Research on the Impact of Fintech on China's Banking Industry

1stZhibin Tao[a, *], 1stJiaxiao Chao[b, *]

These authors contributed equally to this work
[a, *]University of Portsmouth, Anqing City, Anhui Province, 246000, China
[b, *]Anqing Vocational and Technical College of Anhui Province, Anqing City, Anhui Province, 246000, China

TAOZHIBIN7@outlook.com, CHAOJIAXIAO2@outlook.com

Abstract. The banking industry is the main body of the modern financial system and an important hub for the operation of the national economy. Fintech is the key to the innovation and reform of the banking industry. This paper uses text mining technology to collect urban fintech patent data. Based on the micro panel data of various commercial banks in China from 2009 to 2018, this paper analyzes the development capability of China's banking industry from two aspects: asset growth rate (AG) and non-interest income ratio (NIR). This paper finds that: (1) present the downward trend, China banking assets growth of joint-stock commercial bank asset growth decline is most obvious. (2) large state-owned commercial Banks overall present a higher level of development, joint-stock commercial Banks' non-interest income ratio showed a trend of increasing year by year, the city commercial Banks and rural commercial Banks showed poor ability to innovate. (3) China's large state-owned commercial banks and joint-stock commercial banks have greater competitiveness than urban commercial banks and rural commercial banks, but urban and rural commercial banks have greater development potential. Based on the revenue and profit of retail business of China's five major state-owned commercial banks from 2010 to 2018, The micro panel data of retail deposits and loans of China Construction Bank from 2007 to 2018 and the development of retail deposits and loans of Chinese commercial banks from 2011 to 2018 quantitatively investigate the effect of fintech development on the profitability of retail business of Chinese commercial banks. The findings are as follows: (1) Financial technology contributes to the continuous improvement of the benefit contribution of banks' retail business (2). Fintech impacts the asset and liability structure of China's banking industry (3). Fintech has boosted the steady growth of retail deposit and loan business. Combined with the research conclusions of this paper, aim to speed up the organic integration of China's banking industry and fintech and improve the competitiveness of the banking industry, suggestions are put forward from three aspects :(1) at the level of national policy, create a superior environment suitable for the growth of fintech and increase the training of fintech professionals. (2) At the banking supervision level, accelerate the improvement of fintech laws and regulations, and build an industry regulatory framework (3). In terms of banking

development, we will use the advantages of emerging technologies to enhance financial service capabilities.

1   Introduction

As a new form of inclusive finance, fintech has been recognized by many countries and international organizations in promoting the inclusive development of financial resources and the real economy. According to the data, from 2010 to 2017, the total global fintech investment reached $97.7 billion, at a compound annual growth rate of 47%. The rapid development of fintech has changed the business model and competition pattern of traditional finance to a certain extent, and brought systemic impact to the traditional financial market, business model and product process. The birth and development of fintech has also realized financial service supply and improved financial service efficiency, while also exerting profound and complex influence on the business operation of commercial banks, which is one of the core pillars of our financial system. The operational efficiency of commercial banks can not only preserve the stabilization of the financial market, but also boost the superior growth of the real economy. Retail Business of Commercial Bank refers to financial products or services provided to individual residents or small businesses. In recent years, under the background of accelerated economic transformation, increasingly strict regulation, deepening financial disintermediation and accelerating progress of information technology, the retail business of Chinese commercial banks has developed fleetly and gradually become an important field of market competition. China has generated a flurry of related research on fintech and the impact of fintech on commercial banks, but the research is not extensive enough and the research methods are not rich enough. At present, there is no unified understanding of the meaning of fintech, which makes it difficult to carry out in-depth discussion; In the research on the relationship between fintech and the development of commercial banks, most of them focus on the impact on the overall level of commercial banks. At present, there are few researches on retail business of commercial banks, and most of them are about specific business. This paper takes "the impact of fintech on China's banking industry and Retail Business of Commercial Bank" as the research question, starting from the introduction of fintech and the development status of China's banking industry, and then studies the Retail Business that Commercial banks are most closely connected with fintech. Further explore the specific impact of fintech on banks' retail business operations, and finally provide optimization measures for China's banking industry from three different levels.

