

Non-Interest Income, Profit, and Risk Efficiencies: Evidence from Chinese Commercial Banks

Xuan Yao^{1,a,*}, Tiancheng Han^{2,b}, Yuxuan Xie^{2,c}, Qingyuan Liu^{3,d}, He Zhao^{4,e}

¹*School of Economics and Management, Southeast University, Nanjing, Jiangsu 21189, China*

²*Reading Academy, Nanjing University of Information Science & Technology, Nanjing, Jiangsu 210044, China*

³*Business School, Nanjing University of Information Science & Technology, Nanjing, Jiangsu 210044, China*

⁴*Changwang School of Honors, Nanjing University of Information Science & Technology, Nanjing, Jiangsu 210044, China*

E-mail addresses: ^a shiny_yao@yeah.net, ^b tiancheng.han@student.reading.ac.uk, ^c yuxuan.xie@student.reading.ac.uk,

^d 2642897285@nusit.edu.cn, ^e 1440616394@qq.com.

**Corresponding Author*

Keywords: Non-interest income, Commercial banks, Panel data, Multifactor regressions

Abstract: According to the traditional definition, banks are institutions to accept deposits and make loans. However, non-interest income, including commission, fees, and trading, is increasingly being considered a crucial part of the bank operation. Previous literature argues that the increase in non-interest income leads to an increase in profit and lowers the overall risk. However, this paper found that this is not necessarily the case, and the result depends on whether banks are listed or not. We test these hypotheses by analyzing the data from commercial banks in China over a ten-year period. Advice for improving the structure of the non-interest income is provided to policymakers.

1. Introduction

Initially, commercial banks are the financial institutions designed to make loans for companies, and the banks charge interest at an agreed rate. This income called interest income has been the main income of commercial banks in China for many years. The other kind of income, non-interest income containing commission, fees, and trading made up 6.7% of total operating income and 0.15% of total assets in 2002. With the developments of economics in China, the relatively single profit model makes commercial banks more dependent on interest margin income, which makes them more sensitive to changes in the external financial ecological environment, thus the transformation of income structure becomes more urgent. However, the problem is whether it is appropriate to blindly pursue the increase of non-interest income.

In recent years, there are many empirical results related to the impacts of increasing non-interest income. Zhou et al. ^[1] researched the non-interest income of city commercial banks in China and indicates that increasing non-interest income can significantly improve bank performance because

diversifying operation allows banks to better cope with the uncertainty of the financial environment, but the diversified development of non-interest income will reduce the operating performance of city commercial banks due to the high risk of non-interest income investment business. However, Bian et al. ^[2] show that while it is statistically insignificant, non-interest income has negative impacts on both the profit and risk efficiency of Chinese commercial banks.

This paper aims at analyzing the impacts of increasing non-interest income on profit and risk efficiency and finding out if the results are related to whether the bank is listed or not. By using the data of commercial banks in China over a 10-year period from Bankscope, an econometric analysis model is constructed to test the hypothesis. Through the analysis and calculation, it is easy to get the influence of increasing non-interest income and whether there is a difference between listed and unlisted banks. The results can be considered as a piece of advice for the transformation of income structure for Chinese commercial banks to deal with a more sensitive financial environment. Therefore, it is of great theoretical and practical significance to study the impact of developing non-interest income on profit and risk efficiency.

The rest of the paper is organized into five sections, containing the literature review of relevant study, the basic theory and assumption, empirical results future implications, and conclusions.

2. Literature Review

Participating in more non-traditional businesses is the main form of diversification in the banking industry from the conventional industry wisdom. If revenue comes from various financial activities, and these activities are not completely related, the profitability of the bank will increase. A well-diversified commercial bank can achieve many benefits through non-intermediary activities ^[3]. At present, many scholars abroad have conducted research on the evaluation of operating performance of commercial banks' non-interest income from the perspective of the profits and risk efficiency. The scholars mainly have three different views on the relationship between the proportion of non-interest income of commercial banks and the operating performance.

