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국제 학석사 학위 논문

The Impact of the Third-Party Payment on the Profitability of Commercial Banks in China

중국 제 3 자 결제 방식이 상업은행의 수익성에
미치는 영향에 관한 연구

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Abstract

With Internet technology continuing to extend to various fields and the development of e-commerce in China, Internet and mobile terminals have become widespread in popularity, resulting in the rapid expansion of third-party payment and the substantial growth in users. WeChat and Alipay payment have become the main payment methods and occupy almost the entire payment sector, and have a very important position in the settlement field. Moreover, as a result of ongoing innovation and development of third-party payment, the scope of business has also expanded to offline channels and from the Internet finance field to the traditional financial sector, which has greatly influenced the traditional business of commercial banks to a large extent. Due to the overlap of the services provided by third-party payment institutions and commercial banks, competition between these businesses has increased.

Based on this background, this paper first elaborates on the development process of third-party payment, and then analyzes the influence of third-party payment on the bank's traditional core business, intermediate business, consumer resources and data resources from a theoretical perspective. Based on previous studies, this paper employs a short-panel data set of 18 listed commercial banks as data samples to establish the regression model. According to the analysis of the regression results, the fixed effects model is more suitable than the OLS model, and demonstrates significantly negative effects of third-party payment systems upon commercial banks, which is also consistent with the conclusions drawn from the theoretical analysis. With the interaction variable added, it turns out that when the profit income of commercial banks is more dependent on traditional business, they will be more affected by third-party payment, but this phenomenon is more reflected in the inter-bank types rather than in the intra-bank types. Finally, analysis confirms a heterogeneous impact on profitability across different bank types as a result of third-party payment businesses.

Keyword : Internet Finance, Third-party payment, Commercial Banks, Profitability

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Abbreviations

B2C: Business-to-Consumer

CNNIC: China Internet Network Information Center

GDP: Gross domestic product

ICBC: Industrial and Commercial Bank of China

NBSPRC: National Bureau of Statistics of the People's Republic of China

NFC: Near Field Communication

OLS model: Ordinary Least Square model

P2P: Peer-to-peer

RMB: Renminbi

ROA: Return on asset

ROE: Return on equity

I. Introduction

1.1 Background

As the Chinese economy has developed in the 21st century, China has been more attentive to developing their financial industry. With the swift expansion of the Internet, "Internet finance" has expanded rapidly, and the E-commerce industry has become an indispensable part of people's daily life, where third-party payment has also become an essential piece.

In the early development of the E-commerce industry, although it brought convenience to people's lives, people did not trust online transactions as a payment method due to the asymmetry of information between buyers and sellers. Thus, third-party payment emerged. It is a relatively novel payment method. In the beginning, collaboration with banks was necessary in order to provide a convenient and trusted payment channel for the transaction parties, the intermediate fees being the primary source of profit. Take a B2C transaction as an example: once consumers have selected products, the total purchase amounts are relocated to third-party payment platforms. Simultaneously, sellers receive the payment confirmation from the third-party payment platforms and then ship the goods. Once the platforms receive receipt confirmations from buyers, the payment amounts are transferred to the sellers' accounts. This behaviour significantly reduces the mistrust due to the mismatch of information and promotes the swift expansion of E-commerce; third-party payment has also obtained substantial customer resources.

In the international market, the third-party payment industry, more specifically the mobile payment industry, is becoming larger and larger, and the widespread use of smart devices and the continuous development of technology are constantly changing the way people consume. Companies including Google, Facebook, Apple, and many others, continue to enter this industry. In the Asian market, Japan and South Korea are also exploring new development directions due to their leading mobile

operators, and they have opened up a unique path in payment because of their large consumer base advantage. For example, Docomo and AU in Japan; South Korea's LG U+, KT, and SKT, have become mobile payment industry leaders in their country. Using mobile devices for online consumption has become essential for Japanese and Korean people.

In the beginning, the core business of the third-party payment market in China was just online payment. After Alipay was established in China in 2004, the third-party payment industry began to accelerate development. In 2010, third-party payment institutions needed to obtain a license to operate, which significantly improved its credit rating and attracted more customers to use the payment services of third-party payment. The popularization of the Internet and mobile devices in China has further promoted the third-party payment expansion. Nowadays, the scale of transactions continues to expand and extend from the field of online electronic payment to the field of offline transactions with an increasing number of third-party payment institutions. Card and cash payments in China have become a thing of the past. The number of users using WeChat Pay and Alipay in China far exceeds the number of people paying by cash offline. Nowadays, Chinese consumers do not even need to bring their phones; people can scan faces or fingerprints as a bio-payment method. This brings greater convenience to people's lives. There is a joke in China that even beggars are only using their QR code to beg. Currently, third-party payment has expanded from the Internet finance field to the traditional financial field and has begun to overlap with commercial banking businesses, robbing the resources of customers from banks. According to a survey done by the National Bureau of Statistics of the People's Republic of China (NBSPRC) on the E-commerce trading platforms, as of 2019, the scale of China's E-commerce transactions increased by 6.7% compared to 2018, and reached RMB 34.81 trillion. In 2019, in the context of the overall economic downturn, the E-commerce platform for personal commodities and service transactions still maintained high growth. This shows that there is an excellent potential for household consumption,

and also shows that there is a positive impact of e-commerce platform transactions in activating the consumer market.

1.2 Purpose of Research

Commercial banks are highly linked to the stability of China's economy and serve as an essential part of their financial system. In the early stage, traditional commercial banks made profits primarily by relying on their traditional businesses. They occupied a tremendous market share, competitive pressure was low, and profit margins were significant.

However, with the continuous expansion of the Internet and E-commerce, as well as the continuous expansion of the customer base of third-party payment platforms, the status of commercial banks as the main payment and settlement entity in the financial market has gradually weakened. Also, at the same time, the payment scope of this industry has also been continuously expanding, from traditional payment and settlement businesses to credit payment, online lending, financial investment, insurance investment, etc. This has resulted in its functions overlapping with commercial banks in more and more business areas, further reducing the interest in commercial banks. These impacts and challenges that third-party payment and internet finance have brought to commercial banks have forced them to increase non-interest income and develop other banking businesses in order to modify the original profit model of banks. Therefore, the development of third-party payment has not only affected the income of commercial banks' traditional business, but has also deepened the impact of financial disintermediation on banks, changed the industry situation of commercial banks, and weakened their competitiveness.

The purpose of this paper is to find out if there is more competition than cooperation between third-party payment and commercial banks, whether third-party payment negatively and significantly

influences the profitability of commercial banks in China, and how it influences commercial banks with different degrees of dependence on their traditional businesses.

II. Literature Review

2.1 The Impact on Commercial Banks by Internet Finance

Internet finance can simply be understood as Internet technology combined with financial functions, also known as E-finance. Banks (2001) views Internet finance as online digital finance, which is produced through the development of e-commerce and Internet technology. Internet finance is an emerging field that combines Internet technology and financial products. Allen et al. (2002) introduced that electronic finance refers to providing financial services and markets through the use of electronic communications and computing. Claessens et al. (2002) stated that electronic financial services, whether provided online or through other remote mechanisms, have been rapidly developed. The impact of electronic finance will lead to a significant reduction in costs, and competition in the field of financial services will increase. New entrants will emerge from outside the industry, and there will be greater competition among existing financial service providers. Li et al. (2013) introduced three development models of Internet finance, and the three models are third-party payment, p2p online loans, and Internet money market funds. In addition, Internet finance also includes models such as big data finance, information-based financial institutions, and Internet financial portals (Han, 2018).

Generally, industry-related, bank-specific and macroeconomic variables affect the profitability of the banking industry. In terms of discussing the impact of Internet finance on the profitability of commercial banks, many scholars have different reviews. Allen et al. (2002) pointed out that the Internet finance used in the capital market will positively impact financial institutions. Internet finance has a profound effect on the profit structure of traditional finance, as it is changing some of the intermediary functions of banks and accelerating the process of financial disintermediation. Guo (2016), through empirical analysis, found that although financial disintermediation has caused changes in the bank deposit and loan structure and has led to a loss of deposits and loans, it has

forced banks to move towards innovation, transformation and upgrades, which has a positive effect on bank profitability. However, some scholars believe that the reform and development of commercial banks have almost nothing to do with the rapid development of Internet finance. Yu (2012) pointed out that the development of Internet finance has a certain impact on commercial bank deposits, but deposits circulating through Internet platforms account for a small percentage of deposits in the enormous commercial banking system, and the impact on commercial banks is minimal. In contrast, Whinston et al. (2002) believed that the development of Internet finance had made the boundaries between traditional financial institutions more and more blurred. Consequently, banks must rediscover their core competitiveness and use their scale advantages to be more competitive in the financial industry.

2.2 The Impact on Commercial Banks by Third-party Payment

Regarding the research about third-party payment, Lindskog and Nilsson (2001) stated that there are significant risks in e-commerce transactions, and the risks mainly stem from credit risk. The emergence of third-party payment platforms has solved the credibility problem between both parties in the transaction, which is the best way to solve the trust issue. After more than ten years of development, third-party payment has become more mature; banks are also paying greater attention to the influence of local third-party payments. Some scholars believe that this influence is positive. Wang (2009) introduced that third-party payment and commercial banks hold different roles in the financial market. Third-party payment mainly assumes the responsibility of online payment, and its development cannot be separated from the support of commercial banks' basic financial resources. The banks provide technical interfaces, settlement functions, and other services such as payment gateways that third-party payment channels heavily rely on. Therefore, they must cooperate with banks, and commercial banks can make profits through those cooperation processes, so the impact

on these banks is positive (Li, 2013). Chen (2008) pointed out that third-party payment is inseparable from banks because third-party payment accounts need to use bank channels to achieve capital flow when operating. Also, third-party payment technology is not developed enough and needs to use commercial banks' information technology to achieve information security. In addition, Liu et al. (2014) believe that the deposit loan business of third-party payment is not capable of absorbing a large number of deposits because it does not have a safe and reliable credit advantage like commercial banks. Banks that can invent products similar to the products developed by third-party payment platforms would win the competition. The third-party payment loan business mainly attracts low and middle-income groups with small loans since there is no financial limit, so it does not influence the deposit business of commercial banks too much.

Most scholars support the view that the development of Internet finance negatively influences commercial banks. Sohail and Shohal (2003) pointed out that it is precisely because third-party payment companies quickly occupy the market and thus obtain user information easier, that is making maintaining market share difficult for commercial banks. Therefore, third-party payment platforms are posing a significant threat to commercial banks' ability to develop and operate in the future. Fu (2012) pointed out that the third-party payment platform was mainly a service for individual and retail businesses, while banks focused on corporate businesses and high-net-worth customers. These two have complementary advantages in the early stage, but it is broken with the development of third-party payment. Commercial banks' traditional businesses are partially replaced by third-party payment services due to the service expansion of third-party payment, thus hindering the banks' willingness to develop their online banking business, thereby reducing the bank's revenue. Zhang and Wei (2016) conducted a thorough analysis of an in-depth study of the reasons for the loss of customer base, and found that third-party payment uses low transfer limits to obtain customer resources, and tried to monopolize user information completely. Therefore, commercial bank agency services and payment settlement have been replaced mainly by third-party

payments. Commercial banks' fund agency intermediary businesses, agency collection and payment businesses, as well as payment settlement businesses, are severely squeezed by third-party payments (Li et al., 2016). Additionally, Luo and Ding (2018) believe that there is a severe impact of third parties on Chinese commercial banks, which has led to the continual weakening of bank card functions, which is gradually changing the payment methods and habits of customers.

Through these literature reviews, it can be found that most studies show that third-party payment harms the commercial banks' profit. However, most of the literature conducts research and analysis through qualitative analysis. There are not many studies that provide empirical analysis through quantitative methods. Additionally, those quantitative studies are limited to analyzing the impact of third-party finance on banks' overall profitability and rarely subdivide into main banking businesses, such as loan and deposit businesses and intermediate businesses. This paper uses a panel dataset and fixed-effect model to make judgments on the influence of third parties on the bank's profitability through empirical study.

III. Analysis of the Current Situation in China

3.1 Internet Finance

In 2014, the People's Bank of China (PBoC) defined Internet finance as the combination of the Internet and finance, which is an emerging financial model that implements the Internet and mobile communication technology to provide the functions of financing, payment, and being an information intermediary. In a wider definition, Internet finance includes not only businesses conducted by financial institutions through Internet financial services, but also businesses conducted by Internet companies as non-financial institutions. In a narrow sense, Internet finance only refers to financial services developed by Internet companies that are based on Internet technology.

3.1.1 Overview of the Development of Internet Finance

China's Internet finance development relies on the development of Internet technology. The symbol of the early stage of China's Internet was when China officially accessed the International Internet in 1994. During this period, China's Internet was not available nationwide, used a simple web interface, and it had not yet formed a business ecosystem with finance. In 2001, with the establishment of the Internet Society of China, the Internet boom began. Due to the rapid advancement of Internet technology, Internet companies have rapidly expanded their businesses to the financial sector associated with their original businesses. In 2003, Alibaba Group launched Alipay. After obtaining financial licenses, Internet companies established financial institutions, the embryonic form of Internet finance. At this stage, third-party payment and P2P emerged and continued to develop rapidly. In 2011, PBoC gave approval to the third-party payment platform, which meant the third-party payment was truly legal and compliant. This indicated that the Internet and finance were forming a new type of business. Since 2013, due to the popularization of the

Internet and the increase in mobile terminal users, Internet finance has entered an explosive growth stage. Taking third-party payment as an example, its market scale reached a historic 16.9 trillion yuan in 2013. Social capital is pouring into this industry quickly, and various Internet finance companies have started expanding their business to a series of new business models such as online loans, crowdfunding, online wealth management, etc.

