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Study on the Impact of Financial Technology on Risk Taking of Commercial Banks

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Abstract: Under the impact of the wave of financial technology, commercial banks must be alert to the new risk reef hidden in the deepwater while adjusting the course and transforming. From the perspective of credit structure, based on the panel data of 42 Chinese commercial banks from 2011 to 2022, this paper constructs a two-way fixed-effect model to empirically test the impact of financial technology on commercial banks' risk taking and the mechanism of bank credit structure in it. The research finds that fintech significantly reduces the risk taking of commercial banks, and this is achieved through two paths: increasing the proportion of personal loans and reducing the proportion of manufacturing loans. Further analysis shows that fintech has a more significant effect on regional commercial banks' risk taking. This study not only provides new insights for commercial banks to develop fintech, but also provides inspiration for regulators to prevent and resolve financial risks and maintain stable economic operation.

Keywords: Financial Technology; Commercial Banks; Risk Bearing Leve; Credit Structure.

1. Introduction

As an important part of financial institutions, commercial banks have always played an extremely key role in the stable operation of a country's economy and the healthy development of society. According to the financial industry operation data in 2023, the commercial banking system occupies a dominant position with an asset scale of 417.29 trillion yuan, and its industry accounts for 90.5% of the total scale of the financial system." Better coordinate development and security, and effectively prevent and defuse risks in key areas, "according to the government work report for 2024.In recent years, financial risks and banking risks have attracted more and more attention from scholars and government personnel(ALTUNBASY,2022;Li Shuang jian et al.,2022) [1][2].The necessary prerequisite for the sound operation of the financial system is to effectively activate the central role of financial institutions in the chain of risk identification, early warning and disposal. Commercial banks play an irreplaceable role in maintaining the steady operation of the financial market, which directly affects the healthy development of the national economy. Therefore, based on the background of China's financial system with banks as the pillar, how to prevent and resolve commercial bank risks is very important [3].

With the advantages of intelligence, high efficiency and low cost, the advent of financial technology has quickly attracted the attention of the financial industry, and various connected financial platforms have emerged in an endless stream. In the financial technology development Plan (2022-2025), the People's Bank of China proposed to improve the automated risk control mechanism, deepen the application of financial technology, and promote the transformation of risk management from" civil air defense "to "technical defense" and "intelligent control". Li Maolin et al.(2024)pointed out that fintech has now become a new tool for the digital transformation of commercial banks and an important starting point for preventing and resolving financial risks[4].Broby Daniel(2021)believes that the wide application of fintech in the banking industry has profoundly changed the development mode and direction of banks, and has influenced the present and future of the banking industry[5].In order to respond to the call of policies and the fierce competition in the market, more and more commercial banks setup financial technology subsidiaries, cooperate with Internet technology companies or carry out technological innovation on themselves, improve service quality and efficiency, reduce information asymmetry to improve loan structure, and play an important role in risk taking.

However, as financial technology is a new thing, it will inevitably produce new problems and bring new risks in the process of development and application. This stems not only from the irregular operation of technology companies and their lack of experience in applying new things, but also from the fact that relevant policies and regulations have not been put in place. In addition, China's market and financial system is not perfect compared with other developed countries, which also gives illegal activities and gray industries opportunities, a large number of irregular rand illegal activities with the help of financial technology affect the smooth operation of the entire economy. In view of this, it is of important practical and policy significance to study how fintech affects the risk taking of commercial banks, which can help promote the rational allocation of resources and enhance the ability of financial services to the real economy.

2. Literature Review

2.1. Related Research on Financial Technology

As an innovative product of the structural reform of the financial supply side, fintech essentially realizes the two-way empowerment of financial services and digital technology. Yang Rui et al. (2024) proposed that fintech innovates in financial services on the basis of technology [6]. The value core of fintech has not separated from the essential attributes of finance, and its innovation path is manifested as a progressive replacement of the traditional financial intermediary paradigm by technology-driven element reorganization.

