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## Has the Internet Finance Decreased the Profitability of Commercial Banks? Evidence from China\*\*\*

### Abstract

*In this paper it is discussed whether the Internet finance has decreased the profitability of commercial banks in China and how it has been decreased. Using the data of 200 commercial banks in China, during the period from 2011 to 2016, we figure out that Internet finance measured by P2P lending and the third-party payment has a negative impact regarding profitability of these banks. Additionally, as can be observed, the third-party payment has had a more significant negative impact on banks than P2P lending. A mechanism of the influence that Internet finance has on banks is offered in our results. Further, based on the robustness test, it's indicated that city and rural commercial banks and non-listed banks are more easily affected by the Internet finance.*

**Keywords:** *Internet finance, P2P lending, the third-party payment, commercial banks*

### 1. Introduction

Nowadays, the finance innovations have experienced a big evolution through Internet. Internet finance is classified into e-commerce, e-payment, e-money market, online loan services and digital currencies by Lin et al.<sup>1</sup> The Internet finance represented by P2P lending and the third-party payment in China has experienced an impressive development. Their trading volumes from 2012 to 2016 are displayed below. As can be observed, at the beginning, the volumes grow slowly, and then experience a rapid increase after 2014.

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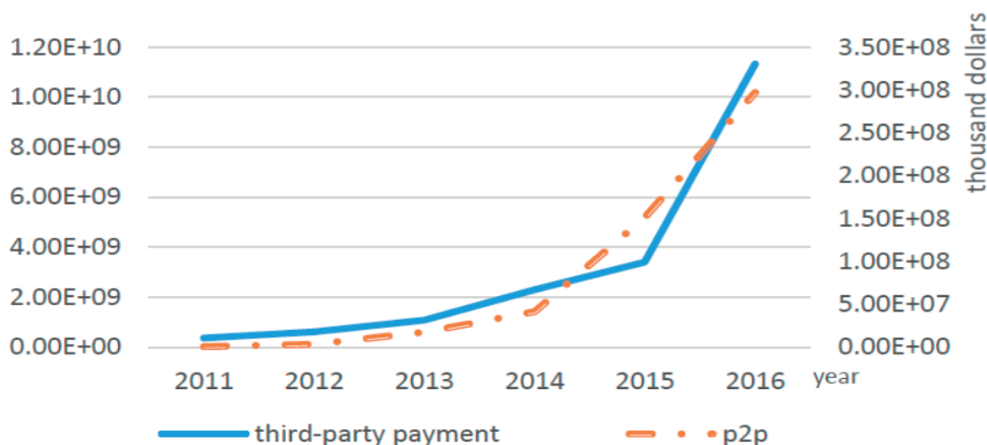
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1 Z. Lin, A. B. Whinston and S. Fan, "Harnessing Internet finance with innovative cyber credit management", *Financial Innovation*, 1(1), 2015, pp. 1-24.

**Figure 1.** The trading volume of third-party payment and P2P



P2P lending originates from the USA in 2005 and prospers in China. The platform of P2P lending has reached to over three thousand, peaking in 2015. For new things, development always means problems, such as absorbing deposits illegally and the rapid growth of breaking down. In 2015, the regulations are put forward immediately. The third-party payment is also included into banking payment and settlement system in November, 2017. Whether the Internet finance will go still with the stricter regulation remains to be seen.

As far as banks are concerned, there are also some evidences that indicate that growth rates of banks' deposits and loans are declining during this period. Banks have played an essential role in not only the finance system but also in our daily life. In the past decades, due to the underdeveloped capital market, methods of investing and financing of common people depended mostly on investment opportunities provided by banks, mostly made of deposits and banking credit. The booming development of Internet finance has brought a vital change into economy.

On the one hand, the third-party payment has absorbed some money which otherwise would have flowed into banks as deposits. On the other hand, P2P lending has also provided loans to individuals and enterprises. Their rapid growth has declared a silent war on traditional banks and becomes a potential threat to banks' monopoly status which may increase the competition within banking industry and contribute to their vital change. Whether the development of Internet finance will result in banks' failure or an essential revolution in banking industry still remains unknown. What is positive is that it has been the Internet finance that has widened the investing and financing channels.

However, as the revolution between the conventional finance and modern finance in China, up till now, the researches on the impact that Internet finance has on banks are rare because of its novelty, most of whose discussion are mainly limited at the mechanism analysis with a lack of practical evidences. In China, the discussions are scarce because of the development and prosperity of its two new forms. This paper is aimed to use empirical

methods to figure out whether and how the Internet finance has impacts on the profitability of banks to provide statistical evidences and suggestions for banks on how to perform when facing the severe competition of Internet finance. Our study has contributed to the existing literature in several ways. Using the 200 banking data from Orbis Bank Focsu and Internet financing data from website, firstly, it is figured out that Internet finance measured by P2P lending and the third-party payment does consistently have a negative impact on the profitability of commercial banks. Further, it can be observed that, up till now, the third-party payment has a more severe impact on banks than P2P lending. As for the mechanism, taking the ratio of interest income in loans and interest expense in deposits, the growth rate of loans and deposits as our proxy variables to do mechanism analysis, it can be found that P2P lending has a negative effect on the ratio of interest income in loans and the growth rate of loans while the third-party payment has a negative impact on the growth rate of deposits and positive impact on the ratio of interest expenses in deposits. More specifically, it's indicated that Internet finance has little to do with other banks except for city and rural commercial banks. The results as well as provide some evidences that listed banks perform better than non-listed banks when facing the competition from Internet finance.

The reminder of this paper proceeds as follows. Section 2 provides a brief summary on the related literature about the profitability of banks and Internet finance. Section 3 outlines the basic model and variables. The data collected procedures are presented in section 4. Section 5 sets out the empirical results and some discussions. Section 6 concludes the results of the overall study.

## 2. Literature Review

According to the existing literature, here are different kinds of factors that have an impact on the profitability of a bank.