3.1.2 Internet Finance Models

There are many modes of Internet finance, the most common are the following six: Third-party payment, crowdfunding mode, P2P network lending, big data finance, Internet financial channel and online microfinance.

1) Third-party payment refers to a trading platform that provides a payment and settlement interface through an independent institution with a certain degree of credit protection through a contract with a bank. The next chapter will explain this in detail. Representatives of third-party payment are Alipay and WeChat Pay.

2) Crowdfunding mode refers to a platform in which project sponsors use the communication characteristics of the Internet and social networks to show their creativity to the public, gain sufficient recognition and support, and raise public funds. Crowdfunding projects return in kind, services, or media content but cannot involve capital or equity. Compared to traditional financing methods, the essence of crowdfunding lies in small amounts of money and large amounts of people. The representative crowdfunding platform is Renrenzan.

3) P2P network lending means that P2P companies build a network platform to directly publish and match capital demand and supply information on the Internet. The supply and demand parties of funds are in direct contact with one another, bypassing banks, brokerages and other intermediaries

to provide direct investment to users. The essence of financing services is a private lending method. The representatives of P2P network credit are Renrendai and CreditEase.

4) Big data finance refers to relying on massive, unstructured data through the Internet, cloud computing and other information methods to conduct professional mining and analysis of its data, combining with traditional financial services, and innovatively developing related funds. Big data finance has expanded the types of enterprises in the financial industry and is no longer just in traditional finance. It has also innovated financial products and services, expanded the scope of customers, and reduced corporate costs. This is represented by Alibaba Finance.

5) Internet financial channel refers to using the vast user base of e-commerce websites, the deep integration of network services and financial products, and Internet channels to provide financial services to customers. Users can directly purchase wealth management products, such as currency funds, online and obtain relatively high returns. Simultaneously, this kind of fund can also be used for online shopping, transfer payments, etc., whenever needed. Compared with traditional financial products, it has the advantages of an unlimited purchase thresholds, no handling fees, and redemption at any time. The representative Internet financial channel is Yu'eobao.

6) Online microfinance means that Internet companies map customer credit data and behavioural data accumulated on e-commerce platforms to evaluate the credit of individuals and issue small loans. Representatives of online microfinance include Mayijiebei and Huabei.

Among these modes, third-party payment, P2P and crowdfunding are the most well-known to the public.

Table 1 2012-2018 Internet Finance Representative Models Transaction Scale
(billion yuan)

Year	2012	2013	2014	2015	2016	2017	2018
Third-party Payment	3810.1	16900.0	32200.0	52300.0	107300.0	154900.0	219600.0
P2P network lending	21.2	105.8	252.8	982.3	2063.9	2804.8	1794.8
Crowdfunding	-	-	0.9	8.9	21.7	26.0	30.49 (e)

Data source: iResearch, 网贷之家, News collection

According to Table 1, it is clear that among the representative models of Internet finance in China, the third-party payment model has the most significant transaction scale. Compared to third-party payment, the scale of P2P and crowdfunding are extremely small. From 2012 to 2018, the scale of these three types of transactions, except for P2P in 2018¹ have been increasing yearly. Third-party payment has gradually become an irreplaceable tool in people's lives.

3.2 Third-party Payment

According to the definition of non-financial institution payment services which is provided by the PBoC in the Measures for the Administration of Payment Services for Non-financial Institutions 2010, non-bank financial structure payment services refers to the network services provided by non-financial institutions as payment intermediaries to buyers and sellers, issuance and acceptance of prepaid cards, bank card acquiring businesses, and other payment services determined by the PBoC. From then, non-bank financial structure payment services were formally incorporated into national supervision. Generally, third-party payment refers to an independent institution with a certain

¹ In 2018, the economic environment was poor, and the debt default rate rose. At the end of 2018, the number of regular operating platforms in the online lending industry nationwide was 1021, a decrease of 1219 from the end of 2017, resulting in a year-on-year decrease of 53.9%. The reason is that after the rapid expansion of the online loan industry, the problems became apparent. Some platforms were forced to exit; some platforms collapsed due to their misoperations, and some platforms were at risk of fraud. For P2P, people's negative sentiment increased, and a large number of lenders withdrew their funds, which led to a significant drop in transaction size.

strength and reputation guarantee and has contracts with major banks to provide merchants and consumers with an online transaction platform that interfaces with the bank's payment and settlement system. Third-party payment service providers cooperate with banks, operators, certification agencies, etc., and based on the bank's payment and settlement functions, provide enterprises and individual users with personalized payment and settlement services and value-added marketing services.

3.2.1 Third-party Payment Structure

In the beginning, the role of third-party payment was just the intermediation of transactions. The third-party payment model protects the customer's credit card information from the merchant. Meanwhile, it also prevents the theft of this kind of information that can be caused by multiple public transmissions on the Internet.

The transaction process of the third-party payment model, taking B2C transaction as an example, is shown in figure 1: (1) The customer purchases goods on the E-commerce website and the consumer places an order, thus the consumer and the merchant reach a transaction intention on the Internet; (2) After choosing to use a third-party payment platform as a transaction intermediary, customers then use a credit card for the payment which will be transferred to the platform; (3) The merchant is notified that the customer has already transferred the payment amount and is required to deliver the goods within a specific time frame, by the third-party payment platform; (4) After being informed of the notification, the merchant will deliver the required goods; (5) After collecting and verifying the goods, the customer will notify the third party; (6) The third-party transfers the payment from its account to the merchant's account, and the transaction is completed. In this transaction process, data and information can be exchanged between third-party payment and major banks, and establishes a transitional account between customers and merchants. The entire transaction process is controllable

to ensure transaction security and smoothness. Therefore, as an independent third party, third-party payment reduces the possibility of unreasonable insider behaviour, therefore ensuring the fairness of third-party payment companies as a fund medium. It has advantages such as low cost, simple operation and fast fund transfer. Third-party payment creates convenient conditions for sellers to seek intermediate capital guarantees, which can reduce the seller's cost of use (Han, 2018).

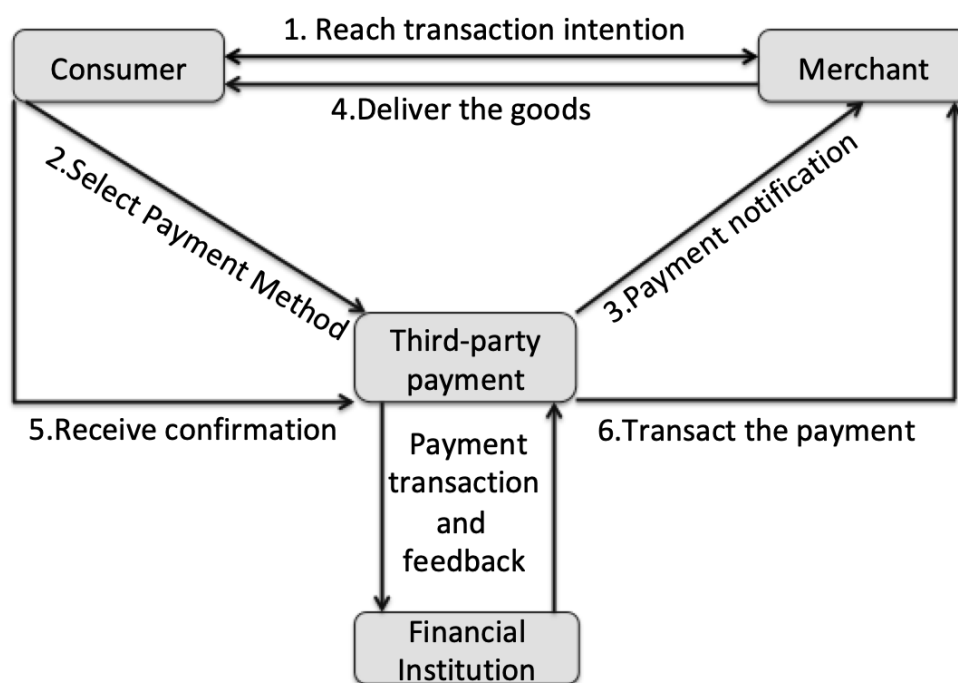


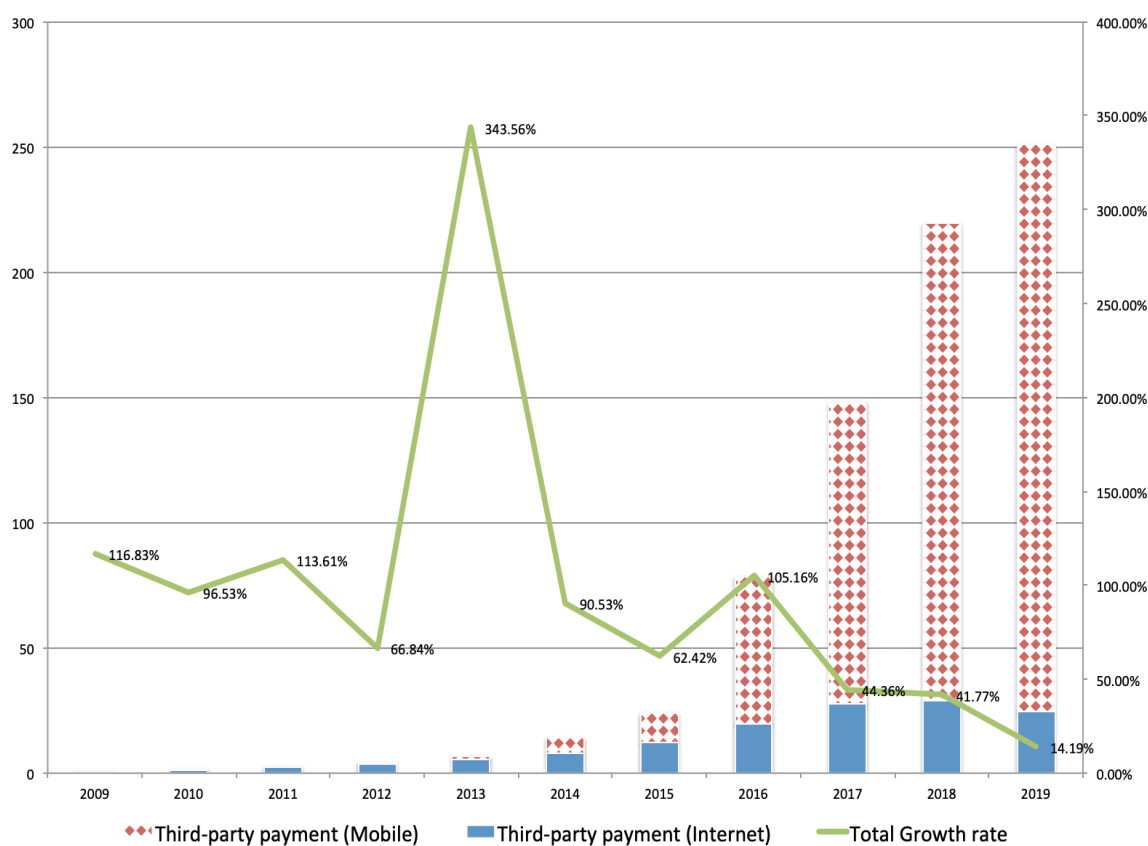
Figure 1 Third-party Payment Transaction Flow

3.2.2 The Development of Third-party Payment

In 2011, the PBoC began to issue the first batch of payment licenses, which marked third-party payment institutions more reliable. In addition, in order to supervise and regulate the behaviour of third-party payment institutions, the PBoC and other regulatory agencies have promulgated a series of laws and regulations since 2010, mainly focusing on payment security, precipitation funds,

money laundering risks and other issues of third-party payment institutions, to guarantee orderly development according to the third-party payment.

As of 2019, the central bank has issued a total of 270 third-party payment licenses; 258 licenses exist currently, excluding institutions whose third-party payment licenses have been cancelled due to violations. Data shows that since the first batch of third-party payment licenses was issued in 2011, the third-party payment market has been in a good state of development in China.

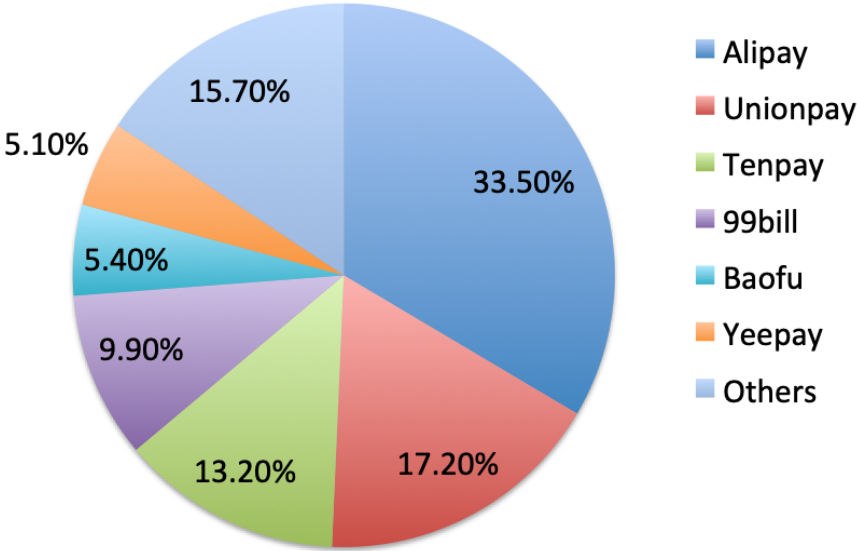


Data source: IResearch

Figure 2 Third-party Payment Transaction Scale

On March 20, 2019, the PBoC released the Overall Operation of the Payment System in 2018. The report pointed out that in 2018, non-bank payment institutions increased 85.05% and had 530.6

billion online payment transactions. As seen from Figure 2, the third-party payment transaction scale has continued growing since 2011. In 2018, its scale passed 219 trillion yuan, which has increased by 41.7%. Additionally, mobile payment has grown the most rapidly and has become the main payment habit of users, in 2013 occupying 7.2% of total third-party transactions with a growth to 90.16% in 2019. The high growth of mobile payment has benefited from increased mobile phone distribution and the maturity of the basic conditions of the Internet, as well as the development of four key links in the industry chain: account institutions, clearing organizations, acquirers, and payment institutions. According to the China third-party payment industry data report released by iResearch: in 2019 Q4, the scale of offline QR code payment transactions was approximately RMB 9.6 trillion, with a quarter-on-quarter growth rate of approximately 11.6% and mobile's terminal NFC payment transaction scale was approximately 9.86 billion yuan, with a relatively fast growth rate, reaching a quarter-on-quarter growth rate of 51.0%.