The measurement of the current development level of

fintech mainly includes three measures: Internet finance, media's attention index on fintech and different models of banks' fintech busines.

The first Internet finance index focuses on squeezing the credit business of traditional banks through Internet channels, which more reflects the competitive effect of technology giants on traditional banks, and lacks the identification of the development level of fintech from the perspective of banks. For example, the Digital Financial Inclusion Index of Peking University is widely used in existing literature as an effective identification of fintech (Guo Feng et al.,2020; Teng Lei and Ma Degong, 2020) [7][8].

Second, the media attention index is mainly based on text mining methods. For example, Sheng Tianxiang et al. (2022) used fintech word frequency to construct the fintech index. However, due to the limitations of exposure forms and information platform disclosure, the total number of news can only be counted and identified from a full perspective, resulting in large errors. It is easily affected by the construction method of the saurus, the effectiveness of news, and the noise generated by massive information [9].

Third, set up subsidiaries. For example, Zhang(2022) identifies and measures the development level of fintech through the announcement on the official website of a bank on whether to establish a fintech subsidiary [10].Zhu Shiyi et al. (2024) evaluated the financial technology development level of commercial banks based on[11].However, this method does not cover multiple channels for banks to carry out fintech business, and it is difficult to reflect the ways in which fintech affects banks.

In addition, Gao Haoyu et al.(2022) selected the number of city fintech-related patent outputs as the proxy variable to measure the development level of city fintech, and represented the level of city fintech development by the number of patent outputs [12].Guo Ye et al. (2022) collected announcements on the official website of banks and measured their fintech level by the number of strategic cooperation between banks and technology enterprises [13].Inspired by the measurement of enterprise innovation ability, Wang Daoping et al.(2022)removed utility patents and appearance patents unrelated to fintech, and measured the fintech development level of a single bank by summing the number of screened patents and the number of software Copyrights[14].

2.2. Relevant Research on The Risk Bearing Level of Commercial Banks

At present, there is no unified standard definition of bank risk taking. Quite a lot of literature holds that bank risk taking is the category of banks' initiative, which refers to the willingness of banks to take risks and the decisions they make. We cannot simply equate bank risk with bank risk taking. The so-called risk refers to the unexpected uncertainty of assets, stock prices and earnings. From the perspective of bank risk taking, bank risk can be divided into the risks that banks take actively for profit and the risks that they accept passively when they are unexpected.

As for the measurement of bank risk taking, for along time, due to the great significance of loan business to banks and people's lack of understanding of bank risk, a large number of literatures have examined bank risk taking from the perspective of loan. For example, Yan Jingrui et al. (2024) used the non-performing loan ratio to measure bank risk-taking [15], and Jiang Hai et al.(2023) used the Z-value of bankruptcy risk to measure bank risk-taking [16]. However, in recent years, the proportion of loan business in banking business has shown a declining trend, and the proportion of non-interest income of Chinese commercial banks has increased year by year. Continuing to use loan to measure bank risk bearing will lead to one-sided results. In fact, the study of bank risk taking from the perspective of asset allocation has been supported by a large number of scholars. For example, Sun Li et al. (2022) used the asset-capital ratio to measure bank risk taking [17]. In the field of bank risk measurement, RWA/TA ratio has become a mainstream measurement tool. GuoNa's team(2024) assessed banks' risk appetite through the ratio of risk assets, which echoed the methodology of empirical research design based on regulatory capital framework developed by Liang Fang et al. (2022) [18][19].

2.3. Relevant Research on the Impact of Financial Technology Development on the Risk-Taking Level of Commercial Banks

Some scholars believe that the development of fintech has significantly improved the risk taking level of commercial banks. Guo Na et al.(2024),by constructing a bank deposit and loan return model constrained by financial technology, believes that the application of financial technology will stimulate banks to take more risks and improve the level of commercial banks' active risk taking. Liang Fang et al.(2022) found that the development offintech could alleviate the restraining effect of macroeconomic uncertainty on commercial banks' active risk taking, and further found through research that the development of fintech would not promote commercial banks to take excessive risks.

