

The Impact of Internet Finance on Interest Income and Non-interest Income of Commercial Banks: Empirical Evidence from China

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ABSTRACT

With the development of the technology, internet finance has become one of the fastest-growing industries in China in recent years. Its business involves lending, savings, payment and investment, which coincided with the main business of banks. In order to study the impact of internet finance on the banking industry, this paper makes an empirical analysis using the data of 115 commercial banks in China from 2011 to 2018 and the data of two primary businesses of internet finance: P2P lending and third-party payments. The monetary funds in the third-party payment platform provides a higher interest rate than the bank account, and has similar security and flexibility, resulting many depositors transferring their deposits to the third-party platform. Compared with bank loans, P2P lending is handled more quickly and has lower collateral requirement, which leads some borrowers turning to use P2P lending platforms. Thus, the banks' credit business was negatively impacted by internet finance, resulting in a decline in the bank's interest income. On the contrary, because the development of internet finance promotes the diversity of financial markets and accelerates the circulation speed of money, internet finance has a positive spill-over effect on the non-interest income of banks. However, the main profit source of Chinese banks is still the spread between the deposit and loans, which leads to the decline of the return on assets of banks despite the positive impact of internet finance on non-interest income of banks.

Keywords: Internet finance, Commercial bank, Profitability

1. INTRODUCTION

1.1. Background

The rapid development of technology in China has led to the combination of the internet and finance, forming the internet finance industry. In the past decade, internet finance has developed rapidly. By 2018, the total amount of China's third-party payments exceeded 300 trillion yuan, and the scale of P2P lending reached 800 million yuan. The rapid expansion of internet finance will inevitably affect the operation of traditional commercial banks. The question is, whether internet finance impacts the credit business and other intermediate businesses of China's commercial banks? If so, the impact is positive or negative? In other words, is internet finance a complement that will boost banking growth or a substitute that will erode banking profit? Answering these questions will help guide the reform of China's commercial banks and promote the mutual cooperation

and joint development of traditional banking and internet finance.

1.2 Related Research

There are disputes about the impact of P2P lending on bank credit business. Some scholars believe that P2P lending can become a substitute for banks to provide loans services for borrowers. Therefore, the development of P2P lending will lead to a decrease in bank credit business volume and interest income. Cornaggia et al. proposed that peer-to-peer loans can replace some bank loans, which seem to be driven by loans with low credit quality. Small banks with assets of less than \$300 million suffer more significant losses in the quantity and quality of loans [1]. Similarly, from the perspective of rural banks, Kohardinata et al. found that the growth of P2P lending can replace the credit growth of rural banks in Indonesia. After the cooperation between the Rural Bank Association and FinTech Association in 2019, the substitution effect transformed into a complementary

effect [2]. Other scholars believe that P2P lending can provide loans to users whose credit cannot meet the bank loan standards, so they should be used to supplement bank loans. For example, Milne and Parboteeah point out that although peer-to-peer lending is snowballing in developed countries such as Britain, it only represented less than 1% of bank lending until 2016. The author argues that P2P lending should be seen as a complement to banking rather than a substitute of banking due to the differences in business models between P2P lending and traditional banking. By cooperating with peer-to-peer lending platforms to provide loan services to customers, banks can reduce their risk costs and focus on providing liquidity services [3]. Tang used data from 59 US banks and LendingClub, the largest P2P lending platforms in the US, to build the model and study whether the users of peer-to-peer lending platforms overlap with the borrowers of banks. Through empirical research, it is found that when bank credit is negatively affected by exogenous factors, borrowers with low quality will not be able to obtain loans from banks and turn to P2P lending platform, which will eventually lead to the deterioration of the quality of borrowers on P2P lending platform. It proves that the P2P platform is a substitute for banks. In addition, the author also points out that P2P platforms can be used as a supplement to bank loans in terms of small loans because of their low cost of initiating loans. Repeating the previous analysis, it finds that borrowers who migrate from banks to P2P platforms apply for larger amount than pre-existing P2P borrowers after a negative impact on bank credit [4].