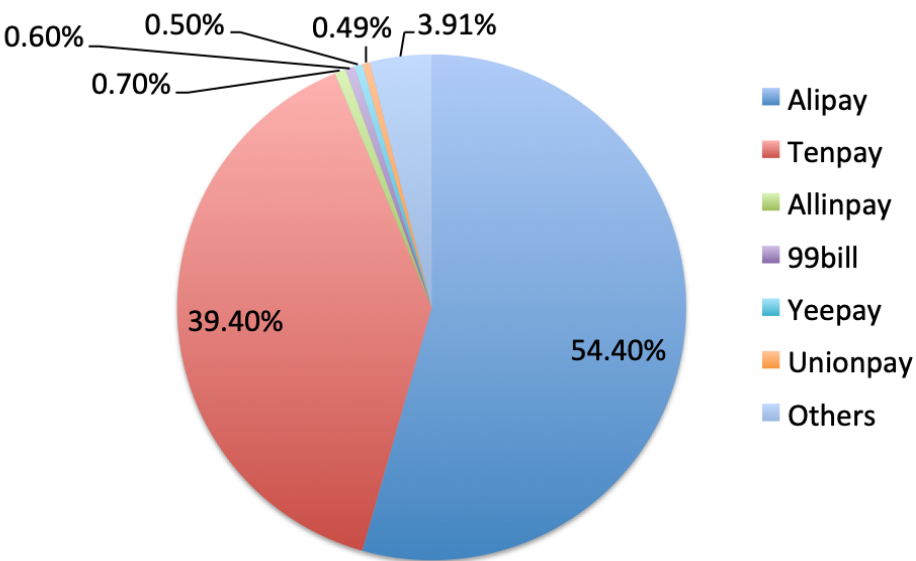


Source: IResearch

Figure 3 2019H1 China's PC Third-party Payment Transaction Scale Market Share

According to the 46th China Statistical Report on Internet Development released by the China Internet Network Information Center (CNNIC), as of June 2020, there are 805 million Internet

payment users in China, accounting for 85.7% of the total Internet users; the number of mobile payment users in China reached 802 million, accounting for 86% of mobile Internet users. For the PC third-party payment in the first half of 2019, Alipay, UnionPay and Tenpay ranked as the top three with market shares of 33.5%, 17.2% and 13.2%, respectively shown in Figure 3.



Source: IResearch

Figure 4 2019 China's Mobile Third-party Payment Transaction Scale Market Share

As for mobile third-party payment, in 2019 Alipay and Tenpay ranked the top two with market shares of 54.40% and 39.4%, respectively shown in Figure 4. The total market share of Alipay and Tenpay have reached 93.8%. Therefore overall, the third-party payment industry is highly concentrated and highly competitive. Oligopoly companies led by Alipay and Tenpay have formed a clear industry monopoly trend.

IV. Mechanism Analysis on the Impact of the Third-party Payment on the Profitability of Commercial Banks

A commercial bank is a currency-operated enterprise whose primary business is to operate industrial and commercial deposits and loans to obtain profits and have many branches. Additionally, commercial banks are involved in a great amount of monetary projects; engage in various substantial amount transactions frequently; have a considerable amount off-balance-sheet businesses that do not involve capital flows; high-debt operations, many creditors, and is closely related to public interest (Zhang, 2011). Banks get their main source of profit through the spread profit model, a process in which they absorb deposits at low-interest rates and make loans at higher interest rates than the deposit rate.

Nowadays, Chinese commercial banks are still operating under a profit model dominated by interest rate differentials. This profit model requires a lot of capital due to the fact that it is generally realized by increasing the scale of deposit and loan assets. Therefore, banks are very concerned about credit. In addition, they provide less intermediary business and there is little difference between banks. In China, this kind of profit model of commercial banks can exist depending on the domestic financial market under the control of interest rates. The intermediate business is relatively backwards, and the proportion of interest income is significantly large (Guo, 2017). However, due to the increase in the marketization of interest rates in China in recent years, interest rate differentials have gradually been narrowed by the market, and the traditional interest rate differential profit model has been challenged in many aspects (Zhang, 2011).

4.1 Cooperation Between Third-party Payment and Commercial Banks

Commercial banks have been operating for a long time in China, have mature systems, high security, and have good credit in the financial market. The third-party payment has only started, and customers trust it far less than commercial banks. Therefore, the cooperation between commercial banks and third-party payment enhances the credit as well as the qualifications of third-party payment, which can gain more trust from users. For example, in the previous cooperation between ICBC (Industrial and Commercial Bank of China) and Alipay, ICBC used its own good credit to guarantee Alipay. Therefore, Alipay was quickly accepted by the majority of users due to it being guaranteed by ICBC. In a short period of time, 10 million people registered, and at the same time, The ICBC also received a substantial income.

(1) Cooperation in settlement services:

Due to the special status of third-party payments, the central bank stipulated in 2017 that third-party payments must seek a custodian and put 20% of the excess reserves for safekeeping. By 2019, the required reserve ratio reached 100%. In order to reduce the risk of setting up accounts in multiple banks, the central bank stipulates that the third party can only choose a signal bank for custody at one time. Additionally, the bank conducts the final payment and settlement service and conducts the funds in custody to supervise and protect the safety of customers. Therefore, third-party payment cannot run the entire payment process independently, and the current account and final settlement need to be carried out by a bank, so it must cooperate with commercial banks. While cooperating with each other, both third-party payment and commercial banks can obtain certain settlement income. For commercial banks, there are too many small merchants and individual users, so cooperation with third-party payment platforms can save costs and obtain settlement income. For third-party payment, the prior settlement with the user in the transaction, and later settlement with commercial banks, can also obtain fee income and expand its user scale.

(2) Cooperation in information exchange:

Commercial banks and third-party payments cooperate by exchanging information. In the process of using bank-provided services, users must provide necessary information and certification guarantees to reduce risks. Therefore, commercial banks have the most accurate and important information about customers, and the details of customers can be queried in the system shared among the banks. The third-party payment collects various user transaction information and then uses big data technology to evaluate the user's credit status. Commercial banks can cooperate with third-party payment to save costs and make it easier to get the customer's user information and credit status. Third-party payment can learn more comprehensive and factual user information through the bank, so the two parties cooperate and mutually benefit in terms of information sharing.

(3) Cooperation in technology and security:

There are many security vulnerabilities in Internet transactions, which can be easily exploited by criminals and cause loss to customers. Thus, ensuring the security of the transaction environment while making online payments is vital. Because the third-party payment development time is not long, and the risk control technology is immature, security is difficult to guarantee. However, Chinese banks started to improve the security of the payment environment very early through the use of SMS transaction codes, U-type shields, etc., which greatly improved transaction security. Through cooperation with commercial banks, third-party payment can take advantage of the advanced security and technology systems of commercial banks in order to prevent risks and protect user interests.

4.2 Competition Between Third-party Payment and Commercial Banks

Although commercial banks almost monopolized all payment businesses in the early stages of the development of third-party payment platforms, the payment business is constantly being replaced

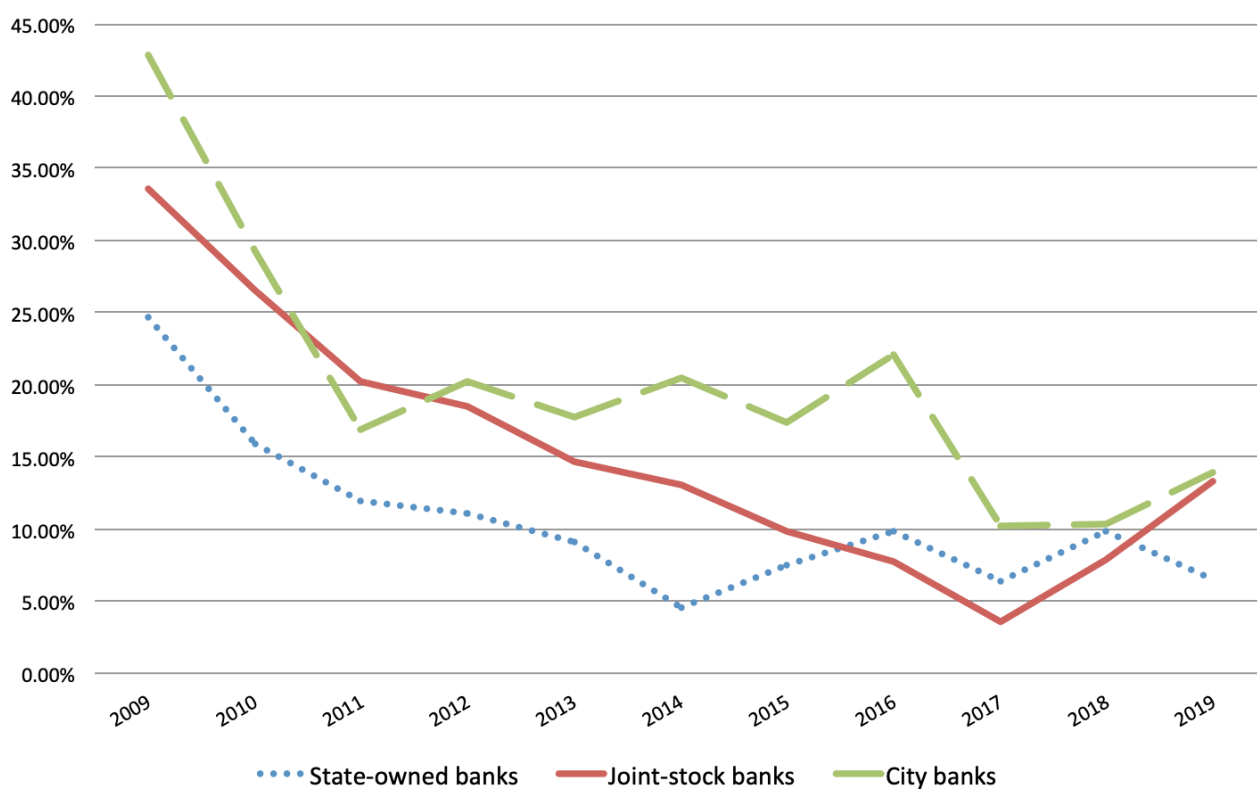
by third-party payment at a fast speed. Especially due to the continuous development of services innovated by third-party payment, even the normal operation of banks has been seriously threatened. According to the sources and uses of funds, commercial banks' business types can be classified into three types: asset business, liability business and intermediate business (Zhang and Tan, 2015). Third-party payments have different degrees of influence on almost all aspects of commercial banks, including all three businesses, as well as business scope, status, and the overall business model of commercial banks. With the rapid development of third-party platforms, the commercial bank market has gradually squeezed out a huge amount of deposited funds, and the advantage of interest rates has been used to reduce the amount of deposits and loans of commercial banks, which has significantly influenced the main business of the bank.

4.2.1 Impact on the Traditional Core Businesses of Commercial Banks

The third-party payment platform's main business is to provide the payment and settlement services, but it not only stays with it, it also continues to expand its business scope, involving traditional financial fields, such as the traditional loan business and deposit business. Also, since net interest income is the primary income of a Chinese bank' traditional business, the expansion affects commercial banks' traditional core business, and also affects the banks' position in the market.

Traditional commercial banks mainly rely on deposit interest to absorb funds, which are divided into demand deposits and time deposits. According to the information provided by the PBoC, the annualized interest rate of demand deposits in 2019 was around 0.35%, the interest rate of one-year time deposits was 1.50%, and the interest rate of three to five-year time deposits was 2.75%. After the rise of the third-party payment industry, the third-party payment product's ability to attract consumers far surpassed commercial banks in two aspects: liquidity and profitability. Take Yu'e Bao as an example. As of the end of 2019, the daily compounded annualized interest rate was

2.7%~3%. Comparing the profitability of the two interest rates, the regular three to five-year annualized interest rate of commercial banks can barely beat the Yu'e Bao yield rate. In terms of liquidity, the liquidity of bank time deposits is poor, while Yu'e Bao is readily available for use, and relying on its own powerful shopping platform, it can be used for direct transactions and payments without repeated withdrawals and deposits. For consumers, products such as Yu'e Bao are basically the same as commercial bank deposits in actual use, and even third-party payment is more efficient and convenient than mobile banking payments, which result in negative influence on bank savings.