Some scholars hold the opposite view, believing that the development of fintech can significantly reduce the level of risk taking of commercial banks.Hu Jing et al.(2023)made a textual analysis of the annual reports of 150 commercial banks and found that commercial banks can reduce the information asymmetry between banks and enterprises through the development of financial technology, and thus reduce the risk bearing level of commercial banks[20].Zheng Zongjie et al.(2022)conducted an empirical analysis based on the panel data of 61 commercial banks from 2013 to 2020,and found that financial technology can significantly reduce the risk bearing level of commercial banks[21].

In addition,some scholars have found that there is a non-linear relationship between the development of fintech and the risk taking level of commercial banks.Liu Mengfei et al.(2021)selected the panel data of 130 commercial banks in China from 2007 to 2017,analyzed the impact of fintech on commercial banks'risk taking and its heterogeneity,and found that the impact of fintech on commercial banks'risk taking presents an inverted"U"-shaped relationship that first increases and then decreases[22].

3. Influence Mechanism and Research Hypothesis

3.1. Mechanism Analysis of The Influence of Financial Technology Development on The Risk Bearing Level of Commercial Banks

As one of the most important pillars of commercial banks and the main source of profits, the risk of credit business has been concerned by all sides. On the one hand,financial

technology enables technology companies to constantly squeeze the space and scope of commercial banks' credit business through Internet financial platforms and huge Internet user channels, forcing commercial banks to turnaround and embrace financial technology in the crisis. On the other hand, commercial banks generally favor "big customers" and "big account industries", which makes the concentration of credit resources tend to head groups, which also leads to the concentration of risks.In the period of economic downturn, it is often easy to form great losses. The most typical is the bankruptcy of Baoshang Bank in 2019.The main reason for its bankruptcy is the huge credit granted to the major shareholder "tomorrow system". The manufacturing industry, real estate industry and other industries in the forefront of commercial bank credit, although inseparable from China's economic background, but as China's economic development to the direction of high-quality change, these credit concentration is too high in the industry will undoubtedly face great changes, and then cause great risks to commercial banks.

In the face of fierce competition, commercial banks actively embrace financial technology, or cooperate with external technology companies, or achieve technological and business transformation and upgrading through research and development themselves,so as to improve credit structure, improve operating efficiency, and reduce costs and expenses. Specifically, on the one hand, the application of financial technology can enhance the risk management ability of banks. Through big data analysis and artificial intelligence technology, banks can more accurately assess the credit risk of borrowers and predict the repayment ability and willingness of small and micro enterprises and retail customers, so as to ensure the fairness and rationality of loan decisions. This refined risk assessment helps banks allocate credit resources reasonably and reduce their dependence on a single or a few large customers,thus spreading risks.

On the other hand,due to the uncertain future cash flow and insufficient collateral,the loan default risk of manufacturing enterprises,especially high-tech enterprises,is generally higher than that of enterprises with sufficient collateral or implicit government guarantee.Fintech can optimize the credit structure,provide more credit services to small and micro enterprises and retail customers,and reduce the credit allocation to the manufacturing industry with greater uncertainty, thus reducing the risk bearing of commercial banks.Based on the above analysis,this paper proposes the following hypothesis:

H1:The development of fintech can reduce the risk bearing level of commercial banks.

H2:Fintech can reduce the risk level of commercial banks by increasing the proportion of personal loans in commercial banks.

H3:Fintech can reduce the risk taking level of commercial banks by reducing the proportion of manufacturing loans.

3.2. The Heterogeneous Impact of Fintech Development on Commercial Banks' Risk Bearing Level

Six state-owned banks, namely Bank of China, Agricultural Bank of China, Industrial and Commercial Bank of China, Construction Bank,Bank of Communications and Postal Savings Bank, together with nine joint-stock commercial banks such as China Merchants Bank and China CITIC Bank, are far ahead of other commercial banks in terms of capital scale and number of customers.In the process of maintaining the stable and orderly operation of the national economy, They play an important role in the stable and orderly operation of the national economy. These nationalcommercial banks have stricter requirements for risk control, and their credit business will be more standardized and prudent, so the marginal role offintech in taking risks for national commercial banks maybe reduced.

