance. The main measure of the overall performance of a bank is return on assets (ROA), which is measured by the ratio of net profit to total assets. This measure comprises two components, effectiveness (profit margin), and efficiency (total assets turnover). ROA has been used in several studies for the purpose of reflecting profitability and is included to reflect the bank's ability to generate income from non-traditional services [37]. Noting the importance of risk in the banking sector and recalling that increased returns are typically associated with increased risk, risk-adjusted profitability measures are introduced into the analysis. Following Stiroh (2004a, b) and Chiorazzo and his colleagues (2008), we compute the ratio of the annual ROA and its SD calculated over the entire sample period (SHROA) to adjust this measure for risk (volatility). This measure is formally defined by the following equation:

To represent bank stability, risk-adjusted return on assets (SHROA) is measured as follows:

$$SHROA_{i,t} = \frac{ROA_{i,t}}{\sigma ROA_{i,}} \qquad (2)$$

where, SHROA it indicates risk-adjusted returns on assets, for the bank i in the year t. ROAit indicates return on average assets, for the bank i in the year t. σROAi represents the standard deviation of return on average assets over entire sample period. In banking activities, increasing profits means banks face more and more risks. Therefore, in addition to the goal of increasing profits, banks need to diversify to spread risks [14,33,34].

- **Ratio of Noninterest Income to Total income (NII)**

Using a framework similar to previous empirical research, we measure noninterest income as the share of noninterest income in total operating income. Total operating income is defined as the sum of gross interest income and noninterest income. Studies of [38, 39] define noninterest income as the share of noninterest income/(net interest income + noninterest income), while [40], defines noninterest income as the noninterest income/net interest income. Net interest income includes costs associated with funding lending and other assets, without taking into account the costs for noninterest income which are typically administrative (trader and investment banker salaries). We prefer to use gross interest income, so that we can isolate revenue from lending. Our results are robust to using the alternative measures, net interest income + noninterest income, or only noninterest income in the denominator. We also split noninterest income into its components, which are: trading income, fee income and unclassified income. Authors in [25] demonstrate the nonlinear relationship between noninterest income and bank business performance. This research argued that when increasing the percentage of noninterest income to some extent, noninterest income will reverse the negative impact on banking bank performance.

- **Bank size (SIZE)**

According to [41], diversification has a positive relationship with the size of bank assets, the larger the size of bank deposits, the higher the loan balance for customers. Bank size is measured by logarithms of total assets. The authors in [42,43] argued that there was a nonlinear relationship between size and business performance. The

effect of bank size on performance is still controversial. Reference [44] argued that large banks often had the advantage of size and had more opportunities to diversify risks than small banks. Therefore, large banks will have lower costs and higher profits [45].

- **Capitalization ratio, measured as the ratio of equity to total assets (ETA)**

This variable shows the level of financial leverage of a bank. High leverage ratio means high risk. This variable is also used in most recent studies such as [6, 34, 14]. High-capitalized banks are less risky and so generate lower profits [46]. The contrary relationship between capital and profits emphasizes that higher insurance costs can prevent bankruptcy risks with low capital asset ratio, indicating a positive relationship between capital asset ratio and performance [47]. Studies of [48] investigated the relationships between investment capital risks and bank risks; and proposed that banks could supplement capital by increasing the risk of the income asset portfolio and off-balance sheet activity, that is, by implementing a more aggressive diversification strategy.

- **Ratio of loans to total assets (LTA)**

The ratio of total outstanding loans to total assets represents the effects of loan strategy to performance and bank risk adjustment as studied by [6, 34, 33]. This ratio increases, meaning that the expansion of credit activities negatively affects the profitability and credit risk will increase accordingly, so there will be a positive correlation between total loans to mobilized capital for bank risk.

- **Ratio of Non-performing loan (NPL)**

Credit quality is often measured by the non-performing loan to total outstanding loan ratio of commercial banks. The bank with a large loss must increase its capital to meet management requirements and minimize the bankruptcy risk. Authors in [49] argued that the decline in asset quality is synonymous with a higher degree of risk. Therefore, there is a positive relationship between credit risk and bankruptcy risk and adjusting expected bank profits. Ineffective loans meaning the high non-performing loan ratio reduce asset quality and quickly increase bank risk [50].

- **Liquidity Ratio (LIQ)**

To measure bank liquidity, the research uses the loan to deposit ratio (*LTD*). If this ratio is too high, banks may not have sufficient liquidity to meet the client's capital needs; if this ratio is too low, banks may not achieve the expected revenue. Some empirical studies showed that the higher the liquidity, the higher the bank's asset risk [39,51].