Data source: Wind

Figure 5 The Deposit Growth Rate of Commercial Banks

Although major commercial banks have basically maintained positive growth in the absolute amount of deposits, it can be seen from Figure 5, that during the ten-year period from 2009 to 2019, the overall average growth rate of all three bank types has shown a downward trend. The third-party

payment platform has absorbed a large amount of precipitation funds, which originally only received a small portion of interest income. However, on the basis of cooperation with fund companies, the third-party payment platform converted these deposits into monetary funds, which furthermore attracts more customers. In terms of demand deposits, compared with banks, it has higher liquidity and higher returns. Although the profit earned by the third-party companies is relatively low, they have attracted a large number of users, and in turn, they have also increased their liquidity. Such behaviour has taken away customers' deposits in banks and has grabbed a share of the deposit business. This shows that the competition between commercial banks and third-party platforms has intensified.

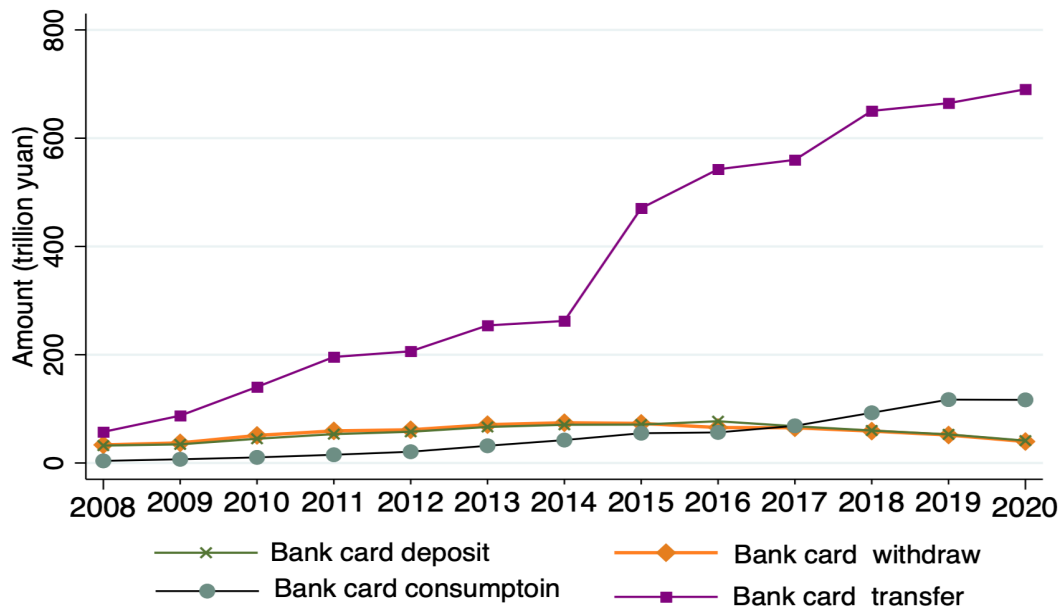
As for the loan business, the China Banking Industry Association's "2020 China Banking Industry Development Report" showed that in 2019, the global economy is in a downward cycle, and the banking industry is under increased risk management pressure, but the overall risk is controllable. The high level of non-performing loan ratios made the banking industry have to make loans cautiously. Additionally, commercial banks have cumbersome procedures and strict review procedures in the course of business operations. Because some small micro-enterprises do not have a high degree of credit or do not have sufficient collateral, it is difficult for banks to lend to these enterprises. A cautious wait-and-see attitude towards financial prospects has led to slower growth in bank loans in recent years. Different from the slowdown in bank loan growth, third-party payment platforms have launched various micro-loans. In 2015, Alipay launched Ant Jiebei, which is a loan service where consumers can apply for small loans of one thousand yuan to 0.3 million yuan from Alipay, if they have an Ali Zhima credit of 600 points or more, with the daily interest rate of 0.04%. Ant Jiebei has issued nearly 50 billion yuan consumer credits to 30 million users across the country in one year. Also in terms of the loan business, Alipay also provides loan services through TaobaoLoan and AliLoan. Though generally, the amount of those loans are small, it made up for the public loan requirements and provided more convenience to consumers by covering individual

consumers who need microfinance. Therefore, the business characteristics of commercial banks and their cautious lending attitude have given the third party an opportunity for development, and have further squeezed out the bank's potential customer base, causing negative impacts on the loan business of commercial banks. As a result, the traditional credit market is gradually being seized by third-party platforms.

4.2.2 Impact on the Intermediate Businesses of Commercial Banks

The competition between third-party payment and commercial banks is mainly due to business overlap. According to the Interim Rules on the Intermediate Services of Commercial Banks (2001) composed by the People's Bank of China, intermediary business refers to a business that does not constitute on-balance sheet assets and on-balance sheet liabilities of commercial banks, but forms bank non-interest income. Intermediate businesses can be defined into 9 types: bank card business, payment settlement business, agency business, commitment business, transaction business, guarantee business, fund custody business, consultant and other type business. Zhang and Tan (2015) found out in China, that even though Chinese commercial banks are all involved in the above nine types of intermediate businesses, they are still mainly focused on payment and settlement, bank card business, and less involved in credit commitments, guarantees, financial derivatives transactions and other high-end businesses. The handling processes of the intermediary business of the two parties are very similar, but the operation process of the third-party payment platform is faster, low in cost, and has a humanized service model. Therefore, customer loyalty is high and large-scale potential customers are attracted, thus reducing the intermediate business income of commercial banks. Similar to that of traditional banks, third party platforms have formed a similar inter-bank settlement function and have established a complete account system, which poses a huge threat to commercial banks' market share. The increasing substitution effect brought by third-party payment directly affects the fee and commission income of commercial banks' settlement and clearing business, agent business, bank card electronic banking business and other

aspects (Xie, 2018). Also, commercial banks are increasingly attaching great importance to intermediary business, so the securing of intermediate business has become one of the reasons for the fierce competition between the two parties.



Data source: Wind

Figure 6 Bank Card Payment

Take Alipay as an example. Following ten years of expansion, Alipay has currently shifted their focus to projects related to payment, transfer, repayment, loans, wealth management, etc., and is actively expanding into overseas markets. Commercial banks have relied on credit cards and online banking in their payment business, while Alipay is also more flexible in payment methods compared to banks, including credit cards, bank cards, account balances, Ant Huabei, asking someone to pay on another's behalf, online banking and other payment methods such as scanning QR codes, NFC payment and facial recognition payment. As for Ant Huabei, it is a consumer credit product launched for Alipay users where people can spend money first and then pay for up to 41

days without interest. Commercial banks' credit card business has been harshly impacted by the emergence of Huabei. It can be seen from Figure 6 that during 2008-2020, bank card consumption did not rise sharply, and bank card deposits and withdrawals have been suppressed since 2014, shown as a downward trend. This is also the period when third-party mobile payments began to develop expeditiously. On the other hand, the increasing amount of third-party payment has also stimulated bank card transfers transactions.

As for transfer business, banks generally use local intra-bank transfers, local inter-bank transfers, inter-regional intra-bank transfers and inter-regional inter-bank transfers. Different commercial banks charge different fees depending on the transfer situation. Alipay transfers are mainly transfers between Alipay accounts and transfers between bank cards and Alipay accounts. The bank transfers within the same city are free of charge for commercial banks. The bank transfers between different places, inter-bank transfers within the same city, and inter-bank transfers between different locations vary from bank to bank. The minimum handling fee ranges from 0.5 to 2 yuan per transaction, and the capped handling fee ranges from 20 to 200 yuan per transaction. Generally, the cross-bank cross-region transaction fee is the highest. Alipay There is a free transfer line of 20,000 yuan per month, and Alipay's internal transfer is free (Wang, 2016). Judging from the current situation, Alipay's transfer fee is much lower than that of banks, so it is very popular among users. Overall, commercial bank transfers have the advantages of optional transfer time, a larger range of transfer banks, and higher transfer limits. The process of transfer using third-party payment is more simple and fast, and users can have a better experience.

In terms of the repayment business, consumers can repay their various bank credit cards through Alipay. Agency payment services were originally a feature intermediary business of commercial banks, including agent payment of public utility charges, insurance premiums, property management fees, tuition, etc. Since the introduction of online payment services by Alipay, users are allowed to complete various payments without going to the bank. Since the third-party payment

has great customer experience and other advantages of these overlapping businesses, it has brought a great impact on commercial banks.

4.2.3 Impact on Customer Market and the Big-data War

Abundant customer resources are the foundation for business expansion, and can effectively increase the profitability of banks and enhance market competitiveness (Liu, 2018). Since commercial banks initially did not pay attention to the development of third-party payment and also because banks' businesses have limitations, third-party payment platforms have gradually attracted more customers. Since third-party payment is continuously improving the user experience, customers have experienced good personalized services and a good user experience through using third-party payment, so customers became more loyal. While ensuring the quality and quantity of customers, increasing customer attention and loyalty, it also attracts more potential customers. Therefore, the third-party payment platform gained more and more customer resources. To better fit the diverse needs of consumers, third-party payment companies not only customize personalized services but also have different innovations in products. In this regard, there is still a big gap between commercial banks. Therefore, the position of commercial banks in the market was gradually shaken by third-party payments, and they began to become post-marginalized, causing banks to lose a large number of customers. The third-party payment platform provides customers with more convenient and high-quality services, constantly upgrades the payment system and expands the business market, making customers more loyal. As a result, the customer base of commercial banks is gradually switching to third-party payment companies.

Having huge data resources not only improves the competitive advantage of third-party payment in the market, but also enables third-party payment to have a certain right to speak in the competition. The third-party payment platform is relatively complete in possessing big data, processing information, recording information, and communicating. At the same time, it has a wealth of

customer groups and credit resources. Even though traditional commercial banks can control the flow of funds, it is difficult to obtain this detailed data information and personal credit information of both parties to the transaction without relying on third-party payment platforms.

4.3 Summary

To sum up, third-party payment has many advantages, and it is easy to obtain the financial cooperation of small to medium-sized enterprises, thereby reducing the share of bank loans; flexible access to financial products increases the cost of banks to obtain deposits. The use of mobile payments continues to increase, without handling fees, squeezing funds for bank payment and settlement services. Cooperating with fund companies, with huge customer resources and convenient operation, they have robbed the bank's fund agency business. Online transactions are frequent, offline transactions are non-cash, they have substantial customer resources and have access to huge information and data sources. It can be seen that the third-party payment has had an inevitable impact on the deposit and loan business, intermediary business or customers of commercial banks, and has diverted the source of income and customer resources of commercial banks. Even though there are cooperation needs between third-party payment and commercial banks, based on the above analysis, it is concluded that the third-party payment has a substitution effect and influences the commercial banking business in a negative way. The next chapter will conduct an empirical analysis to verify this conclusion.

V. Methodology

5.1 Hypothesis

Based on the above analysis, third-party payment initially cooperated with banks, and after rapid development and growth, it brings competitive effects and different influences, resulting in a decline in the bank's profitability. But at the same time, it will also promote banks to actively explore innovations in the different financial sectors, and promote business structure diversification, which may lead to an increase in profitability and changes in profitability structure. To determine what effect has had the greatest impact in the past few years, data must be analyzed using empirical research. The following assumptions are made:

Hypothesis 1: Third-party payment will lead to a decline in the profitability of commercial banks.

(This is due to competition effects. Third-party payment will directly affect the market share of banks' overlapping businesses, thereby harming the profitability of these businesses, thus the total profit is reduced.)

Hypothesis 2: If a commercial bank's profit source relies on its traditional business to a high degree, the profitability will be more affected by the third party's payment, and different types of traditional business will have different effects.

(Among them, the traditional business income includes net interest income corresponding to deposit and loan businesses, and net fee and commission income corresponding to the traditional intermediate business. In terms of data, the interaction variable of the traditional business and third-party payment may be significantly negatively correlated with the bank's profit-related data.)

Hypothesis 3: Third-party payment has a significant heterogeneous impact on the profitability of different types of commercial banks.

(Third-party payment has heterogeneous effects on different types of banks due to variations in shareholding structures, management mechanisms, business objectives, and core businesses between the banks.)

5.2 Data and Variable Selection

5.2.1 Data Selection

In this research, China's commercial banks are divided into three major categories: large state-owned commercial banks, joint-stock commercial banks and city commercial banks. State-owned commercial banks are characterized by the large scale of assets, wide operating areas, complex business varieties and organization and management, and occupy a particularly important position in China's banking financial institutions. Joint-stock commercial banks are commercial banks that, in addition to large state-owned commercial banks, can set up branches in mainland China and conduct business nationwide. There is a large gap in the scale of assets among different institutions of joint-stock commercial banks, and there are also large differences in the types of business operations, geographic regions, and organizational complexity of these banks. In China, most city commercial banks, as local financial institutions, can only operate within a specific area. Although there are also some city commercial banks with large asset scales and high levels of management, such as Bank of Beijing and Bank of Shanghai, which are allowed to open branches in other cities, most city commercial banks are limited to the city area where they operate. The operation of city commercial banks is greatly affected by the development of the local economy, and the business

operation, risk management, corporate governance and organizational structure of various institutions are very different.

This paper chose the time interval from 2008 to 2019, selected the five largest state-owned banks, the eight largest joint-stock banks, and the five largest city banks based on the top 20 of the 2020 China Commercial Bank Ranking list. The data used in this paper mainly comes from the Wind database, IResearch, National Bureau of Statistics and banks' annual Income Statements. As for software, Stata 15.1 is used for all statistics and data analysis.