The research on the impact of third-party payment platforms on bank profits mainly focuses on non-interest income. Most scholars agree that the development of third-party payment business will erode the profit of banks, but the impact may vary depending on the size of the banks. Xia and Chunsom divided third-party payment into desktop payment and mobile payment, and conducted a fixed-effect regression analysis on the data of 16 Chinese listed banks and the scale of third-party payment from 2013 to 2017. The regression results show that higher desktop payments can generate more non-interest income for banks, while mobile payments can restrain banks' non-interest income. From the perspective of bank size, small and medium-sized commercial banks have a positive spill-over effect, but for large state-owned commercial banks, non-interest income reduce [5]. Yang and Liang analysed from the development and business model of banks and third-party payment platforms. With the continuous development of network technology, the third-party payment platform has gradually replaced e-bank as commodity payment. In terms of offline consumption, payment means provided by third-party payment platforms such as code scanning, payment and transfer continue to erode the market of bank card payment, resulting in reduced intermediate income for banks. The

third-party payment platform has continuously expanded its business and launched utility payments, small loans, fund product sales and insurance agency services to seize banks' market share in financial services [6]. Lai conducted an empirical analysis on the relationship between third-party payment and the profitability of Chinese traditional commercial banks. The paper defines the ratio of non-interest income and the gross merchandise volume of third-party mobile payment as independent variables and explanatory variables, respectively. After the regression, it finds that the third-party payment negatively impacts banks' non-interest income. The continuous growth of China's GDP means the continuous improvement of the national consumption level, which accelerates the third-party payment platform's acquisition of market share. Commercial banks should respond to the rapid growth of third-party payment platforms to maintain the competitiveness of credit card usage and transaction share [7].

As for the impact of internet finance on the profitability of banks, there is still no unified conclusion. Chen et al. analyse the popularity of internet finance in China and its impact on traditional banking. Through the fixed-effect regression analysis of the data of 200 commercial banks in China from 2011 to 2016 and the scale of P2P lending and third-party payment. It found that both third-party payment and P2P lending have a significant negative impact on banks' profitability. The development of internet finance reduces the loans and deposits of banks, inhibits the loan interest rate of banks and increases the deposit interest rate of banks, which ultimately has a negative impact on banks' return on asset [8]. Ju and Zhang found that with the expansion of internet finance, such as third-party payment and peer-to-peer lending, banks' profitability indicators such as ROA, ROE and NIM show a downward trend. Facing the fierce market competition of internet finance, commercial banks should actively transform and improve product diversity and service quality to maintain the competitiveness of the banking business [9]. Dong et al. studied from the perspectives of profitability, security and growth of banks and argued that internet finance would positively impact banks. Although the rapid development of internet finance overlaps with the business of banks to a certain extent, competition can encourage banks to improve products, optimise services, reduce operating costs and ultimately improve profitability [10]. Tobing and Wijaya found that peer-to-peer lending has a negative impact on bank profitability. Different from previous studies, third-party payment positively impacts bank profits. This difference may be explained by the fact that the amounts of third-party payments is limited, so large payments still need to be handled by banks. At the same time, third-party payment also needs to have a bank account to supplement the balance, so the growth of third-party payment will positively impact banks' profitability [11].

1.3 Objective

The existing literature on the impact of internet finance on the profitability of commercial banks mainly focuses on the overall profitability index but pays little attention to the specific business. Meanwhile, there is still no precise definition of the impact of internet finance on bank profitability. Therefore, this paper will study the relationship between bank interest income and non-interest income and internet finance, to judge the impact of internet finance on bank credit business and other intermediary businesses. Moreover, this paper will give empirical evidence for the impact of internet finance on bank profitability and give some suggestions on the future business development of the banking industry.

2. METHODOLOGY

2.1 Sample Selection and Data Source

The scale of third-party payment and P2P lending in China has been systematically recorded since 2011. For data availability, this paper employed a fixed-effect model with annual financial data on 115 commercial banks from 2011 to 2018. Based on the ownership, the banks can be divided into large state-owned commercial banks, joint-stock commercial banks, urban commercial banks and rural commercial banks. All types are included in the sample, which is representative. The main source of banks' financial data is the CSMAR database and banks' annual report. The GDP data comes from China's National Bureau of Statistics. The data on the P2P lending scale are obtained from China Industry Information Network and the third-party payment scale data comes from iResearch website. The total social retail goods consumption amount in China comes from the National Bureau of Statistics of China (NBS) and the number of internet users in China comes from the Statistical Report on China's Internet Development.