- **Growth rate of total asset (GTA)**

Asset growth shows that the attitude of managers when facing with bank risk, GTA is calculated by the growth rate of total bank assets. Bank managers often expect more rapid growth and more stable profits [33,34]. This variable positively affects risks because rapid asset growth can increase the bank's investment portfolio risk.

Table 1: Research variables.

Classification	Variable	Definition	Source
Dependent variables	ROA	Returns on assets	[14,33,34]
	SHROA	Risk-adjusted return on assets $SHROA_{i,t} = \frac{ROA_{i,t}}{\sigma ROA_{i,}}$ $ROA_{i,t}$ = Returns on assets $\sigma ROA_{i,}$ = ROA standard deviation	[33,38]
Independent variables	NII	Non- interest income/ Total income	[34]
	NII^2	Square of none-interest income to Total income	[25]
Control variable	SIZE	Natural logarithm of total assets	[42,43, 52]
	LTA	Ratio of loans to total assets	[6, 34]
	ETA	Equity To Assets	[53; 45; 48]
	NPL	Non -performing loan/loan outstanding balance	[49; 50]
	GTA	Growth rate of total assets	[14,34]
	LIQ	Liquidity ratio = loan outstanding balance/customer deposits	[39; 51]

Source: Summary of the author.

4. Results and Discussion

4.1. Descriptive Statistics

This study aims to assess the impact of revenue diversification on risks and performance of 26 Vietnamese commercial banks in the period of 2010–2018. Table 2, descriptive statistics of research variables, including dependent variables, independent variables used in the GMM (Generalized Method of Moments) system model. In which, performance is measured by ROA, SHROA; noninterest income to total income (*NII*) and control variables (*SIZE*, *LTA*, *ETA*, *NPL*, *GTA*, *LIQ)*. Statistical results show that banks' asset use efficiency is approximately 0.7% on average. Meanwhile, the risk-adjusted return on assets is 2.03%. Noninterest income accounts for only 20.28% of the total average income of banks. This is a new challenge for Vietnamese banking system in the context of digital economy develop. Loan outstanding balance accounts on average of 53.6% of total loan outstanding balance, the liquidity ratio reaches 0.851. Non-performing loan ratio of commercial banks is 2.5% on average; Equity/asset ratio reaches 9.26%, ensuring compliance with the regulations of the State Bank of Vietnam and satisfying Basel II standards.

Table 2: Summary descriptive statistics of research variables.

Variable	Obs	Mean	SD	Min	Max
Bank performance					
ROA	252	0.0072	0.0065	-0.0551	0.0264
SHROA	252	2.0289	1.6292	-2.5643	8.1546
Independent variables					
NII	252	0.2028	0.2144	-0.4435	1.1016
NII^2	252	0.0869	0.1812	0.0000	1.2134
Control variable					
SIZE	252	8.0035	0.4880	6.9152	9.1294
LTA	252	0.5282	0.1383	0.1448	0.7859
LIQ	252	0.1533	0.0966	0.0075	0.5671
ETA	252	0.0906	0.0375	0.0231	0.2554
NPL	252	0.0248	0.0158	0.0001	0.1140
GTA	252	0.2262	0.2843	-0.6208	1.6484

Source: Financial reporting data of 26 Vietnamese commercial banks in the period of 2010–2018.

Note: *ROA* (Return on assets); *SHROA* (Ratio between ROA and standard deviation of ROA); *NII* (noninterest income/total income); NII^2 (Square of none-interest income to Total income); *SIZE* (Natural logarithm of total assets); *LTA* (Loan to asset ratio); *ETA* (Equity to asset ratio); *NPL* (Non-performing loan/loan outstanding balance); *GTA* (Growth rate of total assets); *LIQ* (Liquidity ratio = loan outstanding balance/customer deposits).

4.2. Correlation analysis

Table 3: Correlation analysis.

	ROA	SHROA	SIZE	LTA	LIQ	ETA	NPL	NII	NII2	GTA
ROA	1									
SHROA	0.6111	1								
SIZE	0.1158	0.3684	1							
LTA	0.1395	0.2087	0.4487	1						
LIQ	0.0736	0.0737	-0.2554	-0.5524	1					
ETA	0.2193	-0.056	-0.6549	-0.1612	0.1935	1				
NPL	0.0051	-0.0718	-0.1756	0.0063	-0.0106	0.137	1			
NII	-0.1549	-0.0827	0.1365	-0.073	-0.1296	-0.0186	-0.0165	1		
NII2	-0.2545	-0.1517	0.0808	-0.076	-0.1613	-0.0183	-0.0171	0.8679	1	
GTA	0.1663	0.0785	-0.1867	-0.2499	0.2914	0.0747	0.0547	0.0502	0.0275	1

Source: Author's own calculations.