5.2.2 Response Variable

Return on asset (ROA): There are several measures that can test profitability such as the return on assets, return on equity, and yield on earning assets, rate paid on funds, and interest margin. With reference to domestic and foreign research on banks and commercial banks, return on equity or return on assets is usually used as an index to assess the profitability of banks and commercial banks. Return on assets is often used as an overall index of profitability (Ghebreorgis and Atewebhran , 2016). Therefore, in this paper, the return on assets is chosen as the research object. It measures a bank's asset utilization rate. A higher ROA means the higher the bank's asset utilization rate and the higher the profitability. Additionally, ROE will be used in the robustness test.

$$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$$

5.2.3 Explanatory Variable

The scale of third-party payment (TPP): With the expansion of Internet finance and the rapid development of third-party payment, it has brought a lot of convenience to people's lives, but also robbed the bank of customer resources and caused a certain impact on the banking business.

Therefore, the third-party payment size is selected as an important factor that affects the profitability of commercial banks. This paper takes the total amount of third-party PC payment and third-party mobile payment as the third-party payment variable.

5.2.4 Control Variables

In the study of this paper, third-party payment is the only explanatory variable, and referring to the existing literature, this is not the only factor that affects the banks' profit. Thus, in order to enhance the accuracy of the empirical results, this paper adds some control variables to the analysis based on the explanatory variables. According to past studies, most scholars select control variables mainly from the bank's internal and external factors. By analyzing the factors that affect the profitability of commercial banks, this paper expands on the basis of the existing studies and considers all aspects including both the assets side and the liability side, selects asset scale, traditional business income ratio, which further in the study of this paper is divided into net interest income ratio and net fee and commission income ratio, loan- to-deposit ratio, leverage ratio and non-performing loan rate as bank internal control variables. The selection of external control variables is mainly considered from the two aspects of macroeconomic growth and currency conditions. The growth rate of real GDP and M2 growth rate are used as the external control variables.

Banks Specific Variables:

Assets scale (LNSIZE): To a certain extent, the total assets of commercial banks reflect the scale of development of commercial banks. In general, the larger the size of the bank, the more assets, and greater the advantages in customer resources, technology, etc. With its high financial strength, it can achieve a higher level of profitability, and at the same time, it has a strong ability to resist shocks and risks. Due to the large size of assets, this study selects the large logarithm of the total assets to represent the overall size of the bank, to make the data more stationary.

Traditional business income ratio (TR): The operating income in the income statement includes net interest income, net fee and commission income, exchange income, net investment income, net income from changes in fair value, and other businesses income. Among them, the exchange income may be negative. Main business income includes interest income, interest income from financial institutions transactions, fee income, etc. Non-main business income includes gold and silver trading income, securities issuance and agency trading income, foreign exchange trading income, guarantee income, consulting income, custodial income, intangible asset transfer income, etc.(China Bank Annual Report Data Interpretation Form). Therefore, in this paper, the sum of net interest income, net fee and commission income is regarded as the traditional business income of the bank.

$$TR = \frac{\text{Net interest income} + \text{Net fee and commission income}}{\text{Total operating income}}$$

Net interest income ratio (IR):The traditional core business of a bank is the deposit business and loan business, so interest income accounts for a large part of the bank's total income as shown in the appendix, thus, interest income plays a key role in the performance of a bank. This paper selects the proportion of interest income indicators to represent the status of the traditional core business in the commercial banking business.

$$IR = \frac{\text{Net interest income}}{\text{Total operating income}}$$

Net fee and commission income ratio (FEE): As for the intermediary business, the bank acts as an intermediary and agent to implement paid services. This paper chooses intermediary business income, that is, net fee and commission income, as a percentage of the total operating income of commercial banks as an indicator to measure the development of intermediary business income,

which can be a good indication of the status of the intermediary business in the commercial banking business.

$$FEE = \frac{\text{Net fee and commission income}}{\text{Total operating income}}$$

Loan-to-deposit ratio (LDR): Deposit business and loan business are the traditional main businesses of the banking business. They are the most important and basic source of bank funds. Therefore, this paper takes the loan-to-deposit ratio to assess a bank's liquidity. If the ratio is too low, the bank may find it hard to remain at a high income. On the contrary, if it is too high, it indicates that the bank does not have enough liquidity to meet any unforeseen funding needs.

$$LDR = \frac{\text{Total Loans}}{\text{Total Deposits}}$$

Leverage ratio (LR): This ratio shows the capital situation of the bank. That is, to what extent a business is funded by equity or debt. It measures the total assets to total equity. In the case of the asset/equity ratio, the higher the ratio, the more debt the bank holds.

$$LR = \frac{\text{Total Assets}}{\text{Total Equity}}$$

Non-performing loan ratio(NPL): Non-performing loans are loans that have defaulted or are close to default. Once the loan turns into a non-performing loan, the probability that the debtor will repay in full is greatly reduced. For banks, if the debtor fails to pay interest or principal of a commercial loan within 90 days or is 90 days overdue, the loan will be considered a non-performing loan. For consumer loans, 180 days overdue will be classified as a non-performing loan. This indicates that banks will likely suffer risk losses (Segal, 2021). The principal objective of risk management is to reduce non-performing loans to a minimum. (Li, 2002). Non-performing loan ratio refers to the

proportion of non-performing loans of financial institutions in the total loan balance, and is one of the essential indicators of the security of credit assets of financial institutions. A high non-performing loans ratio means that those loans that may fail to be recovered account for a large proportion of total loans. This paper uses the non-performing loan ratio to represent the quality of bank loans.

$$NPL = \frac{\text{Non-performing loans}}{\text{Total loan balance}}$$

Macroeconomic indicators:

Real GDP growth rate (RGDPG) and broad money growth rate (M2G):

Macroeconomic factors greatly affect the development of banks. The country's economic conditions and economic cycles affect the operating profitability of banks. Higher GDP growth results in increases in corporate loans and deposits while improving net interest income and decreasing loan losses (Combey and Togbenou). Therefore, this paper selects the real GDP growth rate and the growth rate of broad money (M2) as measurement indicators in both real and nominal terms.

5.3 Data Description

Table 2 Descriptive Statistics < All Banks>

VARIABLES	Obs	Mean	Std. Dev,	Min	Max
ROA	216	1.053	0.209	0.148	1.715
TPP	216	70.16	87.58	0.251	250.8
LNSIZE	216	1.090	1.258	-2.368	3.405
TR	216	94.77	5.443	70.17	103.1
IR	216	77.77	9.607	48.91	95.93
FEE	216	17.00	6.844	3.974	33.67
LDR	216	74.44	11.07	47.43	112.0
LR	216	16.19	3.582	8.259	31.40
NPL	216	1.249	0.495	0.380	4.320
RGDPG	216	7.833	1.183	6.100	10.30
M2G	216	14.20	5.046	8.275	26.50

Table 2 reveals the average value of return on total assets is 1.053, the minimum value is 0.148, and the maximum value is only 1.715, which is relatively low compared to other industries. The average percentage of net interest income is 77.77%, the minimum value is 48.91%, and the maximum value is 95.93%, indicating that bank income depends on interest income at an extremely high level. The average growth rate of China's real GDP is 7.833%, the minimum value still being over 6% which indicates that China is still in a stage of rapid growth from 2008 to 2019.

In this paper, commercial banks are divided into three types. The following are the descriptive statistics for state-owned commercial banks, joint-stock commercial banks and city commercial banks.

Table 3 Descriptive Statistics < State-owned Banks>

VARIABLES	Obs	Mean	Std. Dev,	Min	Max
ROA	60	1.136	0.181	0.799	1.475
TPP	60	70.16	88.12	0.251	250.8
LNSIZE	60	2.551	0.552	0.985	3.405
TR	60	93.41	4.955	80.74	103.1
IR	60	75.56	6.229	61.56	91.79
FEE	60	17.85	2.542	11.27	21.91
LDR	60	71.49	9.134	50.84	90.40
LR	60	14.81	2.829	11.18	25.90
NPL	60	1.498	0.571	0.850	4.320
RGDPG	60	7.833	1.191	6.100	10.30
M2G	60	14.20	5.077	8.275	26.50

Table 4 Descriptive Statistics < Joint-stock Banks>

VARIABLES	Obs	Mean	Std. Dev,	Min	Max
ROA	96	1.005	0.223	0.148	1.460
TPP	96	70.16	87.84	0.251	250.8
LNSIZE	96	1.033	0.654	-0.746	2.004
TR	96	95.58	4.265	79.61	100.8
IR	96	76.18	10.24	48.91	92.98
FEE	96	19.40	8.090	4.672	33.67
LDR	96	79.96	10.85	62.53	112.0
LR	96	17.18	4.168	11.22	31.40
NPL	96	1.206	0.474	0.380	2.140
RGDPG	96	7.833	1.187	6.100	10.30
M2G	96	14.20	5.061	8.275	26.50

Table 5 Descriptive Statistics < City Banks>

VARIABLES	Obs	Mean	Std. Dev,	Min	Max
ROA	60	1.046	0.188	0.713	1.715
TPP	60	70.16	88.12	0.251	250.8
LNSIZE	60	-0.281	0.828	-2.368	1.007
TR	60	94.82	7.152	70.17	103.1
IR	60	82.52	9.826	55.77	95.93
FEE	60	12.30	5.123	3.974	25.57
LDR	60	68.57	8.942	47.43	93.61
LR	60	15.99	2.682	8.259	21.99
NPL	60	1.066	0.324	0.530	2.230
RGDPG	60	7.833	1.191	6.100	10.30
M2G	60	14.20	5.077	8.280	26.50

Comparing table 3, table 4, and table 5, it shows that State-owned banks have the highest average ROA and the highest average NPL, joint-stock banks' average ROA is the lowest, and average NPL of city banks is the lowest, which is the advantage of relatively small banks. The smaller scale has led to a more cautious attitude towards enlargement, and there are relatively few non-performing loans. The traditional business ratio is similar with all bank types, and is around 95%. There is not a big difference for the range of it. However the net interest income ratio and commission income ratio are various among bank types. City banks rely more on net interest income compared to state-owned banks and joint-stock banks, in which the net interest income ratio is 82.52%, 75.56% and 76.18% respectively.

After finishing the descriptive statistics of the sample, the correlation analysis between the variables and the variance inflation factor (VIF) tests were carried out, and the statistical results are as follows:

Table 6 Correlation Matrix

VARIABLES	ROA	TPP	LNSIZE	TR	LDR	LR	MPL	GRIP	M2G
ROA	1								
TPP	-0.4216	1							
LNSIZE	0.0843	0.3496	1						
TR	0.1975	-0.6155	-0.2446	1					
LDR	-0.3881	0.5862	0.2399	-0.3518	1				
LR	-0.2626	-0.5297	-0.3663	0.3813	-0.2925	1			
MPL	-0.3224	0.3224	0.3679	-0.1339	0.2166	-0.1267	1		
GRIP	0.2594	-0.7716	-0.3723	0.4354	-0.4531	0.5149	-0.2742	1	
M2G	0.1594	-0.7311	-0.3622	0.3762	-0.4012	0.57	-0.1934	0.7785	1

Note: 0.3-0.5 weak correlation, 0.5-0.8 moderate correlation, > 0.8 Strong correlation

Table 7 Variance Inflation Factor Test

VARIABLES	VIF	I/VIF
TPP	3.53	0.283433
GRIP	3.32	0.30101
M2G	3.09	0.323502
LR	1.62	0.617725
LDR	1.53	0.651893
LNSIZE	1.36	0.735401
NPL	1.25	0.798954
Mean VIF	2.24	

According to the correlation analysis results above, it can be seen that there are no strongly correlated variables. The coefficients between most variables are lower than 0.5, and the correlation is weak. Additionally, according to the VIF test result, none of the VIF exceeds 10, which indicates no multicollinearity problems in the model.

5.4 Analytical Method

The data set used in the following models contains 18 banks' data from 2008-2019 (11years). Therefore, it is short panel data, because the time-series observations number is less than the number of banks. The model for this study explores the association between third-party payment and return on asset controlling for other variables that have been found significant in previous pieces of literature. It relies on cross-bank panel data to draw empirical estimations for these underlying relationships. Based on existing studies, this paper first chose three bank internal control variables (TR, NPL and LDR) and two external control variables (RGDPG and M2G) as the basic Ordinary Least Square (OLS) model, then added more variables including a size variable to control the bank scale and leverage ratio for controlling solvency and capital structure to find the best model. Next, bank fixed effect and time fixed effect are used to eliminate the effect of some unobserved bank specific characteristics.

$$(1) ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 TR_{i,t} + \beta_3 NPL_{i,t} + \beta_4 LDR_{i,t} + \beta_5 RGDPG_t + \beta_6 M2G_t + \varepsilon_{i,t}$$

$$(2) ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 TR_{i,t} + \beta_3 NPL_{i,t} + \beta_4 LDR_{i,t} + \beta_5 RGDPG_t + \beta_6 M2G_t + \beta_7 LNSIZE_{i,t} + \varepsilon_{i,t}$$

$$(3) ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 TR_{i,t} + \beta_3 NPL_{i,t} + \beta_4 LDR_{i,t} + \beta_5 RGDPG_t + \beta_6 M2G_t + \beta_7 LR_{i,t} + \varepsilon_{i,t}$$

$$(4) ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 TR_{i,t} + \beta_3 NPL_{i,t} + \beta_4 LDR_{i,t} + \beta_5 RGDPG_t + \beta_6 M2G_t + \beta_7 LNSIZE_{i,t} + \beta_8 LR_{i,t} + \varepsilon_{i,t}$$

(where t stands for year, i denotes different banks, $\alpha_{i,t}$ represents the individual differences of different banks in different periods of time and $\varepsilon_{i,t}$ stands for the error term.)