Compared with national commercial banks, the technical foundation of urban and rural regional commercial banks is obviously much weaker, and the enabling effect brought by financial technology will significantly affect regional banks. In addition, regional banks often have the problems of irregular processes and difficult identification of risk information. With the help of financial technology, information asymmetry can be effectively reduced, a sound risk assessment system can be established, and credit quality can be improved. Therefore, the marginal role of financial technology on their risk taking will be strengthened. To sum up, this paper puts forward the H4 hypothesis:

H4: The impact offintech on risk taking of commercial banks is heterogeneous in terms of bank types.

4. Research Design

4.1. Sample Selection and Data Source

Considering that the Pilot Implementation Plan for Promoting the Integration of Technology and Finance was promulgated at the end of 2010, 42 commercial banks in China's A-share market from 2011 to 2022 were selected as research objects in this study. In order to reduce the influence of extreme values, 1% and 99% tail reduction were performed on all continuous variables in the sample, and 504 observed values were finally obtained. The data were mainly derived from WIND, CNRDS, CSMAR and bank annual reports.

4.2. Variable Selection

4.2.1. Interpreted Variables

Referring to the studies of Guo Na et al. (2024) and Liang Fanget al. (2022), this paper uses the ratio of risk-weighted assets to total assets (RWATA) to measure bank risk taking. Rwata is expressed as credit risk-weighted assets + market risk-weighted assets + operational risk-weighted assets.

4.2.2. Core Explanatory Variables

With reference to the research of Sheng Tianxianget al. (2020), this paper firstly sorted out the Baidu search index of fintech-related keywords in each province by hand, then summarized and synthesized the comprehensive index using the entropy method, and finally divided by the number of permanent residents in each province to measure the development level offintech in each province [23].Keywords related tofintech areas follows: Fintech, Internet finance, artificial intelligence, big data, cloud computing, blockchain, biometrics, mobile payment, online payment, third-party payment, online loan, online loan, online banking, electronic banking, Internet banking, direct banking.

4.2.3. Control Variables

Based on the reference of previous literature research results, this paper selects control variables from the micro level and macro level respectively. One is the micro control variables of banks, including the asset-liability ratio (TDR), cost-income ratio (CTL), and net interest rate on total assets (ROA) of commercial banks. The other is macro-regional control variables, including per-capita GDP(PGDP) of

prefecture-level cities and inflation index (CCPI) of prefecture-level cities.

4.3. Model Design

4.3.1. Fixed Effect Model

This paper constructs the following regression model to analyze the impact of the development of fintech on the risk taking of commercial banks. The baseline regression model is as follows:

$$RWATA=\alpha+\beta FINTECHit+\gamma Controlsit+\mu i+\delta i+\varepsilon it \quad (1)$$

Where RWATA is explained variable bank risk bearing; FINTECH is the development level of financial technology; Controls represents control variables, including bank micro-control variables and macroeconomic control variables; μi is the bank's individual fixed effect, δi is the time fixed effect, εit is the random disturbance term.

5. Empirical Results and Analysis

5.1. Descriptive Statistics

Table 1 is descriptive statistics. It can be seen that the maximum value of bank risk taking of the explained variable is 0.775, and the minimum value is 0.382, with a large gap. The maximum value and minimum value of the development level of fintech in the explained variable are 0.0981 and 0.0045, indicating that the level offintech in different provinces varies greatly.