Some researchers have argued about the effects of ownership. La Porta et al. point out that government-owned banks have poorer performance, especially in developing countries.<sup>2</sup> But it seems that the profitability of government-owned banks in China related to their monopoly power on both the product to get high revenues as well as the labor market resulting in low labor costs<sup>3</sup>, furthermore, point out that CEO's political experiences has a positive effect on banks' ROA which is explained as political rent seeking. However, privatization has an integrated impact, whose conclusions vary with different samples. Haber based on the data of Mexico, figures out that privatization performed not well until the flowing-in of foreign investigations.<sup>4</sup> Beck et al. hold that privatization has positive effects on banks' performance in Nigerian.<sup>5</sup>

2 La Porta, R., Lopez de Silanes, F., and Shleifer, A., "Government ownership of banks", *The Journal of Finance*, 57(1), 2002, pp. 265-301.

3 Hung, C. H. D., Jiang, Y., Liu, F.H., Tu, H., and Wang, S., "Bank political connections and performance in China", *Journal of Financial Stability*, 32, 2017, pp. 57-69.

4 Haber, S., "Mexico's experiments with bank privatization and liberalization, 1991-2003", *Journal of Banking & Finance*, 29(8), 2005, pp. 2325-2353.

5 Beck, T., Cull, R., and Jerome, A., "Bank privatization and performance: Empirical evidence from Nigeria", *Journal Banking & Finance*, (29)8, 2005, pp. 2355-2379.

Geographical diversification<sup>6</sup>, interest rates<sup>7</sup> and the size<sup>8</sup> have a positive relationship with the performance of banks. More specifically, different kinds of capital have varied effects on the profitability and efficiency of banks. For instance, Bitar and et al. figure out that risk-based capital ratios fail to lower bank risk.<sup>9</sup> What's beyond our expectations is that the impact of reducing banking competition on profit is insignificant<sup>10</sup>. The existing empirical evidences in the relationship between the ratio of total equity to total assets and bank performance are mixed.<sup>11</sup> On the one hand, a bank with high capital ratio can seize the opportunity more effectively and handle with the unexpected losses more flexibly.<sup>12</sup> On the other hand, Berger and Patti have proved the agency costs hypothesis to be true, which is to say that a low equity to asset ratio have a positive relationship with firm value in banking industry.<sup>13</sup> Moreover, it's found by Tran and et al. that banks who create more liquidity have lower profitability.<sup>14</sup>

In terms of banks, there are also lots of ways for Internet to function. De Yang and et al. point out that Internet adoption can increase noninterest income but the profits are offset by the larger amounts of noninterest expense which results in no significant differences in Internet-adopting and non-Internet-adoption banks in terms of ROE.<sup>15</sup> At the same year, Hernando and Nieto make quantitative analysis of 72 Spanish commercial banks from 1994-2002 and conclude that the impact of transactional web adoption especially on costs reducing would ultimately play an instrumental role in the ROE and ROA of banks.<sup>16</sup> In terms of profitability, Robert et al. (2006) who observe 424 community banks participating in the first wave of US banks to adopt transactional banking websites in the late-1990s illustrate that the increasing revenues from deposit dramatically improves the profitability of community banks because of the adoption of Internet. Regarding to banking products, based on a "Social Diagnosis" research project in Warsaw, Szopiński, uses the linear regression analysis and draws out that mortgages and credit cards have the biggest influence on the use of online banking.<sup>17</sup> When it comes to the impact that e-finance has on commer-

6 Cai, W., Xu, F., and Zeng, C. (2016). Geographical diversification and bank performance: Evidence from China. *Economics Letters*, 147, 96-98.

7 Claessens, S., Coleman, N., and Donnelly, M., "Low-For-Long Interest Rates and Banks' Interest Margins and Profitability: Cross-Country Evidence", *Journal of Financial Intermediation*, 2017.

8 Chaudron, R. F., "Bank's interest rate risk and profitability in a prolonged environment of low interest rates", *Journal of Banking & Finance*, 2018.

9 Bitar M., Pukthuanthong, K., and Walker T., "The effect of capital ratios on the risk, efficiency and profitability of banks: Evidence from OECD countries", *Journal of International Financial Markets, Institutions and Money*, 2017.

10 Hsieh, M. F., and Lee, C. C., "The puzzle between banking competition and profitability can be solved: international evidence from bank-level data", *Journal of Financial Services Research*, 38(2-3), 2010, pp. 135-157.

11 Mamatzakis, E. and Bermei, T., "What is the effect of unconventional monetary policy on bank performance?", *Journal of International Money and Finance*, 67, 2016, pp. 239-263.

12 Athanasoglou, P.P., Brissimis, S. N., and Delis, M. D., "Bank-specific, industry-specific and macroeconomic determinants of bank profitability", *Journal of international financial Markets, Institutions and Money*, 18(2), 2008, pp. 121-136.

13 Berger, A. N., and Di Patti, E. B. "Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry", *Journal of Banking & Finance*, 30(4), 2006, pp. 1065-1102.

14 Tran, V.T., Lin, C. T., and Nguyen, H., "Liquidity creation, regulatory capital, and bank profitability", *International Review of Financial Analysis*, 48, 2016, pp. 98-109.

15 De Young, R., Lang, W. W., and Nolle, D. L., "How the Internet affects output and performance at community banks", *Journal of Banking & Finance*, 31(4), 2007, pp. 1033-1060. doi: 10.1016/j.jbankfin.2006.10.003.

16 I. Hernando and M. J. Nieto, "Is the Internet Delivery Channel Changing Banks' performance? The Case of Spanish Banks", *Journal of Banking & Finance*, 2007, pp. 1083-1099.

17 Szopiński, T. S., "Factors affecting the adoption of online banking in Poland", *Journal of Business Research*, 69(11), 2016, pp. 4763-4768.

cial banks, Hou et al. using the data from 2003-2014 of 56 commercial banks in China based on the dynamic panel model, demonstrate that with the development of Internet finance, in terms of deposit growth, its positive relationship with the bank capitalization variable has been weakened, on the contrary, its negative relationship with the bank's risky assets has been strengthened.<sup>1</sup>

With the rapid development of Internet technology, there has been a tendency for banks to adopt the Internet, moreover, Claessens et al. argue that the intention of moving to e-finance providers is stronger in countries with weaker financial services.<sup>2</sup>

However, the theories about how the combination of Internet and finance will react to conventional commercial banks are rare and still need a further discussion.