A larger part of scholars believes that the development of non-interest income business by banks can improve the profits and have an improvement in risk efficiency in commercial banks. It is to say, a higher share of non-interest income yields higher profits and risk-adjusted profits. As a mature core non-interest income, low-risk businesses such as handling fees and transaction costs can bring stable profits to banks, thereby improving their operating performance ^[2]. It is generally believed that if non-interest income is more stable than interest income, or the degree of correlation between interest income and non-interest income is not high, the shift to non-interest income activities may reduce the volatility of bank income. In addition, the development of non-interest income can reduce the interest rate risk ^[4] and credit risk faced by banks ^[5], thereby reducing losses and increasing profits.

Some scholars believe that the development of non-interest income by commercial banks negatively affects profit and risk efficiencies. From the perspective of income volatility, banks cannot obtain more stable income as the proportion of non-traditional banking business increases ^[6]. The expansion of non-interest income businesses such as investment business and foreign exchange business will further increase the volatility of profits efficiency and reduce bank performance and risk-adjusted returns ^[7]. In terms of empirical research, Huang and Xia ^[8] used the generalized moment estimation method to explore the impact of non-interest income on bank performance. They found that the development of non-interest income can improve the income structure of city commercial banks that originally relied solely on deposit-loan spreads, but it would affect the city. The business performance of the commercial bank has a negative impact, and the high operating cost is used to offset the new non-interest business income to explain the negative effect.

Weerasuriya et al. ^[9] used Cobb-Douglas and Translog Frontier to estimate the efficiency of banks, the results show that the profit efficiency of banks is reduced due to the participation of non-traditional businesses, while the cost efficiency of banks is improved due to the participation of non-traditional businesses.

Finally, a small number of scholars believe that various factors in the development of non-interest income will offset each other's effects on bank profitability, and thus will not have an impact on the operating performance of the commercial banks. Because the strength of various factors varies among banks of different natures, the increase in the proportion of non-interest income will have different effects on the profit efficiency and risk efficiency of different types of commercial banks.

3. Basic Theory and Assumption

According to previous research, the most result is that there is a positive relationship between the profit of the bank and the non-interest income. Fee-based income and trading income, as the core of the non-interest income, have developed for many years, which can be considered low-risk services, thus developing non-interest income can improve operating performance. Additionally, the shift towards non-interest income means the diversification of the income. Therefore, developing non-interest income can spread the risk, which means the interest rate risks and credit risks faced by banks can be reduced. This paper aims to enrich the existing results and test the following hypothesis: *Hypothesis 1. Developing non-interest income will cause an increase in profits and an improvement in risk efficiency.*

The profit of different banking groups with distinctive objectives and structures may perform differently. This article divides the banking groups into listed banks and unlisted banks. There are many differences between listed and unlisted banks. Listed banks mean banks can sell shares to the public for financing, and stockholders and bank owners share the risk. Besides, when people choose banks for financial services, most prefer listed banks, because listed banks are more transparent, and people know more information about listed banks. Therefore, this paper's assumption of the performances of listed and unlisted banks is as follows: *Hypothesis 2. The results of developing non-interest income are different between listed and unlisted banks.*

4. Empirical Results

4.1 Data and Model Specification

Our sample is a panel data composed of 220 Chinese commercial banks during the period 2010-2020. The principal data source is Bankscope, made by Bureau van Dijk and Fitch Ratings. We also collect data from bank's official annual report wherever the data is missing or confusing. We use the ROAA (Return on Average Asset) as an estimate of the profit efficiency. To perform risk analysis of commercial banks, we use the Z-score measure, which is calculated as follows:

$$Z - score = \frac{ROAA + Equity/Assets}{\sigma_{ROAA}}$$

Where ROAA is return on average assets and σ_{ROAA} is the standard deviation of ROAA. Z-score measures the number of standard deviations that a commercial bank is away from insolvency. A higher value indicates a less risky bank ^[2]. Our explanatory variables include the non-interest income, fees and commission income, trading income, which are all measured as a percentage of total operating income. Our control variable includes total assets, the ratio of equity to asset, non-performing loans, growth into total assets. After analyzing the data of all commercial banks, we

dig into the difference between listed and unlisted commercial banks.