Table 1. Descriptive statistics

Variable	Variable meaning	Observations	Mean	Std.Dev.	Min	Max
RWATA	Bank risk-taking	504	0.636	0.0756	0.382	0.775
FINTECH	Level of fintech development	504	0.0414	0.0237	0.0045	0.0981
TDR	Asset-liability ratio	504	92.87	1.238	90.16	96.25
CTL	Cost-income ratio	504	31.2	5.844	21.51	59.01
LDR	Loan-to-deposit ratio	504	71.95	13.95	32.32	106.3
ROA	Profitability	504	0.977	0.249	0.439	1.649
PGDP	Regional economic growth rate	504	11.36	0.46	10.11	12.16
CCPI	Regional inflation levels	504	102.4	1.051	100.7	105.6
MFI	Share of manufacturing loans	504	16.79	11.24	5.06	62.29
LOAN	Percentage of personal loans	504	28.61	11.71	5.70	59.97

5.2. Baseline Regression Results

Table 2. Impacts of fintech on risk taking of commercial bank

	(1)	(2)
VARIABLES	RWATA	RWATA
FINTECH	-1.266***	-1.773***
	(-4.39)	(-6.71)
ROA		0.032**
		(2.27)
TDR		-0.017***
		(-6.20)
CTL		0.001
		(1.05)
LDR		0.001***
		(4.88)
PGDP		0.094**
		(2.53)
CCPI		0.008*
		(1.92)
Constant	0.688***	0.189
	(56.88)	(0.28)
Individual fixation effect	yes	yes
Year fixed effect	yes	yes
Observations	504	504
R-squared	0.733	0.794
F	19.23	22.36

Table 2 shows the impact offintech development on commercial banks' risk taking. In column (1), only the "individual-year" fixed effect is controlled. The results show that there is a significant negative correlation between the development offintech and the risk taking of commercial banks, and the regression coefficient of fintech is -1.266. After adding control variables, the results in column (2) show that the regression coefficient offintech is -1.773, which is significant at the 1% level, and the control variables have a significant impact on the overall population: From the micro level of banks, profitability (ROA) and loan-to-deposit ratio (LDR) significantly improve the risk taking level of

commercial banks, while asset-to-liability ratio (TDR) significantly reduces the risk taking level of commercial banks. From the macro-economic perspective, regional economic growth rate (PGDP) and regional inflation level (CCPI) significantly increase the risk level of commercial banks.

It can be concluded that the development of fintech significantly reduces the risk taking of commercial banks, and hypothesis H1 is verified.

5.3. Endogeneity Test

In order to solve the possible endogeneity problem in the benchmark model, referring to the practices of Peng Yuchao et al. (2022) and Li Haiqi et al. (2022), INTERNET penetration rate (INTERNET) was selected as the instrumental variable [24][25]. The selection of instrumental variables usually satisfies both correlation and externality. From the perspective of correlation, Internet, as the main carrier and communication channel of fintech, has a direct impact on the coverage breadth and use depth of fintech services. Therefore, from the perspective of correlation characteristics, Internet penetration and fintech are closely related, which meets the conditions of correlation. From the perspective of exogenous characteristics, Internet penetration, as a regional indicator, reflects the Internet access of residents in the region, and has nothing to do with the use of fintech by individuals or enterprises, so it has exogenous characteristics. In this paper, the two-stage least squares method (2SLS) was used to evaluate the model, and the results are shown in Table 3.

In the first stage, the F statistic is greater than 10, and the INTERNET penetration (INTERNET) coefficient is significantly negative, indicating that there is a significant correlation between instrumental variables and endogenous explanatory variables. In the second stage regression, the coefficient of fintech is significantly negative, and the coefficient becomes larger than that of the benchmark regression, which indicates that the previous benchmark regression underestimated the role offintech in reducing the risk taking of commercial banks, and further verifies the hypothesis of this paper.