In order to solve the research problems, the paper conducts regression of panel data with Pooled model, fixed effects model (FEM) and random effects model (REM). Studies of [31, 32,54] have proposed a system GMM estimation tool to solve problems with differential GMM. The Hansen index (1982) is used to check the validity of instrument variables. The study first conducted a correlation analysis to detect autocorrelation and partially identify multidimensional defects of independent variables affecting regression models. Table 3 below presents

the results of the correlation analysis for the study in order to determine the level of association among the variables. The results of Table 3 show that there is no autocorrelation, multicollinearity is not a serious problem affecting the estimation results of the regression model [55]. Multicollinearity does not reduce the predictive power or reliability of the model, facilitating the implementation of subsequent verification steps.

4.3. The Impact of Noninterest Income on the Performance of Commercial Banks

The study used estimation of system GMM (sys-GMM) to solve endogenous phenomena in dynamic table data model in a short and unbalanced period. Check the appropriateness of estimating system GMM by AR (2) and [56]. The results of the study show that these tests are not statistically significant, meaning that the system GMM model is suitable because there is not second-order autocorrelation and variables are appropriate. Research results are shown in Tables 4. The research results show that noninterest income positively affects the performance of the Vietnamese banking system measured by *ROA* and *SHROA* [16,17,33]. Diversify income, which is manifested as a shift in income structure by increasing the proportion of noninterest income, in order to expand the income source, promote the increase of income and profit of the bank, reduce risks. The study also demonstrates the view of [25] on the nonlinear relationship between non-credit income and bank's performance. The authors in [34] argue that the relationship between noninterest income and bank performance is inconsistent with the results of US and European banking studies due to differences in structure, size, and regulation between these markets. In my study, the results also showed a contrast to the regression results of the relationship between noninterest income and profitability of most US banking studies. This stems come from two main differences between the income structure of the Vietnamese banking system and that of the US: Firstly, the difference in the correlation between the growth rate of net interest income and income from non-credit activities; the second is the difference in the distribution of components of noninterest income. The author in [33] shows the relatively high correlation between interest income and noninterest income in US banks from 1984 to 2001, implying less diversification benefits as the banking industry shifts towards noninterest revenue. In the Vietnamese, however, the correlation between the growth rates of interest income and noninterest income is weak. Therefore, the weak correlation between them can lead to positive or negative impacts of a shift towards noninterest income on risk-adjusted profitability. Data statistics show a significant differences in the distribution of noninterest income between banks in the Vietnamese and the U.S. According to authors in [33], showed that in the U.S, the average bank's fees and other income represent 27% of net operating income while trading income counts for about only 3.5%. In the same context, the ratio of non interest income moved from 25% to over 40% of their aggregate income over the period 1984 to [57]. In the case of the Vietnamese commercial banks, fee and other income counted for 11.56% of operating income, the average trading income counted for 8.7%. U.S. banks exhibit high correlation between the growth rates of net interest income and fee-based income, while a weak correlation exists between trading income growth and net interest income growth. This is reasonable because non-traditional trading activities such as foreign exchange, gold trading, and trading of investment securities are affected by market fluctuations, thus avoiding the risk of losses. Meanwhile, net interest income is the main source of income for banks, which is the core motivation for the bank's development in the medium and long term, implying greater diversification benefits should a bank decide to shift its interest income towards this particular component [33]. This research shows that banks can get maximum benefit from traditional non-credit income if they strive to increase the proportion of non-credit income to a certain extent. Especially, in the case of net interest income ratio compared to the gross

income low because the non-credit income can significantly affect the profitability. Banks should come up with more innovative ways of financial products and services to maximize non-credit income and invest resources effectively. At the same time, carefully monitor to minimize the risks that may cause to this activity.

Table 4: GMM model - the impact of noninterest income on performance.