Additionally, in order to study whether commercial banks highly rely on traditional business, and therefore are more affected by third-party payments, an interaction variable of traditional business with the third-party payment scale is added to the original regression model. Furthermore, it separates the main traditional business into loan and deposit business (net interest income) and intermediate business (net fee and commission income).

$$(5-1) \quad ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 TR_{i,t} + \beta_3 LNSIZE_{i,t} + \beta_4 LDR_{i,t} + \beta_5 LR_{i,t} + \beta_6 NPL_{i,t} + \beta_7 RGDPG_t + \beta_8 M2g_t + \beta_9 (TPP*TR)_{i,t} + \varepsilon_{i,t}$$

$$(5-2) \quad ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 IR_{i,t} + \beta_3 FEE_{i,t} + \beta_4 LNSIZE_{i,t} + \beta_5 LDR_{i,t} + \beta_6 LR_{i,t} + \beta_7 NPL_{i,t} + \beta_8 RGDPG_t + \beta_9 M2g_t + \beta_{10} (TPP*TR)_{i,t} + \varepsilon_{i,t} \quad (\text{Note: } TR = IR + FEE)$$

$$(6) \quad ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 IR_{i,t} + \beta_3 FEE_{i,t} + \beta_4 LNSIZE_{i,t} + \beta_5 LDR_{i,t} + \beta_6 LR_{i,t} + \beta_7 NPL_{i,t} + \beta_8 RGDPG_t + \beta_9 M2g_t + \beta_{10} (TPP*IR)_{i,t} + \varepsilon_{i,t}$$

$$(7) \quad ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 IR_{i,t} + \beta_3 FEE_{i,t} + \beta_4 LNSIZE_{i,t} + \beta_5 LDR_{i,t} + \beta_6 LR_{i,t} + \beta_7 NPL_{i,t} + \beta_8 RGDPG_t + \beta_9 M2g_t + \beta_{10} (TPP*FEE)_{i,t} + \varepsilon_{i,t}$$

$$(8) \quad ROA_{i,t} = \alpha_{i,t} + \beta_1 TPP_t + \beta_2 IR_{i,t} + \beta_3 FEE_{i,t} + \beta_4 LNSIZE_{i,t} + \beta_5 LDR_{i,t} + \beta_6 LR_{i,t} + \beta_7 NPL_{i,t} + \beta_8 RGDPG_t + \beta_9 M2g_t + \beta_{10} (TPP*IR)_{i,t} + \beta_{11} (TPP*FEE)_{i,t} + \varepsilon_{i,t}$$

(where t stands for year, i denotes different banks, $\alpha_{i,t}$ represents the individual differences of different banks in different periods of time and $\varepsilon_{i,t}$ stands for the error term.)

Lastly, in order to further analyze the influence of third-party payment on different types of commercial banks, the data is then divided into three subgroups as state-owned banks, joint-stock banks and city banks and are tested separately.

VI. Empirical Results

6.1 Analysis of OLS Regression Results

This paper first conducted an empirical analysis of all commercial bank samples. The result of OLS regressions are shown in Table 8.

Table 8 OLS Regression Results

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA
TPP	-0.001*** (-4.57)	-0.001*** (-4.54)	-0.002*** (-6.58)	-0.001*** (-6.52)
TR	-0.004 (-1.54)	-0.003 (-1.11)	-0.001 (-0.46)	-0.000 (-0.16)
NPL	-0.076*** (-2.91)	-0.117*** (-4.50)	-0.070*** (-3.36)	-0.097*** (-4.63)
LDR	-0.004*** (-2.68)	-0.004*** (-3.08)	-0.004*** (-3.28)	-0.004*** (-3.62)
RGDPG	-0.005 (-0.27)	0.002 (0.14)	0.004 (0.27)	0.008 (0.58)
M2G	-0.012*** (-2.99)	-0.009** (-2.39)	-0.002 (-0.66)	-0.001 (-0.31)
LNSIZE		0.054*** (5.15)		0.036*** (4.19)
LR			-0.038*** (-11.19)	-0.035*** (-10.59)
Constant	2.146*** (6.45)	1.923*** (6.06)	2.222*** (8.43)	2.067*** (8.06)
Observations	216	216	216	216
R-squared	0.292	0.372	0.558	0.593
F test	0	0	0	0
F	14.36	17.59	37.54	37.64

t-statistics in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Comparing the R-squared values 0.292, 0.372, 0.558 and 0.593, it indicates that the more control variables in the regression model, the better the fit of the model. The growth of the explanatory variable TPP negatively affects ROA, and passes the significance test with a confidence level of

1%, which indicates that TPP is statistically significant and negatively affects ROA. To be specific, ROA decreases by 0.001 % for every 1 trillion yuan the third-party payment scale increases (column 4). The regression models are shown as following:

$$(1) ROA_{i,t} = 2.146_{i,t} + (-0.001) TPP_t + (-0.004) TR_{i,t} + (-0.076) NPL_{i,t} + (-0.004) LDR_{i,t} + (-0.005) RGDPG_t + (-0.012) M2G_t + \varepsilon_{i,t}$$

$$(2) ROA_{i,t} = 1.923_{i,t} + (-0.001) TPP_t + (-0.003) TR_{i,t} + (-0.117) NPL_{i,t} + (-0.004) LDR_{i,t} + (0.002) RGDPG_t + (-0.009) M2G_t + (0.054) LNSIZE_{i,t} + \varepsilon_{i,t}$$

$$(3) ROA_{i,t} = 2.222_{i,t} + (-0.002) TPP_t + (-0.001) TR_{i,t} + (-0.070) NPL_{i,t} + (-0.004) LDR_{i,t} + (0.004) RGDPG_t + (-0.002) M2G_t + (-0.038) LR_{i,t} + \varepsilon_{i,t}$$

$$(4) ROA_{i,t} = 2.067_{i,t} + (-0.001) TPP_t + (-0.000) TR_{i,t} + (-0.097) NPL_{i,t} + (-0.004) LDR_{i,t} + (0.008) RGDPG_t + (-0.001) M2G_t + (0.036) LNSIZE_{i,t} + (-0.035) LR_{i,t} + \varepsilon_{i,t}$$

6.2 Analysis of Fixed Effects Regression Results

After the OLS model test, the F test is performed, shown in table 9 and the statistical result obtained are $F(6,192) = 24.07$ for regression 1, $F(7,191) = 23.11$ for regression 2, $F(7,191)=43.77$ for regression 3 and $F(8,190) = 43.90$ for regression 4. All the F statistics are greater than the critical value, and the P-value=0.000 is significantly less than 0.01. Therefore, the null hypothesis is rejected, showing there are unobservable individual effects, so fixed effects are selected to partially solve the endogenous problem caused by missing variables. The fixed effects model regression results are shown in table 9.

Table 9 Fixed Effects Regression Results

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA
TPP	-0.002*** (-6.57)	-0.001*** (-4.75)	-0.002*** (-8.22)	-0.001*** (-6.01)
TR	-0.001 (-0.37)	0.001 (0.25)	-0.001 (-0.72)	0.000 (0.07)
NPL	-0.085*** (-3.81)	-0.100*** (-4.49)	-0.078*** (-4.22)	-0.094*** (-5.18)
LDR	0.002 (1.15)	0.001 (0.43)	-0.001 (-1.09)	-0.003** (-2.04)
RGDPG	-0.003 (-0.23)	-0.025* (-1.67)	0.003 (0.24)	-0.020* (-1.69)
M2G	-0.013*** (-4.21)	-0.016*** (-5.14)	-0.004* (-1.70)	-0.008*** (-3.01)
LNSIZE		-0.109*** (-3.22)		-0.115*** (-4.22)
LR			-0.030*** (-9.64)	-0.031*** (-10.15)
Constant	1.421*** (5.05)	1.692*** (5.89)	2.045*** (8.52)	2.339*** (9.72)
Observations	216	216	216	216
R-squared	0.429	0.459	0.616	0.649
Number of bankcode	18	18	18	18
F test	0	0	0	0
F	24.07	23.11	43.77	43.90

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

And the regression models are shown as following:

$$(1) ROA_{i,t} = 1.421_{i,t} + (-0.002) TPP_t + (-0.001) TR_{i,t} + (-0.085) NPL_{i,t} + (0.002) LDR_{i,t} + (-0.003) RGDPG_t + (-0.013) M2G_t + \varepsilon_{i,t}$$

$$(2) ROA_{i,t} = 1.692_{i,t} + (-0.001) TPP_t + (0.001) TR_{i,t} + (-0.100) NPL_{i,t} + (0.001) LDR_{i,t} + (-0.025) RGDPG_t + (-0.016) M2G_t + (-0.109) LNSIZE_{i,t} + \varepsilon_{i,t}$$

$$(3) ROA_{i,t} = 2.045_{i,t} + (-0.002) TPP_t + (-0.001) TR_{i,t} + (-0.078) NPL_{i,t} + (-0.001) LDR_{i,t} + (0.003) RGDPG_t + (-0.004) M2G_t + (-0.030) LR_{i,t} + \varepsilon_{i,t}$$

$$(4) ROA_{i,t} = 2.339_{i,t} + (-0.001) TPP_t + (0.000) TR_{i,t} + (-0.094) NPL_{i,t} + (-0.003) LDR_{i,t} + (-0.020) RGDPG_t + (-0.008) M2G_t + (-0.115) LNSIZE_{i,t} + (-0.031) LR_{i,t} + \varepsilon_{i,t}$$

As can be seen from Table 9, R-squared values are 0.429, 0.459, 0.616 and 0.649, which means that with variable LNSIZE and LR, the model fits better. So in the following study, regressions will include all these variables. From the regression results column 4, the LNSIZE and NPL are significantly negatively correlated with the ROA of commercial banks. It denotes that the larger the size of the bank, does not necessarily mean the stronger the profitability of the bank. With the expansion of the assets of commercial banks, the rate of profit growth may be lower than the rate of asset expansion, which may be a reason for the reduction of ROA. Higher GDP growth is significantly and negatively leading to lower bank profitability in China. This result may be caused by high economic growth improving the business environment and lowering bank entry barriers. Consequently, increased competition hinders bank's profitability (Tan and Christos, 2012). The non-performing loan ratio is a bank's loan loss, which will inevitably change in the opposite direction to the bank's profit. Therefore, commercial banks should try to reduce the non-performing loan ratio to increase bank profitability. The coefficient of the third party payment is -0.001, so the economic meaning indicates that third party payment has a reverse influence on the profit of commercial banks. With the continuous and rapid growth of third-party payments, the profitability of commercial banks has also been declining, eroding part of the income of commercial banks and squeezing the share of commercial banks. This result is consistent with the foregoing theoretical analysis. Also, it passed the 0.01% significant test, indicating that the impact results are very significant. Third-party payment will result in a downturn in the profitability of commercial banks. It shows that the competitive relationship between banks and third-party payment is more obvious. Therefore hypothesis 1 is established.

For OLS regression and fixed effects regression, this paper used two ways to do the robustness test. The first way is using the ROE as the response variable instead of ROA, because return on equity

(ROE) is another way to measure profitability of the bank. ROE reflects the ability of banks to use their equity to generate profits. Although not as widely used as ROA, it is also a standard indicator for comparing the financial performance of different banks in developed countries (Tan and Christos, 2012) . Another way is using IR and FEE as control variables instead of TR. Results show that the model passed the entire robustness test and demonstrates that the TPP is significant and negatively related with the profitability of banks.²

² Robustness testing results are shown in the Appendix

6.3 Analysis of Fixed Effects Regression Results with Interaction Term

Table 10 Fixed Effects Regression Results with Interaction Term

VARIABLES	(5-1) ROA	(5-2) ROA	(6) ROA	(7) ROA	(8) ROA
TPP*TR	-0.005*** (-3.06)	-0.005*** (-3.25)			
TPP*IR			-0.002** (-2.00)		-0.005*** (-3.24)
TPP*FEE				-0.001 (-0.44)	-0.006** (-2.56)
TPP	0.003** (2.22)	0.004** (2.48)	0.001 (0.67)	-0.001** (-2.21)	0.004** (2.51)
LNSIZE	-0.111*** (-4.15)	-0.161*** (-4.23)	-0.138*** (-3.46)	-0.163*** (-3.90)	-0.168*** (-4.09)
LDR	-0.002 (-1.36)	-0.002* (-1.74)	-0.003** (-2.29)	-0.003** (-2.25)	-0.002 (-1.65)
LR	-0.031*** (-10.54)	-0.029*** (-9.43)	-0.030*** (-9.35)	-0.029*** (-8.99)	-0.029*** (-9.29)
NPL	-0.085*** (-4.72)	-0.104*** (-5.02)	-0.109*** (-5.21)	-0.109*** (-5.17)	-0.103*** (-4.97)
RGDPG	-0.022* (-1.87)	-0.024** (-2.04)	-0.025** (-2.09)	-0.021* (-1.75)	-0.023* (-1.96)
M2G	-0.008*** (-3.06)	-0.008*** (-3.28)	-0.008*** (-3.07)	-0.008*** (-3.20)	-0.009*** (-3.30)
IR		0.008** (2.53)	0.003 (1.29)	-0.000 (-0.00)	0.008** (2.53)
FEE		0.013*** (3.06)	0.005 (1.53)	0.005 (1.25)	0.013*** (2.93)
TR	0.008** (2.45)				
Constant	1.569*** (4.56)	1.572*** (4.59)	2.096*** (7.54)	2.353*** (9.45)	1.546*** (4.44)
Observations	216	216	216	216	216
R-squared	0.666	0.671	0.660	0.653	0.672
Number of bankcode	18	18	18	18	18
F test	0	0	0	0	0
F	41.78	38.41	36.52	35.43	34.78