### 3. Model and data specifications

#### 3.1 Model specification

Based on the research of Feng et al.,<sup>3</sup> we employ the following two-way fixed effects model in the empirical analysis:

$$\text{performance}_{i,t} = \alpha + \beta_1 \text{IFinance}_t + \sum_{i=2}^n \beta_i \text{Control}_{i,t} + v_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

where  $\alpha$  is the constant term.  $v_i$  is the unobserved bank-specific effect and  $\gamma_t$  represents the time effect, while  $\varepsilon_{i,t}$  denotes the error term.  $\alpha$  and  $\beta_i$  are the parameters to be estimated.

#### 3.2 Variables

In our model,  $\text{performance}_{i,t}$  is the specific measure of banks' performance which including five variables: (1) return on average assets (*roaa*), (2) the proportion of interest income in loans (*inin*), (3) the proportion of interest expense in deposits (*inexp*), (4) the growth rate of loans (*grla*), (5) the growth rate of deposits (*grde*).

Following Bian and Deng, return on average assets (*roaa*) used to measure the performance of banks implies how efficiently the banks can earn on specific assets, which is calculated as net income divided by average total assets. *Roaa* is a comprehensive variable that can reflect the profitability of a bank.<sup>4</sup>

On the one hand, we choose the growth rate of both loans and deposits (*grla* and *grde*) to illustrate banks' efficiency of management as proxy variables of mechanism analysis. On

1 Hou, X., Gao, Z., and Wang, Q., "Internet finance development and banking market discipline: Evidence from China", *Journal of Financial Stability*, 22, 2016, pp. 88-100.

2 Claessens, S., Glaessner, T., and Klingebiel, D., "Electronic finance: reshaping the financial landscape around the world", *Journal of Financial Services Research*, 22(1), 2002, pp. 29-61.

3 Feng, G., Gao, J., Peng, B., and Zhang, X., "A varying-coefficient panel data model with fixed effects: Theory and an application to US commercial banks", *Journal of Econometrics*, 196(1), 2017, pp. 68-82.

4 Bian, W., and Deng, C., "Ownership dispersion and bank performance: Evidence from China", *Finance Research Letters*. 2017.

the other hand, the ratio of interest expense to total customers' deposits (*inexp*) and the ratio of interest income to total loans (*inin*) are another way to specify the financing cost and income of a bank, which as well as would be used as proxy variables of mechanism analysis.

What the paper discussed is the impact that Internet finance has on the bank performance. In the following discussion, we mainly talk about the two aspects of Internet finance, namely, the P2P and third-party payment. We use the natural logarithm of the trading volume of both P2P and third-party payment (*lp2p* and *ldsf*).

A number of control variables have been adopted in the model according to the previous theory and empirical research.

According to the results of Akhigbe and McNulty, sizes measured by the amount of assets are the foundation for a bank to develop business.<sup>1</sup> Therefore, we use the natural logarithm of total assets (*lta*) as the proxy variable for the size of each bank. The ratio of equity to total assets (*eqst*), standing for the equity structure is also taken account into our model. Based on the previous study (Pankaj and Sakshi, 2016), the capital to assets ratio has a positive relationship with bank profits as higher capital implies better creditworthiness and borrows less which reduces the borrowing expenses. Moreover, we include loans to total assets ratio (*lata*), corresponded with the fore study.<sup>2</sup> Regarding to the operating risks of banks, it is estimated by the not-performing loans rate (*nplr*). Not performing loans ratio is negatively related to bank performance (Pankaj and Sakshi (2016)). On the one hand, it increases the risk of banks reducing their operating efficiency, principal and interest income. On the other hand, riskier the credit of a bank is, less deposits the customers will put because of the credit risk.

#### 4. Sample and data sources

The world finance crisis took place in 2008, which significantly influenced the development of China's banking industry and it took time for the economy to recover. Furthermore, in China, Internet finance prospers in 2011, so our study covered the period from 2011 to 2016.

We use the yearly financial data of 200 commercial banks covering the period from 2011 to 2016 in China to run a non-balanced panel model. Table 1 describes all the definitions and data resources of the variables employed in the empirical results.

The data are collected from a number of sources. The data of bank derived from Orbis Bank Focus and their annual financial reports or calculated by the author. Based on the data available, we constructed a non-balanced panel for 200 commercial banks in China. Internet financing data such as P2P and third party payment were obtained from the database of iResearch website.

1 A. Akhigbe and J. McNulty, "Profit efficiency sources and differences among small and large U.S. Commercial banks", *Journal of Economics and Finance*, 2005.

2 García-Herrero, A., Gavilá, S., and Santabárbara, D., "What explains the low profitability of Chinese banks?", *Journal of Banking & Finance*, 33(11), 2009, pp. 2080-2092; Lin, X., and Zhang, Y., "Bank ownership reform and bank performance in China", *Journal of Banking & Finance*, 33(1), 2009, pp. 20-29.

**Table 1.** Variables definition and sources

Variables	Measure	Data source
roaa	Net income / total assets	
lta	Log(total assets)	
eqst	Equity / total assets	
lata	Loans / total assets	
nplr	Not performing loans ratio	Orbis Bank Focsu
grla	The growth rate of loans	
grde	The growth rate of deposits	
inin	The interest income / loans	
inexp	The interest expense / deposits	
lp2p	Log(the trading volume of p2p)	www.iResearch.com.cn
ldsf	Log(the trading volume of third-party payment)	

The descriptive statistics for all abovementioned variables are listed in table 2. The panel data consist of 1200 observations, but the final number of observations used in regressions is lower due to missing values and outlier eliminations. Bank-level data are sufficiently representative of the average operating level of the commercial banks in China.