Variable	Banking System (28)							
	ROA				SHROA			
	FE	RE	GMM	GMM for System	FE	RE	GMM	GMM for System
SIZE	0.00677***	0.00700***	0.0163***	0.00678***	0.415	1.034***	2.582**	2.221***
	[3.28]	[4.88]	[3.11]	[5.12]	[0.96]	[2.81]	[2.68]	[7.64]
LTA	0.0056	0.00355	0.0145	-0.00174	0.739	0.738	3.481*	0.175
	[1.27]	[0.88]	[1.40]	[-0.59]	[0.80]	[0.83]	[1.83]	[0.15]
LIQ	0.0115**	0.00611	0.0263**	0.00318	2.786***	3.039***	5.645**	2.623***
	[2.34]	[1.27]	[2.21]	[0.97]	[2.69]	[3.02]	[2.58]	[2.63]
ETA	0.0844***	0.0876***	0.0952***	0.0861***	9.748***	11.38***	11.29*	16.68***
	[6.77]	[7.09]	[2.80]	[7.93]	[3.72]	[4.48]	[1.81]	[6.14]
NPL	0.0511**	0.0322	0.149***	0.00945	5.94	5.549	28.46***	5.723
	[2.53]	[1.52]	[2.65]	[0.45]	[1.40]	[1.31]	[2.76]	[1.27]
NII	0.0141***	0.00933***	0.000832	0.00721***	1.175*	1.130*	-0.217	0.835**
	[4.55]	[2.92]	[0.12]	[6.09]	[1.80]	[1.75]	[-0.18]	[2.20]
NII^2	-0.0452***	-0.0291***	-0.0178	-0.0201***	-3.286***	-2.975***	0.756	-2.231***
	[-10.17]	[-6.99]	[-1.43]	[-5.89]	[-3.51]	[-3.32]	[0.33]	[-6.35]
GTA	0.00499***	0.00511***	-0.00125	0.00405***	0.691***	0.720***	-0.741	0.700***
	[4.67]	[4.44]	[-0.42]	[5.03]	[3.07]	[3.19]	[-1.37]	[3.77]
Constant	-0.0607***	-0.0609***		-0.0557***	-3.252	-8.402***		-18.10***
	[-3.58]	[-5.22]		[-5.36]	[-0.91]	[-2.79]		[-8.04]
Observation	**252**	**252**	**252**	**252**	**252**	**252**	**252**	**252**
Group	**28**	**28**	**28**	**28**	**28**	**28**	**28**	**28**
R-squared	**0.504**	**0.477**			**0.215**	**0.2063**		
AR (2)			**-1.07**	**-1.41**			**-0.24**	**-0.06**
Sargan test			**19.86**	**17.13**			**24.91**	**24.04**
Hansen test				**17.51**				**13.52**

*, **, *** represent significance at the 1%, 5% and 10% levels, respectively.

Note: *ROA* (Return on assets); *SHROA* (Risk-adjusted return on assets) used to measure the performance of commercial banks. Independent variables including: Noninterest income/total income ratio (NII); NII2 (Square of none-interest income to Total income); Natural logarithm of total assets (SIZE); loan to asset ratio (LTA); equity to asset ratio; non-performing loan/loan outstanding balance ratio *(NPL)*; total growth rate of total asset (GTA);