t-statistics in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 10 shows the summary of regression results of fixed effects regression with interaction term results, the regressions 5-8 are shown as following:

$$\begin{aligned}
 \text{(5-1)} \quad ROA_{i,t} = & 1.569_{i,t} + (0.003) TPP_t + (0.008) TR_{i,t} + (-0.111) LNSIZE_{i,t} + (-0.002) LDR_{i,t} + \\
 & (-0.031) LR_{i,t} + (-0.085) NPL_{i,t} + (-0.022) RGDPG_t + (-0.008) M2g_t + (-0.005) (TPP*TR)_{i,t} + \varepsilon_{i,t}
 \end{aligned}$$

$$(5-2) \quad ROA_{i,t} = 1.572_{i,t} + (0.004) TPP_t + (0.008) IR_{i,t} + (0.013) FEE_{i,t} + (-0.161) LNSIZE_{i,t} + (-0.002) LDR_{i,t} + (-0.029) LR_{i,t} + (-0.104) NPL_{i,t} + (-0.024) RGDPG_t + (-0.008) M2g_t + (-0.005) (TPP*TR^3)_{i,t} + \varepsilon_{i,t}$$

$$(6) \quad ROA_{i,t} = 2.096_{i,t} + (0.001) TPP_t + (0.003) IR_{i,t} + (0.005) FEE_{i,t} + (-0.138) LNSIZE_{i,t} + (-0.003) LDR_{i,t} + (-0.030) LR_{i,t} + (-0.109) NPL_{i,t} + (-0.025) RGDPG_t + (-0.008) M2g_t + (-0.002) (TPP*IR)_{i,t} + \varepsilon_{i,t}$$

$$(7) \quad ROA_{i,t} = 2.353_{i,t} + (-0.001) TPP_t + (-0.000) IR_{i,t} + (0.005) FEE_{i,t} + (-0.163) LNSIZE_{i,t} + (-0.003) LDR_{i,t} + (-0.029) LR_{i,t} + (-0.109) NPL_{i,t} + (-0.021) RGDPG_t + (-0.008) M2g_t + (-0.001) (TPP*FEE)_{i,t} + \varepsilon_{i,t}$$

$$(8) \quad ROA_{i,t} = 1.546_{i,t} + (0.004) TPP_t + (0.008) IR_{i,t} + (0.013) FEE_{i,t} + (-0.168) LNSIZE_{i,t} + (-0.002) LDR_{i,t} + (-0.029) LR_{i,t} + (-0.103) NPL_{i,t} + (-0.023) RGDPG_t + (-0.009) M2g_t + (-0.005) (TPP*IR)_{i,t} + (-0.006) (TPP*FEE)_{i,t} + \varepsilon_{i,t}$$

Adding an interaction term to the model greatly changes the interpretation of all coefficients. If there were no interaction term, β of TPP would be interpreted as the unique effect of third-party payment scale on ROA. However, the interaction means that the effect of the third-party payment scale on ROA is different for different values of the traditional business ratio of banks. Therefore, these regressions can also be written as:

$$(5-1) \quad ROA_{i,t} = 1.569_{i,t} + (0.003-0.05*TR) TPP_t + (0.008) TR_{i,t} + (-0.111) LNSIZE_{i,t} + (-0.002) LDR_{i,t} + (-0.031) LR_{i,t} + (-0.085) NPL_{i,t} + (-0.022) RGDPG_t + (-0.008) M2g_t + \varepsilon_{i,t}$$

³ TR= IR+FEE

$$(5-2) \quad ROA_{i,t} = 1.572_{i,t} + (0.004-0.05*TR) TPP_t + (0.008) IR_{i,t} + (0.013) FEE_{i,t} + (-0.161) LNSIZE_{i,t} + (-0.002) LDR_{i,t} + (-0.029) LR_{i,t} + (-0.104) NPL_{i,t} + (-0.024) RGDPG_t + (-0.008) M2g_t + \varepsilon_{i,t}$$

$$(6) \quad ROA_{i,t} = 2.096_{i,t} + (0.001-0.02 *IR) TPP_t + (0.003) IR_{i,t} + (0.005) FEE_{i,t} + (-0.138) LNSIZE_{i,t} + (-0.003) LDR_{i,t} + (-0.030) LR_{i,t} + (-0.109) NPL_{i,t} + (-0.025) RGDPG_t + (-0.008) M2g_t + \varepsilon_{i,t}$$

$$(7) \quad ROA_{i,t} = 2.353_{i,t} + (-0.001-0.01*FEE) TPP_t + (-0.000) IR_{i,t} + (0.005) FEE_{i,t} + (-0.163) LNSIZE_{i,t} + (-0.003) LDR_{i,t} + (-0.029) LR_{i,t} + (-0.109) NPL_{i,t} + (-0.021) RGDPG_t + (-0.008) M2g_t + \varepsilon_{i,t}$$

$$(8) \quad ROA_{i,t} = 1.546_{i,t} + (0.004 - 0.005*IR - 0.006*FEE) TPP_t + (0.008) IR_{i,t} + (0.013) FEE_{i,t} + (-0.168) LNSIZE_{i,t} + (-0.002) LDR_{i,t} + (-0.029) LR_{i,t} + (-0.103) NPL_{i,t} + (-0.023) RGDPG_t + (-0.009) M2g_t + \varepsilon_{i,t}$$

In the rewritten form of regressions 5-8, it can clearly show the meaning of the interaction term, which is, after adding the interaction term, for every unit (trillion yuan) change in TPP, the change in ROA depends not only on the β of the TPP itself, but also on the β of the interaction term and the corresponding traditional business ratio of the bank. Because of the interaction, the effect of a larger scale of third-party payment is different if a bank's income relies more on its traditional business or not. In the columns 5-8, the β of interaction terms are all negative numbers, which means that those banks that rely more on its traditional businesses are more negatively affected by third-party payment. According to columns 6-8, those banks that rely more on its loan and deposit businesses, are more statistically significantly affected by third-party payment, and are more statistically significant than those banks that rely more on their intermediate business. Therefore, hypothesis 2 in this paper is established.

The interaction variables between traditional business and third-party payment are significantly negatively (except column 7) correlated with the bank's return on asset. If a commercial bank's profit source depends to a large extent on its traditional business, then the profitability will be more affected by third-party payments, and different types of traditional businesses will have different impacts. The impact of third-party payment on ROA is more statistically significantly affected by deposit and loan business than by intermediate business.

6.4 Analysis of the Heterogeneity Impact of Different Commercial Bank Types

Table 11 Fixed Effects Regression Results in Different Bank Groups

VARIABLES	(9) ROA	(10) ROA	(11) ROA
TPP	-0.001*** (-9.20)	-0.001 (-1.55)	-0.001* (-1.81)
LNSIZE	-0.184*** (-2.85)	-0.065 (-1.04)	-0.262*** (-5.50)
TR	0.005* (1.85)	0.007 (1.60)	-0.003 (-1.28)
LDR	0.001 (0.56)	-0.003 (-0.93)	-0.004** (-2.28)
LR	-0.006 (-1.34)	-0.021*** (-3.63)	-0.023*** (-4.16)
NPL	-0.144*** (-9.73)	-0.160*** (-3.55)	-0.149*** (-3.22)
RGDPG	-0.026*** (-2.75)	-0.035 (-1.53)	-0.044** (-2.59)
M2G	-0.012*** (-5.06)	-0.009* (-1.92)	-0.012*** (-3.45)
Constant	1.794*** (4.63)	1.644*** (2.91)	2.652*** (10.23)
Bank type	State-owned	Joint-stock	City
Observations	60	96	60
R-squared	0.924	0.575	0.860
Number of bankcode	5	8	5
F test	0	0	0
F	71.10	13.52	35.95

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Through the regression results of classified banks of table 11, the R-squared of the regression models of the three major types of commercial banks are respectively 0.924, 0.575, 0.860. The P-values corresponding to the F statistic are all less than 0.01, indicating that the regression models fit well. Among them, in the regression of state-owned commercial banks, only LDR, LR and TR variables did not pass the 5% level significance test. In the regression model of joint-stock commercial banks, only the LR, NPL variable passed the 5% level significance test, while the TR variable in the city commercial bank regression passed the 10% level test. The results of the regression models are relatively similar for state-owned commercial banks and city commercial banks, while the results of joint-stock commercial banks are vastly different. This difference could be a result of distinctions in bank scale and share structure. State-owned commercial banks and city banks are more affected by the macro economy and bank scale, while joint-stock commercial banks are not significantly impacted by those factors. The regression results all show that the development of third-party payment has a negative impact on the ROA of commercial banks, and only the coefficient of the regression model of joint-stock commercial banks is not significant, indicating that the state-owned commercial banks and city commercial banks are more significantly affected by the third-party payment. Thus, third-party payment has obvious heterogeneous effects on different types of banks. Large state-owned commercial banks are most affected by third-party payments, and joint-stock banks are not significantly affected by third-party payments. Therefore, hypothesis 3 of this paper is established.

Tables 12-14 shows that the fixed effects regression results with interaction terms with different bank types, which indicates the interaction term significance is more reflected in the inter-bank types but is not obvious in the intra-bank types. This may be because there are too little observations of each bank type, leading to such an unobvious result. Excluding either state-owned banks or city banks from regressions are roughly consistent, so that if a commercial bank relies more on its traditional business, then the profitability will be more affected by third-party payments,

which indicates that hypothesis 2 is established mainly through the difference between the joint-stock banks and other types of banks.

Table 12 Fixed Effects Regression Results with Interaction Term <State-owned Banks>

VARIABLES	(12) ROA	(13) ROA	(12-1) ROA	(13-1) ROA
TPP*TR	-0.003 (-1.52)		-0.005** (-2.32)	
TPP*IR		-0.003 (-1.57)		-0.005** (-2.35)
TPP*FEE		-0.005 (-1.05)		-0.006** (-2.00)
TPP	0.001 (0.79)	0.002 (0.91)	0.004* (1.88)	0.004* (1.96)
LNSIZE	-0.201*** (-3.11)	-0.194** (-2.57)	-0.174*** (-4.72)	-0.195*** (-3.74)
LDR	0.004 (1.25)	0.004 (1.28)	-0.004** (-2.29)	-0.004** (-2.29)
LR	-0.009* (-1.85)	-0.009 (-1.68)	-0.033*** (-9.67)	-0.032*** (-8.54)
NPL	-0.140*** (-9.42)	-0.136*** (-7.82)	-0.097*** (-3.13)	-0.104*** (-2.93)
RGDPG	-0.026*** (-2.71)	-0.025** (-2.46)	-0.037** (-2.32)	-0.035** (-2.16)
M2G	-0.011*** (-4.69)	-0.011*** (-4.60)	-0.010*** (-3.00)	-0.010*** (-3.01)
TR	0.009** (2.41)		0.008** (2.10)	
IR		0.009** (2.23)		0.009** (2.13)
FEE		0.009 (1.19)		0.011* (1.80)
Constant	1.369*** (2.89)	1.317** (2.58)	1.758*** (4.06)	1.692*** (3.76)
Bank type	State-owned		Others	
Observations	60	60	156	156
R-squared	0.927	0.928	0.653	0.654
Number of bankcode	5	5	13	13
F test	0	0	0	0
F	65.22	51.40	28.01	22.66

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 13 Fixed Effects Regression Results with Interaction Term <Joint-stock Banks>

VARIABLES	(14) ROA	(15) ROA	(14-1) ROA	(15-1) ROA
TPP*TR	-0.004 (-1.13)		-0.002 (-1.37)	
TPP*IR		-0.006 (-1.41)		-0.002 (-1.44)
TPP*FEE		-0.012* (-1.75)		-0.005* (-1.94)
TPP	0.003 (0.89)	0.006 (1.44)	0.001 (0.46)	0.001 (0.94)
LNSIZE	-0.060 (-0.97)	-0.083 (-0.88)	-0.179*** (-6.51)	-0.222*** (-5.60)
LDR	-0.002 (-0.71)	-0.003 (-0.80)	-0.002* (-1.76)	-0.003* (-1.90)
LR	-0.021*** (-3.66)	-0.019*** (-3.18)	-0.020*** (-4.45)	-0.019*** (-4.14)
NPL	-0.144*** (-3.06)	-0.150*** (-2.83)	-0.124*** (-6.86)	-0.128*** (-6.93)
RGDPG	-0.036 (-1.59)	-0.027 (-1.15)	-0.024** (-2.26)	-0.026** (-2.44)
M2G	-0.009* (-1.79)	-0.009* (-1.90)	-0.010*** (-4.26)	-0.011*** (-4.52)
TR	0.012* (1.94)		-0.002 (-0.71)	
IR		0.011* (1.83)		-0.002 (-0.50)
FEE		0.015* (1.74)		0.003 (0.67)
Constant	1.135 (1.57)	1.071 (1.47)	2.567*** (7.52)	2.505*** (7.16)
Bank type	Joint-stock		Others	
Observations	96	96	120	120
R-squared	0.582	0.593	0.837	0.842
Number of bankcode	8	8	10	10
F test	0	0	0	0
F	12.20	10.19	57.72	47.81