4.2 Profit and Risk Efficiency

Table 1 presents the mean values of the profit efficiency and risk efficiency of commercial banks in China. Overall, the mean value of return on average asset is 0.865% while the standard deviation is 0.952. In more detail, the listed banks' mean value of ROAA is slightly higher than that of the unlisted banks. However, the unlisted banks' standard deviation of ROAA is much greater than that of the Listed banks. In terms of the risk efficiency, which is measured by the Z-score, the mean is about 60.81, suggesting that banks' stability level is about 60% of the stability level enjoyed by the best banks in the sample. The Z-score of unlisted banks is higher than that of listed banks, meaning that unlisted banks are less risky than listed banks overall. Nevertheless, unlisted banks' standard deviation of Z-score, at 138.9, is much higher than that of the listed banks, at 28.4 only, which means that gap in the risk level among unlisted banks varies significantly.

Table 1 Descriptive Statistics of the Chinese Commercial Banks

<i>All banks</i>						
variable	N	mean	sd	min	max	range
ROAA	1485	0.865	0.952	-9.217	20.59	29.8
Z-score	1485	60.81	117.6	1.743	2214	2212
<i>Listed banks</i>						
variable	N	mean	sd	min	max	range
ROAA	440	0.969	0.309	-0.578	2.839	3.417
Z-score	440	53.25	28.4	7.902	178.3	170.4
<i>Unlisted banks</i>						
variable	N	mean	sd	min	max	range
ROAA	1045	0.821	1.114	-9.217	20.59	29.8
Z-score	1045	64	138.9	1.743	2214	2212

4.3 Determinants of Profit and Risk Efficiency

Descriptive statistics of the determinants of profit and risk efficiency is presented in Table 2. On average, the ratio of non-interest income to total operating income is 24.39%, much lower than that ratio in developed countries. The standard deviation of the ratio of non-interest income to total operating income is 21.82%. Moreover, commission and fee income and trading income account for 10.98% and 10.81% of total operating income, respectively, suggesting that commission and fee income are the main component of non-interest income for Chinese commercial banks. Noticeably, the standard deviation of trading income is about twice as much as the figure of commission and fee income. The figure for non-performing loans shows large differences among banks. The mean of equity to total assets is 9.113%.

Table 2 Descriptive Statistics of the Determinants of Profit and Risk Efficiency

variable	N	mean	sd	min	max	range
NTI	1485	24.39	21.82	-101.3	202.7	303.9
Fees	1485	10.98	10.73	-0.0197	105	105
Trading	1485	10.81	20.8	-88.55	193.8	282.3
Assets	1485	164940	536994	209.5	5103000	5102000
ET	1485	9.113	7.722	3.329	89.48	86.16
NPL	1277	1414	4682	0	44986	44986
AssetGrowth	1485	18	37.46	-75.48	987.2	1063

Table 3 presents the regression results to test the effects of non-interest income, its components, and other determinants on profit and risk efficiencies. The first two columns show the results of

profit efficiency regressions, and the last two columns show the results of risky efficiency regressions. In former studies, it is found that both profit efficiency and risk efficiency are negative although insignificant ^[2]. Our results are also negative and the result for risk efficiency is also insignificant. However, our result of profit efficiency is significant at the 1% significance level. The coefficients of assets and equity to assets ratio are insignificant for the regression of profit efficiency, meaning that after controlling other factors, bank size does not have a significant impact on the profit efficiency. The coefficients of assets and the equity to total assets ratio are significant at the 5% and 1% significance levels for the regression of risk efficiency, suggesting that the increase of equity to total assets is beneficial to enhancing the stability of commercial banks. The amount of non-performing loans is associated with less profit while having no obvious impact on risk efficiency. The coefficients of the asset growth ratio are significant in both profit and risk efficiencies regression. It is especially important to find that a higher asset growth ratio lowers the risk efficiency, significant under the 1% significance level. Next, we explore the effects of commission and fee income and trading income on profit and risk efficiency. According to Table 3, although commission and fee income and trading income do not have a significant impact on risk efficiency, it has a significant (at the 1% significance level) and negative effect on profit. This relationship is different from former studies ^[3]. In addition, the regression results of control variables are similar to that in the former regression, except that the impact of growth in total assets on profit efficiency becomes insignificant. There may be several reasons for the result, that the negative relationship between non-interest income and bank profit. To begin with, the current situation of Chinese commercial banks does not allow the growth of non-interest income blindly. Nowadays, the type of non-interest income business is relatively simple. Most non-interest income business in commercial banks is slight and low-level, which means banks face high costs and low returns. Under this circumstance, increasing non-interest income blindly is an unwise choice. If banks increase non-interest income business with high costs and low returns, there will be a financial burden on commercial banks, causing a decrease in profit. Secondly, in some banks, there is a high correlation between different businesses. The higher dependence between different products and services, the higher the risks. When there is a problem with one business, the related business will also be in trouble. Last but not the least, a moral hazard problem may exist between commercial banks and the government. Big commercial banks play an important role in the financial market. If a big commercial bank failed, there might be many severe problems, such as the loss of deposits, investment failures, etc. Therefore, the government may take actions to help commercial banks to solve the problem and avoid failures. As a result, some big commercial banks may invest in projects with high returns and high risks that are likely to fail. These kinds of non-interest income businesses may decrease the bank's profit. The result of this model, the negative relationship between non-interest income and profit does not mean that Chinese commercial banks should stop transforming the income structure but find a way to the current situation.