2.2 Variable Selection

This paper mainly studies the influence of internet finance on the profitability of commercial banks, so the index that can reflect the profitability of commercial banks is selected as the explained variable. The profits of commercial banks mainly come from the interest charged by loans and the formalities fees brought by the intermediary businesses. Therefore, this paper selects the bank's interest income, handling fee and commission income and return on assets to measure the bank's interest income, non-interest income and overall profitability. The explanatory variable is the scale of third-party payment and P2P lending, two major industries that can reflect the development of internet finance. Based on the previous studies, this paper divides control variables into internal and external variables. Internal variables are characteristic variables of commercial banks' operating conditions. Following Gropp and Heider, this paper uses the natural logarithm of total assets to reflect the size of banks [12]. The non-performing loan ratio is used to estimate banks' risk-taking behaviour. A higher non-performing loan ratio means that the quality of bank loans is low, the recovery of loans' principal and interest is hard, and the banks are less profitable [13]. Moreover, this article also considers the loan to asset ratio and loan to deposit ratio to measure the operating structuring of the banks. A higher loan to asset and loan to deposit ratio mean that banks use more assets for loans rather than saving them in the central bank as reserves. External variables consider that the business environment will also impact banks' profitability. In this paper, the GDP growth rate is used as a control variable to measure the country's overall economic growth, the growth rate of total retail consumption can reflect the commercial environment, and the growth rate of internet users is used to measure the popularity of the internet in China. Variable measurements and descriptive statistics are listed in Table 1.

Table 1. Variable selection and descriptive statistics

Variable	Measure	Sample size	Mean	Standard deviation	Min	Max
InII	Log (interest income)	920	22.7808	1.6375	18.8488	27.5777
InNII	Log (non-interest income)	920	19.5617	2.3874	13.6198	25.8275
ROA	Net income/total asset	920	0.0098	0.0036	0.0002	0.02507
InP2P	Log (trading volume of P2P)	920	26.4228	2.0089	22.9923	28.6624
LOA	Loan/total asset	920	0.4503	0.0983	0.0994	0.7323
InTPP	Log (trading volume of third-party payment)	920	31.5016	1.2768	29.7593	33.3753
InTA	Log (total asset)	920	25.8979	1.6868	22.4322	30.9524
GIU	Growth rate of internet user	920	0.0899	0.0525	0.0505	0.2214
GGDP	Growth rate of GDP	920	0.0751	0.009	0.067	0.096

NPLRR	Nonperforming loan ratio	920	1.467	0.9197	0.02	13.25
GRC	Total retail consumption growth rate	920	0.1179	0.0405	0.0401	0.1923
LTD	Loan/deposit	920	0.761	3.342	0.1791	101.8177

2.3 Model Selection

In order to study the influence of internet finance on bank interest income and non-interest income, this paper conducts fixed-effect regression analysis on the following models:

$$\ln I_{i,t} = a_0 + a_1 IF_t + \alpha_2 CONTROL + FE_i + \varepsilon \quad (1)$$

$$\ln NI_{i,t} = a_0 + a_1 IF_t + \alpha_2 CONTROL + FE_i + \varepsilon \quad (2)$$

$$ROA_{i,t} = a_0 + a_1 \ln tpp_t + \alpha_2 \ln p2p_t + \alpha_3 CONTROL + FE_i + \varepsilon \quad (3)$$

$\ln I_{i,t}$ represents the natural logarithm of the interest income of the bank i in period t , $\ln NI_{i,t}$ represents the natural logarithm of the non-interest income of bank i in period t and IF_t represent the natural logarithm of third-party payment and P2P lending scale in year t . CONTROL is the control variable selected for the model. ε is the residual error, FE_i represent the fixed-effect of commercial bank i and ε is the random error term. In order to study the impact of internet finance on the overall profitability of commercial banks, this paper using the ROA as the overall profitability indicator and include the scale of P2P lending and third-party payment into a single model. $ROA_{i,t}$ represent the return on asset for bank i in period t .

3. EMPIRICAL RESULTS

For 115 bank samples, the fixed-effect regression results of bank interest income and internet finance are as follows:

Table 2. Interest Income and internet finance

VARIABLES	(1) lnI	(2) lnNI
lnTPP	-0.0693*** (0.0126)	
lnP2P		-0.0412*** (0.00770)
NPLR	0.0300*** (0.00703)	0.0305*** (0.00704)
lnTA	1.143*** (0.0308)	1.122*** (0.0289)
GGDP	7.668** (3.152)	11.86*** (2.737)

GIU	-1.662*** (0.381)	-2.602*** (0.307)
ROA	25.06*** (2.299)	25.43*** (2.289)
LOA	0.842*** (0.0911)	0.746*** (0.0895)
LTD	-0.00104 (0.00136)	-0.000897 (0.00136)
Constant	-5.742*** (0.782)	-6.475*** (0.785)
Observations	920	920
R-squared	0.900	0.900
Number of banks	115	115