liquidity ratio = loan outstanding balance/customer deposits (*LIQ*). Research data is extracted from audited financial statements in the period 2010–2018, published publicly on the electronic portal of banks and publicly announced at the State Securities Commission of Vietnam. In Viet Nam, the banks's revenue from services currently is still mainly from card fees, credit card fees, intermediary services of real estate transaction payment, international payment and ATM and Internet Banking and Mobile Banking fees. Banks continue to raise fees to increase revenue from services. Non-credit activities also have positive results, noninterest income increasing the proportion of income structure. However, not all banks have a large revenue from services, including large-scale banks and strongly develop retail services. Recently, credit activities seem to be growing slowly, banks switch to develop services to increase revenue, but it is difficult to expect strong growth in a short time. Banks with abundant capital also promote the bank to move to investment, the trend of becoming a multi-functional bank or commercial bank with the function of the investment bank. Increasing the proportion of noninterest income in the income structure is one of the strategies to increase profits for banks when the credit growth limit is restricted under the Interest Rate Ceiling regulations. However, the lack of experience in investment as well as a shortage of investment banking functions such as management systems, risk control makes these activities not really effective. In fact, the level of growth and contribution to the bank's revenue from service activities is not commensurate with its potential; although there are many positive points, they are not enough to cover risks from net interest income activities. The system of Vietnamese commercial banks needs to improve and promote the non-credit service quality, especially e-banking services in the context of constantly changing consumer habits and increasing technology acceptance level. It is necessary to restructure revenue between credit and non-credit services effectively in accordance with the financial capacity and development objectives and business development orientation of each bank, making the most of supporting policies from the State Bank of Vietnam and the government. Promote implementation of comprehensive and breakthrough solutions to manage credit growth stably, effectively and minimize risks as well as ensure the safety of the banking system. The larger the bank's asset size (SIZE), the more likely it is to increase revenue and profit, grow strongly in assets and be able to use capital more efficiently than small banks. Studies of [43, 42] also found that both bank scale and squared bank regression increased cost efficiency, suggesting that large banks managed cost more efficiently than small banks, meaning their business performance was better. The research results of the loan/total asset ratio (LTA) are similar to those of [6, 34]. Reference [14] suggesting that the increase in this ratio means that the expansion of credit activities will increase credit risk accordingly, so there will be a negative correlation between total loan on capital mobilized to profitability. Author finds that coefficient on the loans to total assets ratio is negative and highly significant at the level of 1%. This means that the more loans presented on a bank's balance sheet, the lower the bank's profitability. This shows that in recent years, Vietnamese commercial banks have been more cautious in lending activities. The bank has expanded the size of its loan portfolio with potentially less risky industries. The banks with good liquidity are usually large-scale banks with state capital. The liquidity of these banks (LIQ) is usually better than the rest. In fact, the better the banking liquidity, the higher the profitability of the credit institutions, along with an increasing credit risk [39,51]. The widespread liquidity crisis did not occur. Besides, some banks are sometimes in a state of liquidity tension and local liquidity difficulties. liquidity stress of the commercial banking system can be identified through interest rate fluctuations in financial markets. Liquidity of the system has always been very concerned and closely monitored by the State Bank. Because of the liquidity weakness is the root cause leading to the restructuring of the system to ensure safety and healthy development.

Capital mobilization from customer deposits is not always low-cost, due to competitive pressures that banks are forced to raise costs and lower lending rates. Therefore, banks need to have appropriate capital mobilization strategies to save costs and increase business efficiency. In general, banks satisfy the Basel II standard and the state bank regulation on Equity/Asset Ratio (ETA), which is positively related to profitability. The higher this ratio, the lower the dependence on Capital Funding and make profits of banks higher. This shows the bank's ability to absorb losses and handle risks [47,58]. Vietnam Commercial banks have made great progress and made positive contributions to the socioeconomic development. However, along with that development, the shortcomings in the management of banks as well as difficulties also arise in many aspects of operation, including the issue of equity - that is the capital component which is extremely important in operating capital of commercial banks. Therefore, it is necessary to have strong changes in the recognition and management of bank equity from the state management agencies as well as commercial banks. Growth rate of total assets (GTA) has a positive and significant effect on banks' profitability indicators (ROA). The main reason for the increase in these banks' total assets is the sharp increase in customer loan outstanding. The asset structure has had a positive shift from interbank capital to credit. The total assets of banks also continued to grow, but at a modest level because the State Bank's credit tightening policy limited lending growth at banks. Banks have accepted to sacrifice profits instead of choosing the solution is to increase lending rates. Most banks only target profit growth much lower than the previous average increase. Perhaps this is a strategic choice of banks in the context of increasing competition. They have actively expanded the facility to exploit service fee revenues through the customer ecosystem. Capital mobilization must adhere to the strategy of expanding credit operations, determining a reasonable structure to increase the profitability of the bank.

5. Check Robust

Because banks can choose whether or not to diversify by changing the income structure, the issue of endogeneity between the share of noninterest income to total income and the bank's performance is regularly discussed in literature [43,59,60]. Hence, I test the robustness of the results by controlling for possible endogeneity, following [59] approach of using lagged instrumental variables. If endogenous variables do not exist, the study will use a two-stage least squares regression (2SLS) estimated . The results of Table 5 shows that AR (2) and Hansen tests are not statistically significant, which means that the system GMM model has no autocorrelation and tool variables are consistent [61]. Therefore, the research model used in this paper is highly sustainable.

Note: *ROA* (Return on assets); *SHROA* (Risk-adjusted return on assets) used to measure the performance of commercial banks. Independent variables including: Noninterest income/total income ratio (NII); NII2 (Square of none-interest income to Total income); Natural logarithm of total assets (SIZE); loan to asset ratio (LTA); equity to asset ratio; non-performing loan/loan outstanding balance ratio *(NPL*); total growth rate of total asset (GTA); liquidity ratio = loan outstanding balance/customer deposits (*LIQ*). Research data is extracted from audited financial statements in the period 2010–2018, published publicly on the electronic portal of banks and publicly announced at the State Securities Commission of Vietnam.