Table 3 the Regression Results of All Banks on Profit and Risk Efficiencies

	Profit efficiency		Risk efficiency	
	<i>All banks</i>	<i>All banks</i>	<i>All banks</i>	<i>All banks</i>
L.NTI_	-0.00408*** (-6.58)		-0.014 (-0.96)	
L.FEEOOR		-0.00865*** (-4.84)		0.059 (-1.41)
L.Trading_		-0.00320*** (-4.51)		-0.0158 (-0.95)
L.Assets_	6.21E-09 (-0.06)	3.50E-08 (-0.35)	0.00000719** (-3.11)	0.00000683** (-2.94)

L.ET_	-0.00119 (-0.20)	-0.00257 (-0.43)	1.904*** (-13.53)	1.915*** (-13.58)
L.NPL_	-0.0000247** (-2.99)	-0.0000251** (-3.03)	-0.0000383 (-0.20)	-0.0000436 (-0.23)
L.Growthintotalassets_	0.00684* (-2.02)	0.00065 (-1.92)	-0.0311*** (-3.91)	-0.0294*** (-3.69)
_cons	0.914*** (-17.74)	0.951*** (-17.7)	38.68*** (-32.05)	37.83*** (-30.05)
Observations	1068	1068	1068	1068

Moreover, we further investigate the determinants of profit and risk efficiency of listed and unlisted banks. First, according to Table 4, in terms of profit efficiency, the negative effect of non-interest income is significant at the 1% significance level for both listed and unlisted banks, which is consistent with the figures for all commercial banks. For listed banks, the effect of fees and commission income is significant at the 1% significance level and trading income is significant at the 10% significance level. For unlisted banks, however, the impact of fees and commission income is not very evident. But the effect of trading income, which is negative, is significant at the 1% significance level. Second, according to Table 5, although the effect of non-interest income is insignificant for banks as a whole, non-interest income has a positive and significant effect on listed banks and a negative and significant effect on unlisted banks. For listed banks, the effect of fees and commission income, and trading income is positive and significant at the 5% significance level. For unlisted banks, however, the impact of trading income is negative and significant at the 10% level and fees and commission income is insignificant. There are several possible reasons to explain this. First, listed banks usually have better internal regulation systems and a well-functioning risk control department. In comparison, unlisted banks are relatively unfamiliar with how to manage a diversified business. Therefore, listed banks could expand non-interest income to decrease the risk. Second, the relatively large size of listed banks means that they have enough capital to achieve the scale of economy of a new department, such as sales and trading. On the contrary, unlisted banks are restricted by the cash flow and capital, unable to invest enough for a new project. Thus, unlisted banks' risk efficiency will decrease as non-interest income increases. Thirdly, the unlisted commercial bank does not need to disclose the information of shareholders, thus leading to the risk of misusing of funds in the non-interest rate business.