t-statistics in parentheses

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

Table 14 Fixed Effects Regression Results with Interaction Term <City Banks>

VARIABLES	(16) ROA	(17) ROA	(16-1) ROA	(17-1) ROA
TPP*TR	-0.003 (-1.14)		-0.005** (-2.04)	
TPP*IR		-0.002 (-0.88)		-0.005* (-1.94)
TPP*FEE		0.004 (0.77)		-0.005 (-1.17)
TPP	0.002 (0.84)	0.000 (0.16)	0.003 (1.47)	0.003 (1.30)
LNSIZE	-0.259*** (-5.43)	-0.211*** (-3.38)	-0.019 (-0.48)	-0.047 (-0.75)
LDR	-0.005** (-2.49)	-0.004* (-1.81)	0.000 (0.13)	-0.000 (-0.14)
LR	-0.026*** (-4.27)	-0.029*** (-4.33)	-0.021*** (-4.89)	-0.021*** (-4.81)
NPL	-0.138*** (-2.92)	-0.135*** (-2.80)	-0.093*** (-4.74)	-0.102*** (-4.30)
RGDPG	-0.042** (-2.43)	-0.050*** (-2.80)	-0.019 (-1.32)	-0.021 (-1.39)
M2G	-0.013*** (-3.56)	-0.012*** (-3.21)	-0.007** (-2.12)	-0.007** (-2.15)
TR	0.002 (0.41)		0.014*** (3.61)	
IR		0.002 (0.33)		0.014*** (3.46)
FEE		-0.007 (-0.79)		0.016*** (2.94)
Constant	2.178*** (4.47)	2.380*** (4.45)	0.518 (1.09)	0.621 (1.22)
Bank type		City		Others
Observations	60	60	156	156
R-squared	0.863	0.871	0.639	0.640
Number of bankcode	5	5	13	13
F test	0	0	0	0
F	32.31	26.92	26.38	21.36

t-statistics in parentheses

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

VII. Conclusion

7.1 Summary

Under the wave of Internetization, third-party payment continues to develop vigorously. The business scope of third-party payment companies and banks continue to expand and overlap. Although the scale of third-party payment is significantly smaller than that of banks, third-party payment is gradually encroaching on the market share of commercial banks. In reviewing and analyzing the relevant literature, this paper studies the impact of third-party payment on the profitability of commercial banks through a combination of theory and empirical research methods. Based on the short panel data of 18 listed commercial banks in China from 2008 to 2019, this study analyzes impacts of third-party payment on the profitability of commercial banks. The analyzed results show that third-party payments have a significant negative impact on the return on assets of commercial banks. Additionally, as banks rely more on traditional business, they will be more impacted by third-party payments. Therefore, commercial banks need to change the traditional profit model in order to increase profitability.

7.2 Implications

This paper draws a consistent conclusion through theoretical and empirical analysis that the commercial banks' profit is adversely affected by the development of third-party payments; the more a commercial bank relies on its traditional businesses, the greater the impact it will suffer. Even though the impact of third-party payment is negative, it also offers new opportunities for commercial banks to restructure and innovate. Therefore, it is necessary to strengthen and innovate commercial banking businesses to offset the impact of third-party payment, and continuously

optimize the internal governance structure, enhance management systems, and improve the quality of employee service to increase user experience. Under the impact of the swift expansion of advanced financial technology and Internet technology, the most important thing is innovation. Innovation can be developed through the following aspects. In terms of loan business, banks could also launch microfinance products with lower interest rates and flexible loan borrowing procedures. In addition, large commercial banks should learn how to compete on their own merits and use big data technology to improve the analysis of lenders' credit evaluation accuracy, enhance the efficiency of the loan process, and reduce costs. In terms of payment and settlement business, commercial banks should make innovative developments in the direction of more convenience and high security. Banks could also change the previous offline payment method that relies on physical bank cards and expand to multiple payment channels. They could also learn to use biometrics and other technologies to conduct payment transactions from third-party payment while ensuring the security of transactions.

Also, banks should be aware of its own drawbacks and those advantages of third-party payment, as well as strengthen cooperation to achieve complementary advantages and win-win cooperation and draw on third-party payment advantages to develop its own weaknesses. In order to provide people with a more convenient and efficient payment life, information sharing between the two, and the research and development of technology, can promote positive development for both parties (He, 2019). Banks can also increase customer loyalty by optimizing usage procedures and improving customer experience. Additionally, banks should seize new opportunities. China is already implementing research on central bank digital currencies, which is bound to have a certain impact on the development of third-party payments (Tsinghua Financial Review, 2017), and it is a rare and perfect opportunity for commercial banks. In today's fragmented information age, opening up its own information collection channels, collecting, sorting, analyzing and calculating unstructured information is the direction of development. By optimizing information collection channels and

using new technologies to improve big data mining capabilities, banks can better understand customers' living and consumption habits, tap into potential needs, improve precision marketing, and gain more advantage in competition (Kang, 2015).

7.3 Limitations

Furthermore, the author realized this paper has some limitations:

First, the history of third-party payment development is relatively short, and there are few relevant data on the influence of the expansion of third-party payment in the field of commercial banks. In addition, the market in the early stage of third-party payment development is not standardized, and no effective statistics have been formed. Therefore, the data set that is used in this paper does not cover the entire third-party payment development time. Because the data collected in this paper is limited to only 18 relatively large-scale commercial banks, and the time value is only 11 years, the data may not be sufficiently complete, so the conclusions drawn may not represent the impact on all commercial banks.

Second, in the empirical aspect, this paper uses commercial banks' net fees and commissions income as data indicators to measure the traditional intermediate business of commercial banks, which may include some untraditional intermediary businesses, which may lead to deviations.

Third, due to the outbreak of COVID-19, there are some different impacts on third-party payments and commercial banks. However, because the epidemic is still ongoing, and it is still difficult to collect data for the year 2020, as for the data, the year 2019 could not be treated as special. When the data is relatively complete, the impact can be further studied.

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Appendix

Appendix A

OLS Regression Robustness Testing:

Using ROE instead of ROA as the Response Variable

VARIABLES	(1) ROE	(2) ROE	(3) ROE	(4) ROE
TPP	-0.023*** (-4.75)	-0.022*** (-4.67)	-0.021*** (-4.63)	-0.020*** (-4.52)
TR	0.069 (1.46)	0.087* (1.87)	0.043 (0.94)	0.059 (1.37)
NPL	-1.824*** (-3.69)	-2.402*** (-4.79)	-1.717*** (-3.64)	-2.427*** (-5.21)
LDR	-0.033 (-1.43)	-0.036 (-1.61)	-0.036* (-1.67)	-0.041** (-1.99)
RGDPG	0.434 (1.40)	0.522* (1.73)	0.381 (1.29)	0.481* (1.72)
M2G	-0.034 (-0.49)	0.005 (0.07)	-0.121* (-1.79)	-0.090 (-1.41)
LNSIZE		0.686*** (3.85)		0.869*** (5.16)
LR			0.316*** (4.65)	0.380*** (5.81)
Constant	13.913** (2.52)	11.165** (2.07)	13.013** (2.47)	9.350* (1.86)
Observations	215	215	215	215
R-squared	0.546	0.576	0.588	0.636
F	41.61	40.16	42.28	44.91

t-statistics in parentheses

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

Appendix B

OLS Regression Robustness Testing:
Using IR and FEE instead of TR as Control Variables

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA
TPP	-0.001*** (-4.43)	-0.001*** (-4.46)	-0.001*** (-6.42)	-0.001*** (-6.46)
IR	-0.005* (-1.84)	-0.004 (-1.32)	-0.002 (-0.66)	-0.000 (-0.21)
FEE	0.003 (0.91)	0.001 (0.18)	0.002 (0.78)	0.000 (0.10)
NPL	-0.093*** (-3.60)	-0.119*** (-4.60)	-0.078*** (-3.69)	-0.098*** (-4.63)
LDR	-0.005*** (-3.74)	-0.005*** (-3.48)	-0.004*** (-3.75)	-0.004*** (-3.54)
RGDPG	0.010 (0.52)	0.009 (0.48)	0.010 (0.67)	0.009 (0.64)
M2G	-0.009** (-2.31)	-0.008** (-2.12)	-0.001 (-0.41)	-0.001 (-0.27)
LNSIZE		0.045*** (3.92)		0.035*** (3.68)
LR			-0.036*** (-10.50)	-0.035*** (-10.36)
Constant	2.048*** (6.31)	1.909*** (6.05)	2.175*** (8.27)	2.063*** (8.03)
Observations	216	216	216	216
R-squared	0.335	0.381	0.566	0.593
F	14.96	15.92	33.77	33.33

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix C

Fixed Effects Resgrssion Robustness Testing:
Using ROE instead of ROA as the Response Variable

VARIABLES	(1) ROE	(2) ROE	(3) ROE	(4) ROE
TPP	-0.020*** (-4.32)	-0.018*** (-3.51)	-0.019*** (-4.48)	-0.017*** (-3.67)
TR	0.037 (0.79)	0.045 (0.96)	0.045 (1.02)	0.052 (1.18)
NPL	-2.135*** (-4.46)	-2.218*** (-4.56)	-2.064*** (-4.60)	-2.138*** (-4.69)
LDR	-0.087*** (-2.85)	-0.094*** (-2.99)	-0.051* (-1.74)	-0.058* (-1.90)
RGDPG	0.393 (1.54)	0.269 (0.94)	0.345 (1.44)	0.234 (0.87)
M2G	-0.025 (-0.44)	-0.045 (-0.74)	-0.125** (-2.22)	-0.142** (-2.39)
LNSIZE		-0.631 (-0.96)		-0.566 (-0.92)
LR			0.363*** (5.26)	0.362*** (5.24)
Constant	21.437*** (4.01)	23.003*** (4.11)	13.822*** (2.65)	15.254*** (2.80)
Observations	215	215	215	215
R-squared	0.663	0.664	0.706	0.707
Number of bankcode	18	18	18	18
F test	0	0	0	0
F	62.55	53.72	65.05	56.98

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix D

Fixed Effects Regression Robustness testing:
Using IR and FEE instead of TR as Control Variables

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA
TPP	-0.002*** (-6.57)	-0.001*** (-3.32)	-0.002*** (-8.20)	-0.001*** (-5.11)
IR	-0.001 (-0.45)	-0.000 (-0.01)	-0.001 (-0.36)	-0.000 (-0.03)
FEE	-0.000 (-0.01)	0.012*** (3.22)	-0.004* (-1.75)	0.004 (1.21)
NPL	-0.088*** (-3.80)	-0.148*** (-6.00)	-0.068*** (-3.57)	-0.110*** (-5.22)
LDR	0.002 (1.10)	-0.001 (-0.83)	-0.001 (-1.06)	-0.003** (-2.35)
RGDPG	-0.001 (-0.08)	-0.029** (-2.02)	-0.004 (-0.31)	-0.022* (-1.83)
M2G	-0.012*** (-3.98)	-0.016*** (-5.40)	-0.005** (-1.98)	-0.008*** (-3.18)
LNSIZE		-0.235*** (-5.16)		-0.157*** (-4.02)
LR			-0.032*** (-9.88)	-0.029*** (-9.13)
Constant	1.412*** (5.00)	1.911*** (6.77)	2.108*** (8.76)	2.379*** (9.86)
Observations	216	216	216	216
R-squared	0.430	0.500	0.623	0.653
Number of bankcode	18	18	18	18
F test	0	0	0	0
F	20.58	23.75	39.30	39.51

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

국문 초록

중국 제 3 자 결제 방식이 상업은행의 수익성에 미치는 영향에 관한 연구

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중국에서 인터넷 기술이 다양한 분야로 계속 확장되고 전자 상거래가 발전함에 따라 인터넷 단말기 및 모바일 단말기가 널리 보급되었고, 이는 제 3 자 결제를 급속히 확장시키며 사용자 수를 크게 증가시켰다. 알리 페이와 위챗 페이는 주요 결제 수단이 되었으며 전체 결제량의 대부분을 차지하고 있으며 결제 분야에서 매우 중요한 위치를 차지하여 상업 은행에 큰 영향을 미쳤다. 또한 지속적인 혁신과 제 3 자 결제의 개발을 통해 온라인에서 오프라인으로, 인터넷 금융 분야에서 전통적인 금융 분야로 사업 범위가 확대되기 시작했으며 이는 상업 은행의 전통적인 비즈니스에 큰 영향을 미쳤다. 결과적으로 제 3 자 결제와 상업 은행의 비즈니스가 겹치기 시작했고 경쟁이 심화되었다.

이 배경을 바탕으로 본 논문에서는 먼저 제 3 자 결제 개발 프로세스를 정교화 한 다음, 제 3 자 결제가 기존 핵심 사업, 중개 사업, 소비자 자원 및 상업 은행의 데이터 리소스에 미치는 영향을 이론적 관점에서 분석한다. 본 논문에서는 이전 연구를 바탕으로 상장 된 18 개 시중 은행의 짧은 패널 데이터를 데이터 샘플로 채택하여 회귀 모형을 구축하였다. 분석 결과에 따라 고정 효과 모형이 더 적합하며 제 3 자 결제 방법은 시중 은행에 통계적으로 유의미한 부정적 영향을 미치고, 이는 이론적 분석에서 도출 된 결론과도 일치한다. 여기에 상호 작용 변수를 추가 할 경우, 시중 은행의 수익 수입이 전통적인 비즈니스에 더 많이 의존하는 것으로 나타나며 제 3 자 결제의 영향을 더 많이 받게 될 것이지만, 이 현상은 같은 은행 유형 보다는 서로 다른 은행 유형 간에 더 많이 반영된다. 마지막으로, 결과는 제 3 자 지급이 여러 은행의 수익성에 이질적인 영향을 미친다는 것을 보여줬다.

주요어: 인터넷 금융, 제 3 자 결제, 상업 은행, 수익성

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