**Table 2.** Descriptive statistics of total banks

Variables	Obs	Mean	Std. Dev.	Min	Max
roaa	1,083	1.019	0.471	-1.23	2.96
lta	1098	16.667	1.603	12.057	21.968
eqst	1097	9.216	7.741	3.502	91.423
lata	1094	43.094	11.118	3.575	77.238
nplr	1027	1.302	0.840	0	9.56
grla	898	14.280	10.155	-2.018	30.843
grde	900	14.401	10.908	-0.643	33.709
inin	1089	10.584	2.527	7.418	15.613
inexp	1089	3.096	0.934	1.859	4.784
lp2p	1200	7.120	2.216	3.434	9.935
ldsf	1200	11.569	1.174	10.036	13.576

*Notes: All level variables except the p2p and dsf are in one thousand dollars; and the ratio variables are expressed as a percentage; variables grla, grde, inin and inexp have been winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentile to remove outliers of the main variables from our data set.*

Total banks are classified into five categories based on their types, the description of which is as well as reported in table 3. From the perspective of mean, it can be seen that government-owned banks have greater profitability than other banks which is consistent with Marie et al. (2001) and significantly higher assets in size but lower growth rate of deposits.

For rural commercial banks, what needs to pay attention to is that they are high in *roaa*, *lata* and *nplr* with relatively low leverage and total assets, which means that they don't do well in loans management and need to improve the efficiency of making loans, though their profitability is quite fine. As for the 13 joint-stock commercial banks, they are big in size but high in leverage with the minimum credit risks. City commercial banks that have the fastest growth rate in loans and deposits are competitive in the competition among banks. Whether they will still perform better when facing the Internet finance remains to be seen.

**Table 3.** Descriptive statistics of banks based on types

	Variables	Obs	Mean	Std. Dev.	Min	Max
roaa	government-owned banks	30	1.209	0.160	0.87	1.48
	joint-stock commercial banks	78	1.008	0.228	0.49	1.66
	city commercial banks	532	1.086	0.433	-0.77	2.84
	rural commercial banks	269	1.183	0.365	0.20	2.26
	foreign banks	174	0.534	0.530	-1.23	2.96
lta	government-owned banks	30	21.466	0.434	20.411	21.968
	joint-stock commercial banks	78	19.285	1.209	15.597	20.591
	city commercial banks	538	16.685	0.949	13.360	19.534
	rural commercial banks	281	16.178	1.082	12.976	18.565
	foreign banks	171	15.376	1.355	12.057	18.058
eqst	government-owned banks	30	7.019	0.759	5.564	8.208
	joint-stock commercial banks	78	5.721	0.775	4.092	8.064
	city commercial banks	538	7.243	2.476	3.502	35.756
	rural commercial banks	280	8.296	1.722	4.311	12.849
	foreign banks	171	18.909	15.718	5.931	91.423
lata	government-owned banks	30	51.645	2.867	46.233	55.776
	joint-stock commercial banks	78	43.313	7.861	25.975	57.402
	city commercial banks	538	41.117	10.540	10.757	77.238
	rural commercial banks	279	49.820	7.883	22.882	62.634
	foreign banks	169	36.666	13.198	3.575	66.934
nplr	government-owned banks	30	1.295	0.388	0.85	2.39
	joint-stock commercial banks	76	1.077	0.465	0.14	1.99
	city commercial banks	530	1.158	0.759	0	9.56
	rural commercial banks	268	1.735	0.806	0.31	4.84
	foreign banks	123	1.117	1.128	0	5.97
grla	government-owned banks	30	9.793	5.647	1.540	17.893
	joint-stock commercial banks	65	15.443	6.193	2.894	26.281
	city commercial banks	443	17.594	9.544	-2.018	30.843
	rural commercial banks	227	11.267	8.735	-2.018	30.843
	foreign banks	133	8.828	12.326	-2.018	30.843
	government-owned banks	30	7.568	5.427	-0.643	16.962
	joint-stock commercial banks	65	14.154	10.057	-0.643	33.709



grde	city commercial banks	443	16.888	10.808	-0.643	33.709
	rural commercial banks	227	12.359	9.362	-0.643	33.709
	foreign banks	135	11.314	12.760	-0.643	33.709
inin	government-owned banks	30	7.949	0.560	7.418	9.199
	joint-stock commercial banks	78	11.042	2.473	7.418	15.613
	city commercial banks	535	11.449	2.515	7.418	15.613
inin	rural commercial banks	278	9.635	1.691	7.418	15.613
	foreign banks	168	9.656	2.762	7.418	15.613
	government-owned banks	30	2.379	0.533	1.859	3.815
inexp	joint-stock commercial banks	78	3.856	0.767	2.024	4.784
	city commercial banks	533	3.252	0.936	1.859	4.784
	rural commercial banks	278	2.761	0.736	1.859	4.784
	foreign banks	170	2.934	1.005	1.859	4.784

Notes: All level variables are in one thousand Dollars; and the ratio variables are expressed as a percentage; variables *gla*, *grde*, *inin* and *inexp* have been winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentile to remove outliers of the main variables from our data set.

## 5. Empirical results and discussion

### 5.1 Empirical results of basic model

In our basic model, we investigate whether the development of P2P and the third-party payment has effects on the profitability of banks and how it affects in China with the annual data of 200 commercial banks during the period from 2011 to 2016. The empirical results are listed in table 4.

The results suggest that the Internet finance measured by P2P and the third-party payment does have a negative relationship with the profitability of banks according to specifications (1) and (2) in table 4 (significant at 1%), corresponded with the conclusions of K. Batu Tunay et al. (2006). Moreover, as can be observed, the coefficient on the third-party payment is -0.088, while P2P is -0.064 indicating that the third-party payment has a more significantly negative impact on the profitability of banks than P2P.