Table 4 the Regression Results of Listed and Unlisted Banks on the Profit Efficiency

	Profit efficiency			
	<i>Listed</i>	<i>Unlisted</i>	<i>Listed</i>	<i>Unlisted</i>
L.NTI_	-0.00664*** (-4.88)	-0.00294*** (-4.09)		
L.FEEOR			-0.0110*** (-4.15)	0.000604 (-0.22)
L.Trading_			-0.00342* (-2.40)	-0.00313*** (-3.83)
L.Assets_	-3.74E-08 (-0.45)	0.00000187* (-2.29)	-2.42E-09 (-0.03)	-0.00000232* -2.94
L.ET_	0.0400** (-3.16)	-0.00294 (-0.43)	0.0255* (-2.06)	-0.00161 (-0.23)
L.NPL_	-0.0000220** (-3.19)	-0.0000230*** (-3.90)	-0.0000222** (-3.21)	-0.000232*** (-3.93)
L.Growthintotalassets_	0.00195* (-2.31)	0.000197 (-0.52)	0.00155 (-1.76)	0.000238 (-0.63)
_cons	0.850*** (-9.94)	0.903*** (-13.88)	0.982*** (-10.37)	0.865*** (-13.09)
Observations	360	708	360	708

Table 5 the Regression Results of Listed and Unlisted Banks on the Risk Efficiency

	Risk efficiency			
	<i>Listed</i>	<i>Unlisted</i>	<i>Listed</i>	<i>Unlisted</i>
L.NTI_	0.115*** -3.71	-0.0506** (-2.93)		
L.FEEOR			0.163** -2.71	-0.0518 (-0.79)
L.Trading_			0.103** -3.71	-0.0409* (-2.08)
L.Assets_	0.00000564** -2.97	0.0000267 -1.35	0.00000515** -2.7	-0.0000276 -1.26
L.ET_	2.634*** -9.1	1.665*** -10.03	2.882*** -10.23	1.678*** -10.04
L.NPL_	-0.000124 (-0.79)	0.0000492 -0.35	-0.000124 (-0.79)	0.000446 (-0.31)
L.Growthintotalassets_	-0.0552** (-2.87)	-0.0259** (-2.86)	-0.0481* (-2.41)	-0.0249** (-2.74)
_cons	31.53*** -16.11	41.52*** -26.51	29.49*** -13.7	41.10*** -25.83
Observations	360	708	360	708

4.4 Tests

4.4.1 Model Selection Test

In order to select a suitable model for regression, this paper carried out the Hausman test. The null hypothesis of the Hausman test is that the coefficients of the fixed-effect model and random effect model are similar. If the null hypothesis is not rejected, the random-effects model should be adopted, because the degree of freedom of the fixed effects model will be reduced by differential treatment. The fixed-effect model was used to reject the null hypothesis. Prob> CHI2 was found to be 0.0000 by the test, so the fixed-effect model was adopted in this paper.

4.4.2 Robustness Test

In order to ensure the robustness and accuracy of the research results, this paper adopts variable substitution method to conduct stability test. In this paper, FOCUS and focus-FTO are used to replace non-interest income and its components respectively. FOCUS is an income diversification indicator of the Herfindahl-Hirschman type, as follows:

$$\text{FOCUS} = (\text{NTL}/\text{OR})^2 + (\text{II}/\text{OR})^2$$

Operating Revenue (OR) includes non-interest income (NTL) and interest income (II). Focus measures the diversification of a bank's operating income. The higher the FOCUS value, the lower the diversification and the more concentrated the income type. Since the sample allows us to break down non-interest income into its components, including fee income, trading income and other non-interest income, we also calculate another diversification index (focus-fto) as follows:

$$\text{FOCUS} = (\text{Fee}/\text{OR})^2 + (\text{Trade}/\text{OR})^2 + [(\text{Others}/\text{OR})]^2 + [\text{OR}(\text{II})]^2$$

The proportion of non-interest income is more inclined to measure the development scale of non-interest income of banks, while the index of income diversification is more inclined to measure the development degree of non-interest income business of city commercial banks from the perspective of the income structure of banks. As can be seen from the regression results of the study on bank performance, the proportion of non-interest income, as the explanatory variable, has negative and significant regression coefficients under different models. The regression results after substitution are shown in Table 6 below. It can be seen that the income diversification index is

positively correlated with bank performance and is significant. The higher the index of income diversification (FOCUS), the lower the degree of diversification. Therefore, it can be concluded that the degree of diversification is negatively correlated with bank performance, and the direction of influence of other variables on bank operating performance is basically consistent with the original model, which proves that the conclusions obtained from previous studies in this paper are robust and reliable.