Table 6: GMM system - Check Robustness of regression

VARIABLES	GMM system—Check Robustness of regression			
	ROA		SHROA	
	GMM	GMM for System	GMM	GMM for System
SIZE	0.00935***	0.00709***	2.813***	2.165***
	[3.47]	[2.82]	[3.59]	[3.66]
LTA	0.00676	-0.0024	0.684	-0.128
	[1.33]	[-0.38]	[0.35]	[-0.06]
LIQ	0.00476	-0.000298	2.225	2.278
	[0.77]	[-0.04]	[1.14]	[1.16]
ETA	0.112***	0.0939***	25.58***	15.19***
	[4.65]	[3.99]	[3.92]	[3.08]
NPL	0.0464	0.00263	3.934	3.845
	[1.18]	[0.08]	[0.45]	[0.44]
NII	-0.00557	0.0101	-2.503**	0.748
	[-1.28]	[1.62]	[-2.15]	[1.02]
NII2	-0.0032	-0.0272	1.897	-1.996***
	[-0.44]	[-1.47]	[1.17]	[-2.96]
GTA	0.00661***	0.00274*	2.010***	0.336
	[3.73]	[1.83]	[2.94]	[1.44]
Constant	-0.0928	-0.0546	-19.2621	-12.9410
	0.0235	0.0227	4.9550	4.2640
Observation	**252**	**252**	**252**	**252**
Group	**28**	**28**	**28**	**28**
AR(1)	**-1.34**	**-1.40**	**-1.42**	**0.07**
Sargan	**61.96**	**27.48**	**85.89**	**45.57**
Hansen	**24.58**	**16.25**	**17.95**	**14.11**

*, **, *** represent significance at the 1%, 5% and 10% levels, respectively.

6. Conclusions

Structural changes in the banking industry and the rise of alternative funding sources for for enterprises have allowed banks to find different ways to increase profits along with traditional lending operations. From a theoretical point of view, banks benefit when they diversify their income [62]. Many studies have been conducted from one country to another one to analyze the impact of non-credit income on the efficiency of banking business. Some studies suggest that non-credit operations can improve banking performance and profitability. In contrast, in another line of analysis highlights a negative relationship between noninterest income and commercial bank

profits. There are also results suggesting that there is a nonlinear relationship between them. In the context of Vietnam's commercial banking system. So what is the relationship between noninterest income and profitability in the context of the Vietnamese commercial banking system?

To address this question, This paper uses the generalized method of moments (GMM) to analyze the impact of noninterest income on the performance of 28 Vietnamese commercial banks in the period from 2010 to 2018. GMM modeling uses techniques to deal with endogeneity, variance, and autocorrelation in the research model. This study provides evidence of nonlinear links between noninterest income and the profitability of bank. The regression shows an inverse relationship between noninterest income and the performance of Vietnamese commercial banks. Many studies have found that the development of noncredit services by U.S. banks and the banks of some developing countries increase bank income and significantly improve performance. This difference between banks in Vietnam and banks elsewhere stems from differences in the income structure of the Vietnamese banking system and those of developed countries in which noninterest income accounts for a high proportion of income, even surpassing net interest income. Banks can maximize the benefit of traditional noninterest income when they increase the proportion of noninterest income, especially when net interest income is lower than gross income. Noninterest income can significantly improve profitability. Banks should come up with more innovative ways of financial products and services to maximize noninterest income and invest resources effectively. At the same time, carefully monitor to minimize the risks that may cause to this activity. The larger the size of a bank's assets, the more likely it is to increase revenue and profit, expand its assets, and use capital more efficiently than small banks. The loans to total assets ratio have a negative effect on profitability. This shows that in recent years, Vietnamese commercial banks have been more cautious in lending activities. At the same time, the faster the growth of a bank's assets, the more stable is its profit growth. The more liquid banks are, the more profitable credit institutions are, even as credit risk increases. Credit risk is adjusted to reduce the profit of a bank. The ratio of equity to total assets increases, reducing dependence on funding flows and enabling banks to become more profitable. Commercial banks have been focused on developing utility and modern banking services, increasing the proportion of noninterest income in total income. This trend in modern banking seems to be suitable only for banking operations in developed economies to minimize risks and ensure the sustainable development of banks. However, in developing countries that still face many challenges, anxieties require banks to strengthen their urgent solutions promptly in order to increase their competitiveness in the marketplace.

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8. Conflicts of Interest

The author declares no conflict of interest.

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