**Table 4.** Empirical results of roaa

	total banks		government-owned banks		joint-stock commercial banks		city commercial banks		rural commercial banks		foreign banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
lp2p	-0.064*** (-4.48)		-0.033 (-0.95)		-0.004 (-0.10)		-0.121*** (-5.70)		-0.082*** (-3.93)		0.012 (0.35)	
ldsfl		-0.088*** (-4.39)		-0.105*** (-3.96)		-0.154*** (-3.94)		-0.151*** (-4.46)		-0.132*** (-4.91)		0.041 (0.80)
lra	0.223** (2.00)	0.089 (1.04)	0.431 (1.00)	0.569*** (3.62)	0.052 (0.21)	0.451*** (2.92)	0.536*** (3.57)	0.250* (1.96)	0.485*** (2.66)	0.339** (2.36)	0.35 (0.76)	0.019 (0.05)
eqst	0.028** (2.51)	0.022** (2.07)	0.044 (0.82)	0.047 (1.11)	-0.061 (-1.28)	-0.027 (-0.70)	0.033** (2.30)	0.023 (1.59)	0.073*** (3.78)	0.061*** (3.19)	0.19 (0.14)	0.012 (0.71)
lata	0.011*** (3.50)	0.009*** (2.91)	0.013 (1.38)	0.010 (1.63)	0.020** (2.52)	0.024*** (3.49)	0.013*** (3.84)	0.010*** (2.66)	0.020*** (3.53)	0.016*** (2.79)	0.80 (0.01)	0.002 (0.21)
nplr	-0.125*** (-4.57)	-0.126*** (-4.32)	-0.261*** (-3.10)	-0.172*** (-2.98)	-0.093 (-1.18)	0.030 (0.39)	-0.126*** (-3.61)	-0.122*** (-3.01)	-0.150*** (-4.46)	-0.159*** (-4.85)	0.13 (-0.095)	-0.101 (-1.47)
Obs	1001	1001	30	30	76	76	522	522	257	257	116	116
R-squared	0.764	0.761	0.900	0.946	0.737	0.792	0.768	0.750	0.718	0.723	0.604	0.606
F-test	(28.13)	(27.55)	38.527	60.305	12.244	14.795	24.968	19.935	(26.27)	(39.52)	(2.30)	(2.49)

Notes: t statistics in parentheses \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

We classify the total banks into five parts based on their types by introducing four dummy variables, the empirical results of whose are listed in table 4. As can be observed, except for foreign banks, both P2P and third-party payment have a negative impact on bank performance, no matter whether it is significant or not. Moreover, the coefficients of *lds* are greater than *lp2p*, which testifies our results further.

Then we use the proxy variables of the profitability of banks to discuss how the Internet finance influences the profitability of banks. The way that P2P lending affects the banks mainly relies on the loans. On the one hand, P2P can absorb a proportion of loans from the banks which reduces banks' interest income. On the other hand, under the pressure of competition, banks have to decrease their interest rates on loans with interest income shrunk. The impact that the third-party payment has on banks is mainly through deposits. From the perspective of quantity, the rapid development of the third-party payment has split partial deposits from banking system and impairs the foundation of banks to make loans. Banks have to increase the interest rates on deposits to appeal the depositors, which contributes to the increase of their interest expenses. At the same time, the interest expenses also have been reduced because of the decrease of deposits. It is the game between the increasing and decreasing effect that determine the final result. From the empirical results of table 5, as can be seen, both *lp2p* and *lds* have a significant negative impact on *income* and *inexp*. The negative effect on interest income and expenses has been clarified above which further testifies our analysis. It's easy to conclude from the results that, from the perspective of third-party payment, its decreasing effect on deposits is stronger than increasing effect on the interest rates and the decreasing effect will be further verified in table 6. As listed in table 6, the estimated coefficients of *lp2p* and *lds* are statistically negative in most estimation. The results suggest the presence of the decreasing effect that P2P and third-party payment has on loans and deposits.

Regarding for the control variables that we are interested in, we can observe that in table 3, the coefficients of *lta* on *roaa*, under the most circumstance, are positive as expected, significant at 5%. It implies that the profitability of a bank increases with the growth of its assets, namely, scale economy and bank returns increase with its absolute size.<sup>3</sup> As for the *eqst*, it has a positive relationship with *roaa* which is consistent with the research of Jorge A. Chan-Lau and et al. (2015). As is demonstrated by Allen N. Berger and Christa H.S. Bouwman (2013), capital enhances the survival ability and market shares of banks in not only normal times but crisis. Combined with table 6, it's easy to understand that the ratio of loans to total assets is positively related to *roaa* and the growth rate of loans (significant at 1%). What surprises us is that *lata* is negatively related to the share of interest incomes in loans, significant at 1%, which means that the average interest rate in loans is declining with the expansion of loans for banks. From one side, it indicates the decline of financing costs which is consistent with the policy of government and the capital is soft. From another side, it also reflects the rapid development of P2P has increased the competition of banks industry which has demonstrated above. When it comes to not performing loans ratio, though its coefficient on *income* is positive, it is insignificant. The rest of the empirical results related to *lata* are corresponded with our expectations, so the discussions are omitted. The last point is that, as we can see, the coefficient of *lta* in the specifications (1) and (2) of table 6 is extremely high and significant at 1%, implying that total assets, as the foundation of banks to make loans, have vital positive influence on the growth of banks' loans.

<sup>3</sup> Bertay, A. C., Demirgüç-Kunt, A., and Huizinga, H., "Do we need big banks? Evidence on performance, strategy and market discipline", *Journal of Financial Intermediation*, 22(4), 2013, pp. 532-558.