From the results in Table 7 of the original regression model in listed banks, risk efficiency is positively correlated with non-interest income. In the new model, the greater the diversity index value, the lower the degree of diversification, as well as the diversity index has a negative relationship with risk efficiency, which shows a consistent result. Therefore, robustness can be proved. In the unlisted banks' models, the influence directions of the original model and the replacement model are opposite, and the influence directions of other variables are the same. As a result, the accuracy and reliability of the research results in this paper are verified.

Table 6 the Results of Roaa

variables	ROAA [using focus(fto)]						ROAA					
	All banks		Listed		Unlisted		All banks		Listed		Unlisted	
L.FOCUS	0.000 0384* ** (5.47)		0.000 0714* ** (5.61)		0.000 0236* ** (2.80)							
L.NTI_							-0.004 08*** (-6.58)		-0.006 64*** (-4.88)		-0.00 294* ** (-4.09)	
L.FOCUS FTO		0.000 0334* ** (5.71)		0.000 0495* ** (5.01)		0.000 0234* * (3.30)						
L.FEEOR								-0.00 855* ** (-4.84)		--0.01 10** * (-4.15)		0.000 604 -0.22
L.Trading -								-0.00 320* ** (-4.51)		-0.00 342* ** (-2.40)		-0.00 313* ** (3.83)
L.Assets_	1.67e- 09 (0.02)	-1.44e- 09 (-0.01)	-4.08e- 08 (-0.50)	-3.99e- 08 (-0.48)	-0.000 00214 ** (-2.62)	-0.000 00218 ** (-2.68)	0.0000 00006 21 -0.06	3.5E- 08 -0.35	-0.000 00003 74 (-0.45)	-2.42 E-09 (-0.03)	-0.00 0001 87* (-2.29)	-0.00 0002 32* (-2.57)
L.ET_	-0.00 00227 (-0.06)	-0.00 00685 (-0.01)	0.044 0*** (3.49)	0.039 8** (3.16)	-0.001 88 (-0.27)	-0.001 98 (-0.29)	-0.001 19 (-0.20)	-0.00 257 (-0.43)	0.040 0** -3.16	0.025 5* -2.06	-0.00 294 (-0.43)	-0.00 161 (-0.23)
L.NPL_	-0.00 00247 ** (-2.97)	-0.00 00245 ** (-2.94)	-0.00 00221 ** (-3.24)	-0.00 00221 ** (-3.21)	-0.000 229** * (-3.86)	-0.000 225** * (-3.80)	-0.000 0247* * (-2.99)	-0.00 0025 1** (-3.03)	-0.000 0220* * (-3.19)	-0.00 0022 2** (-3.21)	-0.00 0230 *** (-3.90)	-0.00 0232 *** (-3.93)
L.Growth	0.000	0.000	0.001	0.002	0.000	0.000	0.0006	0.000	0.001	0.001	-0.00	0.000

intotalass ets_	705* (2.06)	712* (2.09)	75* (2.10)	11* (2.55)	222 (0.58)	203 (0.54)	84* -2.02	65 -1.92	95* -2.31	55 -1.76	0197 -0.52	238 -0.63
_cons	0.539 *** (7.75)	0.580 *** (9.17)	0.189 (1.37)	0.373 ** (3.10)	0.660 *** (7.88)	0.668 *** (8.70)	0.914* ** -17.74	0.951 *** -17.7	0.850 *** -9.94	0.982 *** -10.3 7	0.903 *** -13.8 8	0.865 *** -13.0 9