Table 3. Endogenous treatment: instrumental variable method

2LLS estimation		
	Stage One	**Stage Two**
VARIABLES	**FINTECH**	**RWATA**
INTERNET	-0.003353***	
	（-5.48）	
FINTECH		-3.20741 ***
		(-4.02)
TDR	0.0002539	-0.015585***
	（0.46）	(-4.20)
CTL	6.91e-06	0.0007984
	(0.05)	(0.66)
LDR	0.0000739	0.001788***
	(0.66)	(2.93)
PGDP	-0.0017224	0.082103
	(-0.16)	(1.48)
ROA	-0.0039742	0.0384888
	(-0.97)	(1.59)
CCPI	0.0006554	0.0101176*
	(0.70)	(1.88)
Individual fixation effect	yes	yes
Year fixed effect	yes	yes
Kleibergen-Paap rk LM statistic		15.521***
Cragg-Donald Wald F statistic		241.991***
Kleibergen-Paap rk Wald F statistic		30.052***
F statistic		30.05
Hansen J statisticsP-values		0.000
Observations	480	480
R-squared		0.598

5.4. Robustness Test

5.4.1. Change Explanatory Variables

With reference to the study of Yan Jingrui et al. (2024), the DID-difference DID model is constructed to test the impact of financial technology on the risk taking of commercial banks. The binary dummy variable TREAT is constructed according to whether the listed bank has established a financial technology subsidiary, and the value of TREAT is 1 when it is established, or 0 if it is not. If the listed bank establishes its FINTECH subsidiary in the first half of the year, the value of FINTECH in the current year and the following years is assigned 1; if the listed bank establishes its FINTECH subsidiary in the second half of the year, the value of fintech in the current year is assigned 0, and the value of fintech in the following years is assigned 1. The explanatory variable FINTECH DID is the cross term of TREAT and fintech.

The regression results obtained are shown in Table 4. The regression coefficient of fintech on the risk taking of commercial banks is -0.036, which is significant at 1% level. The research results are consistent with the benchmark case, which strongly confirms that the research conclusion has good robustness.

Table 4. Change of explanatory variables

VARIABLES	RWATA
DID	-0.036***
	(-4.58)
TDR	-0.020***
	(-6.91)
CTL	0.000
	(0.20)
LDR	0.001***
	(3.73)
PGDP	0.143***
	(3.70)
CCPI	0.009*
	(1.91)
ROA	0.016
	(1.13)
Constant	-0.134
	(-0.19)
Individual fixed effect	yes
Year fixed effect	yes
Observations	504
R-squared	0.783

5.4.2. Explanatory Variables Lag by One Phase

Table 5. Explanatory variables lag by one stage

VARIABLES	RWATA
L.FINTECH	-1.572***
	(-6.42)
TDR	-0.022***
	(-7.65)
CTL	0.000
	(0.64)
LDR	0.001***
	(3.92)
PGDP	0.105***
	(2.84)
CCPI	0.010**
	(2.37)
ROA	0.041***
	(2.94)
Constant	0.371
	(0.56)
Individual fixed effect	yes
Year fixed effect	yes
Observations	462
R-squared	0.813
r2_a	0.786
F	24.37

Because fintech requires a lot of investment in the early stage, the impact on enterprises may not be immediately apparent, but only after a period of time. Therefore, this paper will delay the explanatory variables by one period to verify the robustness of the benchmark model. The regression results obtained are shown in Table 5. The regression coefficient of financial technology on the risk taking of commercial banks is -1.572, which is still significant at 1% level, which verifies the robustness of the study.

5.5. Impact Mechanism Test

The impact offintech on the risk taking of commercial banks can be explained by the proportion of personal loans and manufacturing loans. On the one hand, through fintech, commercial banks reduce information asymmetry, better launch personalized credit products to meet the needs of a wide range of customers, reduce the credit concentration of large customers, and improve the quality and efficiency of credit allocation. On the other hand, fintech optimizes the credit structure, provides more credit services to small and micro enterprises and retail customers, and reduces credit allocation to the manufacturing industry, which has greater uncertainty, thus reducing the risk taking of commercial banks. Therefore, in this paper, personal LOAN ratio and manufacturing loan ratio (MFI) are taken as intermediary variables, and an intermediary model is built based on the intermediary effect of Jiang Dingsheng et al. (2022) [26].