**Table 5.** Empirical results of *inin* and *inexp*

	total banks			government-owned banks			joint-stock commercial banks			city commercial banks			rural commercial banks			foreign banks		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)						
lp2p	-0.378*** (-5.80)		-0.144 (-1.04)		-0.223 (-0.79)		-0.470*** (-3.99)		-0.263*** (-2.60)		-0.380*** (-3.27)							
ldsf		-0.220*** (-6.49)		-0.423*** (-5.89)		-0.161 (-1.40)		-0.191*** (-3.29)		-0.194*** (-3.75)								
lta	2.399*** (4.19)	1.343*** (9.12)	1.214 (0.69)	2.710*** (5.33)	3.701 (1.51)	1.555*** (2.95)	3.104*** (3.52)	1.276*** (5.89)	1.837* (1.83)	1.396*** (5.69)	0.922 (0.81)	0.631 (0.77)						
eqst	0.105 (1.61)	0.001 (0.10)	0.616** (2.54)	0.315*** (3.42)	0.211 (0.63)	0.272*** (2.69)	0.109 (1.08)	0.000 (0.01)	0.191* (1.97)	0.014 (0.47)	0.057 (0.94)	-0.023 (-0.82)						
lata	-0.086*** (-5.71)	0.001 (0.28)	-0.041 (-0.65)	-0.036** (-2.43)	-0.111 (-1.47)	-0.041* (-1.72)	-0.094*** (-4.28)	-0.001 (-0.16)	-0.037 (-1.28)	0.007 (0.83)	-0.038 (-1.27)	0.016 (0.68)						
nplr	0.056 (0.54)	0.093*** (3.11)	-1.318*** (-2.96)	-0.062 (-0.48)	-1.673*** (-3.25)	-0.661** (-2.57)	-0.161 (-1.19)	0.072* (1.78)	-0.040 (-0.27)	0.046 (0.89)	1.005*** (3.60)	0.282*** (3.15)						
Obs	1009	1007	30	30	76	76	525	523	262	262	116	116						
R-squared	0.750	0.730	0.779	0.923	0.861	0.790	0.681	0.661	0.653	0.790	0.853	0.718						
F-test	(14.67)	(18.07)	29.069	23.907	47.816	34.666	54.298	32.412	(1.47)	(6.10)	(3.01)	(6.05)						

Notes: *t* statistics in parentheses \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The dependent variable of specifications (1), (3), (5), (7), (9) and (11) is *inin* while the dependent variable of specifications (2), (4), (6), (8), (10) and (12) is *inexp*.

**Table 6.** Empirical results of *gr1a* and *grde*

	total banks			government-owned banks			joint-stock commercial banks			city commercial banks			rural commercial banks			foreign banks		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)						
lp2p	-4.242*** (-11.61)		-2.107 (-1.56)		-4.223*** (-4.84)		-5.900*** (-10.75)		-4.567*** (-7.76)		-2.737*** (-2.40)							
ldsf		-4.102*** (-7.22)		1.058 (0.67)		-4.323* (-1.92)		-4.865*** (-5.76)		-5.617*** (-6.48)		-0.605 (-0.34)						
lita	17.312*** (7.58)	-2.316 (-0.92)	24.308 (1.50)	-7.286 (-0.67)	36.559*** (5.53)	23.092** (2.56)	24.685*** (7.91)	1.676 (0.49)	20.480*** (3.83)	0.162 (0.04)	17.975 (1.29)	-13.000 (-1.03)						
east	1.017*** (2.49)	-0.199 (-0.67)	-1.350 (-0.63)	-5.074* (-2.00)	-2.626* (-1.82)	-5.578** (-2.22)	0.888*** (2.69)	-0.544 (-1.21)	-0.281 (-0.47)	-1.328*** (-2.19)	1.431* (1.76)	-0.280 (-0.49)						
lata	0.495*** (6.43)	-0.401*** (-4.71)	0.450* (1.88)	0.587 (1.44)	1.227*** (4.37)	0.308 (0.91)	0.552*** (6.98)	-0.391*** (-4.02)	0.733*** (4.22)	-0.246 (-1.47)	0.585* (1.71)	-0.060 (-0.14)						
np1r	-3.576*** (-5.42)	-3.152*** (-4.48)	-10.805*** (-5.11)	-6.190* (-2.05)	-5.295*** (-2.48)	-11.274** (-2.15)	-3.327*** (-4.19)	-4.350*** (-4.99)	-1.832*** (-2.04)	-1.119 (-0.90)	-5.958*** (-2.63)	-2.820 (-1.27)						
Obs	850	851	30	30	64	64	435	435	221	221	100	101						
R-squared	0.731	0.617	0.878	0.707	0.782	0.753	0.757	0.638	0.732	0.634	0.576	0.460						
F-test	(102.48)	(63.26)	32.791	9.598	13.432	12.637	(72.36)	(66.21)	(54.54)	(40.16)	(5.91)	(0.74)						

Notes: *t* statistics in parentheses \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The dependent variable of specifications (1), (3), (5), (7), (9) and (11) is *gr1a* while the dependent variable of specifications (2), (4), (6), (8), (10) and (12) is *grde*.

## 5.2 Robust test of different types of banks

We conduct a robustness test, based on the different types of banks. Total banks are divided into five categories, government-owned banks, joint-stock commercial banks, city commercial banks, rural commercial banks and foreign banks. The empirical results are listed in table 4-6, which are still roughly consistent with results of the basic model.

As can be observed from *roaa*, the coefficients on *ldsif* is more significant and larger than *lp2p*, which demonstrate that commercial banks, in China, are more negatively influenced by the third-party payment rather than P2P. P2P is the petty loans, the applicants of which are small businessmen. Banks usually won't lend loans to them because of their low credit. So these lenders who have been appealed to P2P mostly aren't customers of banks at the beginning. What P2P has done is to increase increments of credit market of banks rather impair the existing market. For government-owned banks and joint-stock commercial banks, whose coefficients of *lp2p* on *roaa* are not significant at all, it can be fully explained by the analysis above. For these eighteen big banks, under the pressure of regulation, it is more urgent for them to make good loans with lower risks so they won't be affected by P2P as severe as other small banks. As for the foreign banks, their main businesses in China mostly rely on foreign exchanges and international trades, so it's normal that Internet finance has little effect on them. Relying on the specifications of (7) to (10) of table 4, we can find that both city and rural commercial banks are significantly negatively influenced by Internet finance, significant at 1%, furthermore, the negative impact is stronger on city commercial banks than rural commercial banks. In China, it's traditional that the services city and rural commercial banks provide are regional. They have the advantages in location, having better credit to locally provide loans and absorb deposits easily. P2P are derived from city at the very beginning because of the Internet technology and the culture that urban residents are more open-minded and easy to accept new thing, furthermore, they have more demands for loans because of the high life costs. For rural commercial banks, the majority of which are derived from rural credit cooperatives, its main business is to provide loans to farmers and support the development of agriculture. So it's reasonable that city and rural commercial banks are more greatly affected by the Internet finance than other types of banks, among which city commercial banks are influenced the most seriously.