2   Text content

2.1   About Fintech

Fintech is the service of new processes and products created by advances in digital technology. The Financial Stability Board defines fintech as Financial innovation driven by technology. It is a financial service that may lead to new business models, applications, processes or products with relevant material impact on financial markets and financial institutions. At the same time, fintech is an important means for commercial banks to reduce information asymmetry, reshape business processes, enhance risk management ability and improve operational benefits.[1] The US Department of Commerce defines the fintech community as a company that provides innovative financial services for application software and technology to customers. Based on the description of companies by Dorfleitner et al. (2017), the fintech industry can be defined as four different business models based on their differentiation: Finacing, Asset Management, Payments, and Other Fintech.

The core part of "technology finance" is finance. By optimizing the productiveness of financial services, innovating and expanding the model and scope of financial service technology enterprises, it aims to promote technological innovation and entrepreneurship. However, the core foundation of "fintech" is technology. Through the progress of technology, it promotes the innovation of financial markets, financial institutions and financial businesses, aiming to ameliorate the productiveness of financial services.

Both "fintech" and "Internet finance" reflect the integration of finance and technology, and are activities to transform traditional financial services. However, "fintech" focuses more on a series of transformation and innovation of emerging technologies on financial business. It does not rely on specific scenarios, and its impact is more extensive than "Internet finance". "Internet finance" includes not only the transformation and upgrading of traditional business by financial institutions using Internet technology, but also the financial innovation undertaken by Internet financial enterprises. It is more inclined to use Internet technology to promote business development and product innovation. In general, the concept is less than that of "fintech".

2.2   Current status of fintech development in China

2.2.1 Big Data.

The US federal government defines big data as the collection and processing of large and complex data information for the purpose of gaining knowledge and understanding, thereby improving capabilities, and ultimately accelerating innovation in science and engineering. According to The State Council of China, big data is a collection of data characterized by large capacity, multiple types, fast access and high application value. Gartner (NYSE: IT and ITB) divides big data into information assets that are substantial, rapidly growing, and variety, while requiring new processing patterns for enhanced decision making, process majorization and insight discovery.

The main impact of big data on the financial sector:

(1) Reduce risk loss. Analyze massive data in the financial industry through big data technology can not only effectively reduce the risk of credit evaluation, product research and development, institutional operation and other links, but also effectively reduce the risk loss. (2) Improve operating profit. Financial institutions can obtain comprehensive user information through big data, conduct personalized product recommendation and real-time marketing, reduce customer acquisition expenses, and help financial institutions sell products, improve product sales accuracy and user loyalty. (3) Big data technology can promote financial product innovation in financial institutions. Financial institutions can obtain valuable information chains related to customers, customers' transaction motivation and behavior data online, and then analyze customers' demands for profitability, liquidity, security and other aspects of financial products. Then through the face value, income, risk, liquidity, convertibility, complexity and other characteristics of financial instruments re-selected bank decomposition and combination to design financial products that match customer needs.

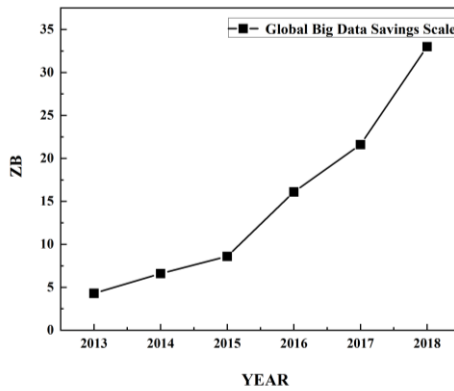**Development status of big data industry**

Fig. 1. Global Big Data Storage scale, 2013-2018 (Unit: ZB) [Owner-draw]

Source: International Data Corporation (IDC) big Data research report

This picture shows that the global big data storage has been increasing rapidly in recent years, reaching 33ZB in 2018, an increase of 7.67 times compared with the 2013 volume (4.3zb). At the same time, IDC predicts that the global revenue of big data industry in 2019 is expected to reach $189.7 billion, an increase of 12.1%; The global revenue of the big data industry will reach $312.7 billion in 2023, achieving an average annual growth of 13.1%.[1] According to the forecast in the *Big Data White Paper 2019*, the global big data market will reach $56 billion in revenue by 2020, increase about 33.33% compared with 2018.The overall big data market will continue to grow at a rate

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[1] IDC. *Global Semi-Annual Big Data Spending Guide, 2018H2*, 2019..

of about \$7 billion annually with the increasing maturity of the overall market and the continued integration and development of emerging technologies.[2]

2.2.2 Cloud Computing.

Cloud computing refers to a system with strong computing ability formed through computer networks, which can store and collect relevant resources and configure them on demand to provide personalized services to users. This kind of computing can integrate information, mobilize and process in parallel, and realize massive calculation of big data and the preservation of results. By combining IT resources into a resource pool, IT resources are shared over the network using virtualization technology. This technology mainly includes virtualization, mass data distribution storage technology, mass data management technology, parallel computing technology, programming mode and so on.