Note: Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

It can be seen from the regression result that the P-value of lnTPP, lnP2P, NPLR, lnTA, GIU, ROA and LOA are all significant at the 1% confidence level and the P-value of GGDP is significant at 5% confidence level. The interest income refers to the interest calculated and charged by the bank when granting loans to enterprises or individuals according to the interest rate stipulated by the state or agreed in the contract. The scale of third-party payment and the scale of P2P lending are both negatively correlated with the bank's interest income. Every 1% increase in the scale of third-party payments and P2P lending will lead to a 0.06% and 0.04% decline in the bank's interest income. The reasons come from the perspectives of deposits and loans. Similar to banks, third-party payment platforms can also provide deposit business. They help users deposit idle funds through a series of monetary funds. These monetary funds are secured by the credit of large financial enterprises behind the platform and have similar security to banks. Through third-party payment, the money invested in the monetary fund can be used at any time, providing flexibility similar to bank cards. However, these monetary funds can provide higher interest rates than bank accounts, which attract a large number of depositors to transfer bank deposits to third-party payment platforms. Unlike non-financial enterprises, the main source of funds for banks is not equity but liabilities such as deposits and interbank lending. The decline of deposits leads to the erosion of banks' capital and the restriction of lending capacity, which eventually leads to

the decline of banks' interest income. In addition, the third-party payment platform also provides alternative services for bank credit cards. The third-party payment platform gives the credit rating according to the user's information and consumption records, and the user has a specific loan limit according to the credit rating when consuming. These microloans have replaced credit card services, resulting in lower interest income brought by credit card consumption.

The scale of P2P lending is negative related to the interest income of the banks. The main business of P2P lending platforms is to provide loans to individual consumers and small enterprises, which has direct competition with the loan business of banks. However, compared with bank loans, P2P lending is more convenient to handle. All procedures can be completed on the network without going offline. Meanwhile, compared with bank loans, P2P lending is approved more quickly and has lower requirements for collateral. Although Tang believes that P2P lending can become a supplement to bank loans in terms of microfinance, providing loan services for borrowers with poor reputations and difficult to obtain bank loans [4]. The continuous development of the P2P lending business and the above advantages compared with bank loans will inevitably grab some bank customers and squeeze the bank's loan market.

The higher the total assets of a bank, the larger the size of the bank. Large banks have the advantages of economic scale and brand, so the bank's assets are positively correlated with the bank's interest income. The growth rate of internet users represents the popularization speed of the internet. The increase of internet users will bring a massive market to internet finance and reduce bank interest income due to the limitation of traditional credit businesses. The GDP growth rate reflects China's overall economic situation. In a period of economic prosperity, the demand for bank loans will increase, which will increase the bank's interest income. Therefore, the GDP growth rate is positively correlated with the bank's interest income. The loan to asset ratio represents the use of bank funds. In addition to issuing loans, some of the bank's funds need to be retained in the central bank as deposit reserves, which will not generate interest income. The higher loan to asset ratio means that banks use more funds to make loans rather than save in the central bank as reserves, so it is positively related to interest income.

The fixed-effect regression results of banks' non-interest income and the scale of internet finance are as follows:

Table 3. Non-interest Income and internet finance

VARIABLES	(1)	(2)
	lnNII	lnNII
LnP2P	0.109*** (0.0217)	
lnTPP		0.127*** (0.0358)
GRC	1.541** (0.736)	2.795*** (0.882)
NPLR	-0.0702*** (0.0221)	-0.0639*** (0.0223)
lnTA	0.885*** (0.0975)	0.982*** (0.0988)
GIU	-0.0282 (0.460)	-1.482*** (0.433)
Constant	-6.323*** (2.198)	-9.973*** (1.973)
Observations	920	920
R-squared	0.610	0.604
Number of banks	115	115