We also figure out that the coefficients of *lp2p* on *grra* and *ldsif* on *grde* are significant negative (significant at least at 10%), which as well as support the mechanism analysis.

## 5.3 Robust test of listed and non-listed banks

From another perspective, based on whether the banks are listed or not, we can observe two groups of banks, listed and non-listed banks. In China, there are only sixteen banks that have listed except for those who are listed nearly in the end of 2016 which have been regarded as non-listed banks in our discussion.

From table 7, it's evident that, for listed and non-listed banks, the negative impact that the third-party payment has on the profitability of banks is stronger than P2P has on the prof-

itability of banks, no matter whether the coefficient is significant or not. This result is in accordance with the result of our basic model that the profitability of banks is more affected by the third-party payment instead of P2P. The development of P2P hasn't formed a big threat to banks because the customers of the two parts are almost different. Furthermore, the results indicate that listed banks perform better than non-listed banks, facing severe competition of P2P and the third-party payment at the same time. The listed banks, under the common circumstance, often perform better than non-listed banks.

**Table 7.** Empirical results of listed and non-listed banks

	listed banks				non-listed banks					
	roaa (1)	inexp (2)	inin (3)	grla (5)	grde (6)	roaa (7)	inin (9)	inexp (10)	grla (11)	grde (12)
lp2p	0.027 (1.30)		0.109 (0.64)	-2.243*** (-3.44)		-0.104*** (-6.77)	-0.418*** (-5.34)		-5.187*** (-13.68)	
ldsf		-0.114*** (-5.26)			2.133 (1.26)		-0.145*** (-6.68)		-0.187*** (-4.76)	-5.599*** (-9.20)
lta	-0.178 (-0.96)	0.388*** (3.56)	0.091 (0.06)	16.982*** (2.95)	-9.405 (-1.34)	0.479*** (4.24)	2.810*** (4.34)	1.308*** (7.90)	20.983*** (9.03)	1.999 (0.72)
eqst	0.019 (0.61)	0.066*** (2.69)	0.269 (0.76)	-0.292 (-0.19)	-2.357 (-1.40)	0.035** (2.57)	0.112 (1.21)	0.002 (0.12)	0.591** (2.15)	-0.643* (-1.69)
lata	0.004 (0.60)	0.013** (2.24)	-0.124* (-1.95)	0.653** (2.42)	-0.144 (-0.40)	0.014*** (4.98)	-0.085*** (-4.60)	0.000 (0.02)	0.521*** (7.88)	-0.398*** (-4.89)
nplr	-0.233*** (-6.17)	-0.093** (-2.14)	-1.625*** (-3.62)	-8.165*** (-3.62)	-16.336*** (-4.65)	-0.135*** (-4.60)	-0.140 (-1.38)	0.044 (1.26)	-2.889*** (-4.82)	-2.729*** (-3.63)
Obs	96	96	96	85	85	789	797	795	665	665
R-squared	0.780	0.823	0.876	0.797	0.793	0.754	0.744	0.723	0.764	0.647
F-test	16.687	33.671	39.210	18.724	17.810	(37.52)	(40.84)	(16.85)	(112.26)	(92.1)

Notes: t statistics in parentheses \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.



## **5.4 Robust test of different located banks**

The last robust test we do is based on where the bank's headquarters locate. We classify the banks into four types. Eastern banks, middle banks and western banks are classified based on the territory of China, while the overseas banks are banks whose headquarters are overseas.

The empirical results are listed in table 8 and table 9 (from specifications (1) and (2) of each table), it can be found that the coefficients on *ldsf* are larger and more significant than the coefficients on *lp2p* in terms of *roaa*. It proves again that the third-party payment has more important effect on banks' profitability at present.

As far as banks are concerned, the results indicate that eastern banks and western banks are more heavily affected by the P2P and the third-party payment.

**Table 8.** Empirical results of eastern and middle banks

	eastern banks						middle banks					
	roaa (1)	(2)	inin (3)	lnexp (4)	gla (5)	grde (6)	roaa (7)	(8)	inin (9)	inexp (10)	gla (11)	grde (12)
lp2p	-0.095*** (-5.52)		-0.359*** (-3.81)		-4.480*** (-11.58)		-0.028 (-0.95)		-0.383*** (-2.71)		-6.390*** (-7.13)	
ldsf		-0.136*** (-5.66)		-0.207*** (-4.49)		-5.306*** (-7.76)		-0.055 (-1.50)		-0.177* (-1.81)		-4.100*** (-2.72)
lta	0.516*** (3.81)	0.326*** (2.96)	2.654*** (3.11)	1.395*** (6.48)	19.524*** (7.89)	0.927 (0.29)	-0.080 (-0.32)	-0.087 (-0.50)	1.738* (1.67)	0.930*** (2.68)	30.183*** (4.80)	2.571 (0.40)
eqst	0.031** (2.34)	0.023* (1.79)	0.058 (0.62)	0.006 (0.27)	0.841*** (2.63)	-0.363 (-0.82)	0.076*** (2.92)	0.072*** (2.96)	0.463*** (3.84)	0.114** (2.54)	0.027 (0.05)	-1.777* (-1.97)
lata	0.019*** (5.47)	0.016*** (4.37)	-0.065*** (-2.70)	-0.004 (-0.56)	0.470*** (6.12)	-0.449*** (-4.88)	0.004 (0.52)	0.003 (0.55)	-0.163*** (-5.02)	-0.020 (-1.56)	1.094*** (6.98)	-0.059 (-0.26)
npfr	-0.110*** (-3.75)	-0.110*** (-3.34)	-0.196 (-1.58)	0.050 (1.25)	-2.625*** (-3.83)	-3.774*** (-4.03)	-0.223*** (-8.12)	-0.216*** (-7.14)	0.281 (1.10)	0.101 (1.24)	-4.093*** (-3.30)	-3.628* (-1.91)
Obs	628	628	632	631	531	531	147	147	153	152	126	126
R-squared	0.764	0.756	0.707	0.745	0.750	0.659	0.779	0.780	0.798	0.678	0.802	0.656
F-test	(25.63)	(26.96)	(8.36)	(11.79)	(94)	(103.39)	50.360	63.206	34.405	13.184	25.201	24.892