First, the direct effects offintech on risk taking of commercial banks are tested:

$$RWATA=\alpha+\beta FINTECHit+\gamma Controlsit+\mu i+\delta i+\varepsilon it \quad (2)$$

Second, the direct impact offintech on the share of personal loans and the share of manufacturing loans is as follows:

$$LOAN=\alpha+\beta FINTECHit+\gamma Controlsit+\mu i+\delta i+\varepsilon it \quad (3)$$

$$MFI=\alpha+\beta FINTECHit+\gamma Controlsit+\mu i+\delta i+\varepsilon it \quad (4)$$

The results offintech reducing the risk taking of commercial banks through the proportion of personal loans are summarized in Table 6.Column(1)shows that fintech significantly reduces the level of risk taking of commercial banks, and column(2)shows that the regression coefficient of explanatory variable Fintech on the proportion of personal loans is positive and significant at the level of 1%,which means that fintech helps to increase the proportion of personal loans. It is generally believed in the existing literature that the proportion of personal loans affects the risk taking of commercial banks. For example, Yan Jingrui et al.(2024) believe that fintech can help improve the credit structure of commercial banks, reduce information asymmetry, and screen out more high-quality customers from the large number of long-tail customers. Therefore,this paper believes that part of the influence of fintech on commercial banks'risk taking is realized by increasing the proportion of personal loans, assuming H2 is verified.

The results o ffintech reducing the risk taking of commercial banks through the proportion of manufacturing loans are summarized in Table 7. Column (2) shows that the regression coefficient of explanatory variable Fintech on the proportion of manufacturing loans is negative and significant at the level of 5%, which means that Fintech can help reduce the proportion of manufacturing loans. According to relevant literature, the proportion of manufacturing loans is an important factor affecting the risk taking of commercial banks. For example, Guo Naet al. (2024) believe that the default rate of manufacturing loans is relatively high, and more credit resources flowing to the manufacturing industry will increase the risk taking of commercial banks. Therefore, this paper believes that part of the influence offintech on commercial banks' risk taking is achieved by reducing the proportion of manufacturing loans, and hypothesis H3 is verified.

5.6. Heterogeneity Analysis

From the perspective of a full sample, the above paper studies the impact of fintech on the risk taking of commercial banks, and passes the endogeneity and robustness tests. However, under the differences of different asset sizes and different types of commercial banks, the impact of fintech on their risk taking may have a heterogeneous effect. Therefore, this paper will conduct a heterogeneity test on a sub-sample of commercial banks.

Table 6. Tests the mediating effect of the ratio of personal loans to commercial banks' risk taking

	(1)	(2)
VARIABLES	**RWATA**	**LOAN**
FINTECH	-1.773***	167.302***
	(-6.71)	(5.46)
ROA	0.032**	6.506***
	(2.27)	(4.03)
TDR	-0.017***	0.504
	(-6.20)	(1.59)
CTL	0.001	0.246***
	(1.05)	(3.47)
LDR	0.001***	0.037
	(4.88)	(1.06)
PGDP	0.094**	2.119
	(2.53)	(0.49)
CCPI	0.008*	1.152**
	(1.92)	(2.26)
Constant	0.189	-183.846**
	(0.28)	(-2.33)
Individual fixed effect	yes	yes
Year fixed effect	yes	yes
Observations	504	504
R-squared	0.794	0.885

Table 7. Testing the intermediation effect of the loan ratio of manufacturing industry on the risk taking of commercial banks

	(1)	(2)
VARIABLES	**RWATA**	**MFI**
FINTECH	-1.773***	-58.925**
	(-6.71)	(-2.48)
ROA	0.032**	2.420*
	(2.27)	(1.94)
TDR	-0.017***	-1.195***
	(-6.20)	(-4.88)
CTL	0.001	-0.233***
	(1.05)	(-4.26)
LDR	0.001***	-0.059**
	(4.88)	(-2.18)
PGDP	0.094**	4.859
	(2.53)	(1.45)
CCPI	0.008*	-1.443***
	(1.92)	(-3.65)
Constant	0.189	231.992***
	(0.28)	(3.80)
Individual fixed effect	yes	yes
Year fixed effect	yes	yes
Observations	504	504
R-squared	0.794	0.925