Table 7 the Results of Z-Score

variables	Z-score [using focus(fto)]				Z-score			
	Listed		Unlisted		Listed		Unlisted	
FOCUS	-0.000340 *** (-1.92)		0.0000119 (0.11)					
L.NTI_					0.115*** -3.71		-0.0506 ** (-2.93)	
FOCUSFTO		-0.000217 (-1.54)		0.000108 (1.22)				
L.FEEOR						0.163** -2.71		-0.0518 (-0.79)
L.Trading_						0.103** -3.17		-0.0409 * (-2.08)
Assets_	0.0000027 5* (2.33)	0.000002 76* (2.33)	0.0000722 *** (-2.62)	0.0000727 *** (6.13)	0.0000056 4** -2.97	0.0000051 5** -2.7	0.00002 67 -1.35	0.00002 76 -1.26
ET_	5,522*** (31.85)	5.542*** (32.06)	4.476*** (33.47)	4.485*** (33.59)	2.634*** -9.1	2.882*** -10.23	1.665** * -10.03	1.678** * -10.04
NPL_	-0.000145 (-1.45)	-0.000146 (-1.45)	-0.00794* ** (-25.95)	-0.00795* ** (-26.03)	-0.000124 (-0.79)	-0.000124 (-0.79)	0.00049 2 -0.35	0.00044 6 -0.31
Growthintotalas sets_	-0.000738 (-0.06)	-0.00257 (-0.22)	-0.0106 (-1.40)	-0.0114 (-1.50)	-0.0552** (-2.87)	-0.0481* (-2.41)	-0.0259 ** (-2.86)	-0.0249 ** (-2.74)
_cons	19.25*** (3.80)	18.22*** (3.66)	43.47*** (3.29)	42.68** (3.23)	31.53*** -16.11	29.49*** -13.7	41.52** * -26.51	41.10** * -25.83

5. Future Implications

With the advent of the era of financial openness, new challenges and requirements have been put forward for the management of commercial banks in China. We have explored the factors that influence the returns and risks of listed and unlisted banks. Based on the above, we will put forward the development policy of commercial banks from a macro perspective.

5.1 Take Different Measures for Listed and Unlisted Banks.

For listed banks, steadily increase non-interest income. Steadily expanding non-interest income is a necessary way to improve the risk efficiency of banks in the future. The source of commission and commission income is more stable and less risky. While improving work efficiency and service level, we will appropriately expand personalized products in combination with our own characteristics, develop high-value-added businesses such as consultants, information, and financial

services, reduce business costs and increase revenue. However, due to fierce competition, the market tends to be saturated. For unlisted banks, it is advised that a more prudent approach should be taken in terms of the non-interest income. While maintaining the stable development of traditional noninterest businesses, banks need to consider the utility of non-interest income businesses from multiple perspectives such as comprehensive income, cost, and risk. Therefore, these commercials, given their own scale, market, customer resources, and influence should not blindly expand into the brand-new non-interest business.

5.2 Optimize the Structure of Non-Interest Income.

Commercial banks should make full use of big data technology and financial technology platform, actively promote business reform and upgrading, strengthen the innovation of high-quality financial products, optimize the business structure of non-interest income, balance the relationship between risk and income, and disperse bank risks. At the same time, we should pay attention to the business structure of handling fees and commission income. As the noninterest business with the highest proportion of non-interest income business, the positive effect of commission income business on banks' income cannot be ignored. Therefore, commercial banks should optimize their internal structure to suit their own bank development and seek the best structure of risk and income when developing Commission and commission income business.

5.3 Strengthen the Supervision of Non-Interest Income Business.

As the risks of non-interest income business to various listed or non-listed banks are different, commercial banks should establish and improve the risk control system to control the costs of various non-interest income businesses; Government regulators should improve the supervision of various types of non-interest income activities, strengthen policy incentives for non-interest income business, and guide the rational development of non-interest income business; Set up a special regulatory department to monitor the business risk of non-interest income in real-time and strictly control the risk of the banking system.

6. Conclusion

To sum up, according to the empirical data and model analysis above, it is concluded that the increase in non-interest income will decrease the profit efficiency of commercial banks. But the increase in non-interest income has no evident impact on commercial banks' risk efficiency. When we look further into the situation of listed and unlisted banks, the result of profit efficiency is largely unchanged. However, it is found that listed banks could enhance the risk efficiency by diversifying their income, while the move will only further decrease the risk efficiency for unlisted banks. Our statistical method turns out to be robust as different tools are applied to test it. Finally, we propose that policymakers should implement effective measures in terms of the healthy development of commercial banks according to these findings.

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