Note: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

It can be seen from the regression result that the P-value of lnP2P, lnTPP, lnTA and NPLR are significant at 1% confidence level and GRC is significant at 5% confidence level. The bank's non-interest income mainly includes service fees, intermediate business income, investment activity income and handling fees charged from merchants during bank card consumption. Surprisingly, contrary to the interest income, the non-interest income of banks is positively correlated with the scale of third-party payment and P2P lending, which may be contrary to common believe. Every 1% increase in the scale of third-party payments and P2P lending will lead to an increase of 0.11% and 0.12% in the non-interest income of banks. For this unconventional result, this paper gives the following possible reasons. First of all, neither third-party payment nor P2P lending can get rid of the independent operation of banks. The third-party payment platform needs to be bound with the bank card to realize the recharge and withdrawal functions of the account. In addition, due to the consideration of capital security, the third-party payment platform limits the daily payment and collection amount of the account. Therefore, some large transactions still need to be carried out through banks. When withdrawing money from a third-party payment platform to a bank card, People need to pay a certain handling fee, part of which will become the bank's non-interest income. Thus, the development of

third-party platforms leads to a positive spill-over effect on banks' non-interest income. For P2P lending, although the approval process can be handled online, the collection and payment still need to rely on the bank account. The emergence of P2P lending provides a new way to obtain funds, promotes the growth of consumption and investment in the market, and then improves bank' intermediary business and settlement business. Overall, the growth of the scale of Internet financial transactions represents the enhancement of the diversity of the financial market, improves the vitality of the financial market and improves the flow speed of money in the market, which are all benefit to banks' non-interest income.

GRC is the growth rate of total retail consumption, which is positively related to the non-interest income of banks. The increase in GRC means the prosperity of China's retail market. In the retail market, the dealings are often pay by the bank cards or third-party payment accounts. Therefore, the growth of total retail consumption can promote the growth of bank card transaction volume and increase the bank's handling fee and commission income. The size of a bank can be expressed by lnTA. The larger the size of a bank, the stronger its ability to provide diversified services. Thus, the scale of the bank is positively related to the income from handling fees and commissions. NPLR is the non-performing loan ratio of banks. When NPLR is high, it means that the asset quality of banks deteriorates. This limits the banks' funds to diversify businesses, so the bank's non-performing loan ratio is negatively correlated with the bank's non-interest income.

The fixed-effect regression result of banks' return on asset, and the scale of internet finance is as follows:

Table 4. Overall Profitability and internet finance

VARIABLES	(1) ROA
lnP2P	-0.000447*** (0.000157)
lnTPP	-0.000536** (0.000253)
lnTA	-1.79e-05 (0.000468)
NPLR	-0.000852*** (0.000104)
GGDP	0.0673 (0.0493)
GIU	-0.0169*** (0.00622)
Constant	0.0366***

(0.0121)

Observations	920
Number of cd	115
R-squared	0.492

Note: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

It can be seen from the result that the P-value of lnP2P, GIU, NPLR are all significant under the confidential level of 1%, and the P-value for lnTPP is significant at 5%. Return on assets is the sum of interest income and non-interest income divided by total assets, which can measure a bank's overall profitability. The third-party payment scale and P2P lending scale are negatively correlated with the bank's return on assets. Every 10000 RMB increase in the third-party payment scale and P2P lending scale will lead to a 4.47% and 5.36% decrease in the bank's return on asset. Although internet finance has a positive effect on banks' non-interest income, it still reduces the overall profitability of banks. The underlying reason is that the bank's profit source in China is still the traditional deposit-loan spread and the level of business diversification is insufficient, resulting in the negative effect of internet finance on interest income is larger than the positive spill-over effect of non-interest income.

NPLR represents the quality of bank loans. The increase of this value means that the proportion of non-performing loans of banks increases. Since the principal and interest on bad loans are hard to recover, banks need to set aside provisions for loan losses, which will be deducted from profits. So, the profitability of banks will decline with increasing NPLR. GIU represent the growth rate of the internet user. With the increase of internet users, residents can use the internet platform for more activities such as online shopping, online payment, online loan and so on. These internet services replace the functions of banks, resulting in the decline of bank business. Therefore, the growth rate of internet users is negatively correlated with the return on assets of banks.

4. CONCLUSION

With the rapid development of the internet, new internet financial tools such as third-party payment platforms and P2P lending platforms have gradually integrated into the lives of Chinese residents. Due to the overlap of business, the development of internet finance is bound to affect the operation of banks. Through empirical analysis, this paper finds that the scale of the third-party payment and the P2P lending is significantly negatively correlated with the bank's interest income, while it is significantly positively correlated with the bank's non-interest income. In terms of the overall profitability of banks, internet finance will still have an

adverse impact because of the interest income as banks' main profits. In the future, China's commercial banks should strengthen diversification and reduce the dependence of profits on interest income. In addition, banks should also cooperate with internet financial platforms to make full use of the positive spill-over effect of internet finance on banks' fees and commission income to improve banks' performance.

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