According to the types of commercial banks, this paper divides them into national commercial banks and regional commercial banks. National commercial banks include state-owned banks and joint-stock banks, while regional banks include city commercial banks and rural commercial banks. The regression results are shown in Table 8. The influence coefficient of financial technology on the risk taking of both banks is negative, and the influence on regional commercial banks is significant at 1%,while the influence on national commercial banks is not significant. According to the above analysis, national commercial banks are more cautious and standardized in risk management and control, and their risk-bearing behaviors are more stable. In contrast, regional businesses are more willing to significantly improve their operating efficiency and improve their credit structure through fintech, so that fintech has a stronger marginal impact on regional commercial banks' risk taking. Hypothesis H4 is verified.

6. Research Conclusion and Policy Recommendations

By combing past literature, this paper systematically expounds the mechanism of financial technology affecting the risk taking of commercial banks. Taking 42 commercial banks from 2011 to 2022 as the research objects, this paper empirically tested the effect offintech development on commercial banks' risk taking by using two-way fixed effect model test, and further tested the mechanism of personal loan ratio and manufacturing loan ratio as intermediary variables, and finally conducted heterogeneity analysis according to different types of commercial banks. The following research conclusions are drawn:

(1) The development of financial technology significantly reduces the risk taking of commercial banks.

Table 8. Heterogeneity test

	(1)	(2)
VARIABLES	**RWATA**	**RWATA**
	Regional commercial banks	**National commercial banks**
FINTECH	-1.145***	-0.253
	(-2.60)	(-0.49)
TDR	-0.020***	-0.028***
	(-6.27)	(-4.97)
CTL	0.001	-0.000
	(1.30)	(-0.22)
LDR	0.001***	0.003***
	(3.02)	(6.07)
ROA	0.034**	0.039
	(2.00)	(1.63)
PGDP	0.163***	0.059
	(3.66)	(0.78)
CCPI	-0.000	0.004
	(-0.02)	(0.69)
Constant	0.563	1.892
	(0.65)	(1.47)
Individual fixed effect	yes	yes
Year fixed effect	yes	yes
Observations	324	180
R-squared	0.775	0.899
r2_a	0.740	0.878
F	17.85	13.75

(2)Fintech can reduce the risk taking of commercial banks by increasing the proportion of personal loans and reducing the proportion of manufacturing loans.

(3)Compared with national commercial banks, fintech has a stronger marginal impact on regional commercial banks' risk taking.

The 14th Five-Year Plan proposes to accelerate China's financial reform, opening up and development from six aspects, including preventing financial risks and promoting the development of financial technology. In this context, combining the conclusions of this paper, the following suggestions are put forward:

(1)Commercial banks should make full use of the advantages brought by financial technology, develop new personalized financial products to meet the needs of different types of customers, and use big data, artificial intelligence and other technologies to reduce the information asymmetry between credits, expand the breadth and depth of financial services, reduce dependence on large customers, and provide quality services for small and medium-sized enterprises and retail customers.

(2)For different types of banks, large commercial banks,as the key to supporting the economy,need to be cautious and concerned about the systemic risks that may be brought about by fintech.At the sametime,by relying on their own expertise and technology,they should develop and establish platforms for resource sharing and help all parties in the financial industry to cooperate and win.Small and medium-sized banks should make reasonable use of fintech to create personalized strategies and services in accordance with regional characteristics, so as to meet the financing needs of local enterprises.

(3) While bringing opportunities, fintech has also brought new challenges and risks. In recent years, problems such as shadow banking and P2P have occurred frequently, causing huge risks and losses to the entire financial system. Regulators should constantly update financial regulatory tools and norms to identify risks in the financial market in a timely manner.

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