**Table 9.** Empirical Results of Western and Overseas Banks

	western banks				overseas banks							
	roaa	inin	inexp	grla	grde	roaa	inin	inexp	grla	grde		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
lp2p	-0.109*** (-4.04)	-0.339 (-1.43)	-0.340*** (-3.87)	-5.581*** (-5.00)	21.481*** (3.67)	1.431 (0.18)	0.010 (0.26)		-0.388*** (-3.13)		-2.799** (-2.26)	
ldsf	-0.158*** (-3.70)					-5.323** (-2.61)		0.038 (0.71)		-0.233** (-2.58)		-0.683 (-0.37)
lta	0.504*** (3.09)	0.324** (2.40)	2.812* (1.85)	1.573*** (5.06)	21.481*** (3.67)	1.431 (0.18)	0.043 (0.10)	-0.015 (-0.04)	0.544 (0.48)	0.564 (0.64)	16.700 (1.18)	-13.277 (-1.01)
eqst	0.083*** (4.24)	0.074*** (3.96)	0.394*** (2.82)	-0.041 (-0.87)	0.639 (0.86)	-1.729 (-1.58)	0.014 (0.78)	0.011 (0.66)	0.046 (0.75)	-0.028 (-0.96)	1.415* (1.74)	-0.304 (-0.53)
lata	0.005 (1.31)	0.001 (0.34)	-0.118*** (-4.06)	0.028*** (3.02)	0.491*** (2.86)	-0.462** (-2.31)	0.001 (0.10)	0.002 (0.18)	-0.042 (-1.41)	0.015 (0.62)	0.582* (1.67)	-0.052 (-0.12)
nplr	-0.200*** (-4.42)	-0.191*** (-3.83)	-0.515 (-1.42)	0.150 (1.54)	-5.227*** (-3.36)	-0.800 (-0.46)	-0.097 (-1.33)	-0.103 (-1.47)	0.988*** (3.42)	0.261*** (2.92)	-5.789** (-2.44)	-2.312 (-1.02)
Obs	117	117	115	115	99	99	109	109	109	109	94	95
R-squared	0.761	0.753	0.750	0.760	0.787	0.630	0.603	0.605	0.854	0.719	0.562	0.444
F-test	20.553	14.737	77.703	74.359	17.760	8.085	(2.52)	(2.75)	(2.81)	(6.32)	(5.45)	(0.61)

Notes: *t* statistics in parentheses \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## **6. Conclusion and policy implications**

### **6.1 Conclusion**

With the rapid development of Internet finance, such as P2P lending and the third-party payment, there are many discussions and conflicts about the effects that the Internet finance has on banks which stand for the conventional finance institutions.

In our study, as can be concluded, the Internet finance measured by P2P lending and third-party payment does have a negative impact on the profitability of banks; furthermore, the negative effect of third-party payment is greater than P2P at present. We explore the channel behind the relation and find that the P2P has a negative impact on the growth of loans and positive effect on the interest income, the third-party payment has a negative impact on the growth of deposits and positive effect on the interest expense.

Furthermore, through the robust test, a conclusion can be drawn that it's city and rural commercial banks that are greatly influenced by the Internet finance instead of the big government-owned and joint-stock banks in China. Besides, the results indicate that listed banks perform better when facing the competition from the Internet finance than non-listed banks.

### **6.2. Policy implications**

There was a long time that banks had monopolized the financing market. However, with the rapid development of P2P and the third-party payment, there is obvious that the Internet finance, at the beginning, does have a negative impact on the profitability and operating efficiency of banks through deposits, loans and interests. It alarms the banks that it is time to make some change to their behaviours to sustain their status. Banks can put out some new products, improve their services to strength the ability of competition. For instance, banks, whose disadvantages rely on the interest, can turn to absorb more target deposits through providing some convenience on lending facility which can not only increase the deposits but also decrease the financing costs than higher the deposit interest directly.

However, the relationship between banks and Internet finance is not only competitive but also cooperative. Benefiting from its prosperous development, the Internet finance has accumulated big data about the credits of individuals and small and medium enterprises. If banks can make cooperation with Internet finance to share these data, it will be a significant evolution for banks in credit management which is helpful to lower the ratio of non-performing loans and operating risks.

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## **Да ли је Интернет финансирање смањило профитабилност пословних банака? Кинеско искуство**

Апстракт

У овом раду се говори о томе да ли је Интернет финансирање смањило профитабилност пословних банака у Кини и на који начин. Користећи податке о 200 комерцијалних банака из Кине у периоду од 2011. до 2016. године, налазимо да Интернет финансирање мерено P2P позајмљивањем и плаћањем од трећих лица има негативну везу са профитабилношћу банака. Механизам утицаја који Интернет финансирање има на банке очит је у нашим резултатима. Поред тога, као што се може приметити, плаћање трећих лица има значајнији негативни утицај на банке од P2P кредитирања. Даље, на основу теста робусности, указујемо на то да су градске и руралне пословне банке, као и оне које нису листиране на берзи подложније утицају Интернет финансирања.

**Кључне речи:** Интернет финансирање, P2P кредитирање, плаћање од трећих лица, пословне банке