Major impacts of cloud computing on the financial sector

(1) The application of cloud computing in the field of banking is mainly in the aspects of IT operation management and open bottom platform. Through the construction of open cloud platform and API, the financial service ecosystem is built to provide services such as life payment, shopping and information inquiry, which effectively increases the value of financial accounts.

(2) The use of cloud computing can increase online resources are financial institutions, financial institutions in the use of cloud computing can quickly adjust IT resource usage, also make the financial institutions of greatly increased the availability and reliability of IT resources, avoid the user demand soared, as a result of the collapse of the system and system fault and the risk of data loss, operational disruptions.

(3) Cloud computing can save and summarize the information resources in financial institutions, improve the information update rate, integrate the information resources of various parts, establish a more convenient information system, and make the data resources in financial institutions realize the unified management function.

2.2.3 Artificial Intelligence.

Artificial intelligence is the study of make some of computers to simulate human thinking process and intelligent behavior of the discipline, which is a combination of people's way of thinking and computer calculation convenience, is a fusion of computer science, statistics, machine learning, computer vision, etc at the forefront of comprehensive discipline, studies how to make the computer to do intelligent work in the past only talent can do. AI will not only involve computer science and psychology but also philosophy and linguistics. Artificial intelligence is characterized by rapidly absorbing information and transforming it into knowledge, predicting the future based on domain modeling and big data analysis, and optimizing game strategies under certain rules.

The main impact of artificial intelligence on finance

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[2] China Academy of Information and Communication Technology. ,*White Paper on Big Data 2019*. 2019.

(1) Artificial intelligence can quickly complete the integration of information, but also can complete the difficult human to achieve the speed and amount of calculation, at the same time, can transform unstructured data into structured data for analysis. Artificial intelligence also has the ability of natural language processing, which can analyze data information from the semantic level to improve the speed and effectiveness of information retrieval.

(2) Artificial intelligence can not only reduce the information asymmetry and moral hazard of both sides of the transaction, but also predict the market, provide risk warning function for financial institutions, and prompt financial institutions to take preventive measures in advance.

(3) artificial intelligence system is for the general customers to provide a more personalized experience, artificial intelligence system to receive the information sent by the client, will be the information match with the contents of the database, and then effective processing scheme of feedback to clients, simplify the customer operation process, to further improve the customer experience.

(4) The use of artificial intelligence system, through big data and in-depth analysis, to establish a customer credit model, analyze the economic ability of customers, it can decrease the difficulties of risk control business, and even contribute to the growth and optimization of China's financial industry through significant help.

2.2.4 Peer-to-peer (P2P) lending.

P2P online lending refers to the online lending between individuals through the Internet platform. Peer-to-peer lending platforms link those who want to invest with latent borrowers whose businesses need loans, acting as intermediaries to match borrowers and lenders and transfer funds. In 2016, China Banking Regulatory Commission defined P2P online lending platform as financial information intermediary enterprises engaged in online lending information business activities. It provides convenient channels for borrowers and borrowers through the Internet and has service functions such as information evaluation, interaction and transaction. As of February 2016, there were 3,944 P2P platforms in China, but there were 1,425 problematic platforms in total. The types of incidents of problematic platforms include suspension of business, running away, difficulty in withdrawing cash, and economic investigation intervention. So far, the main problems of P2p are: poor management, wrong transactions, fraud, hacking attacks. According to PWC's 2016 survey, the potential market in the US is expected to attain to $150 billion by 2025.

2.3   Analysis on the development capability of China's banking industry

The development ability reflects the potential competitiveness of the banking industry and determines whether the bank can obtain more competitive advantages in the future. This paper analyzes the development ability of China's banking industry from two aspects: Asset Growth (AG) [3]and Non-interest Income Ratio (NIR)[4]. AG is the main

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[3] Asset Growth is the ratio between the total Asset Growth at the end of the year and the total Asset Growth at the beginning of the year, where the total Asset Growth of this year is the

index to analyze the capital accumulation ability and development ability of banks in the current year. Non-interest income refers to the other operating income of a bank except interest income. Banks with higher NIR tend to have higher innovation ability and better development ability.
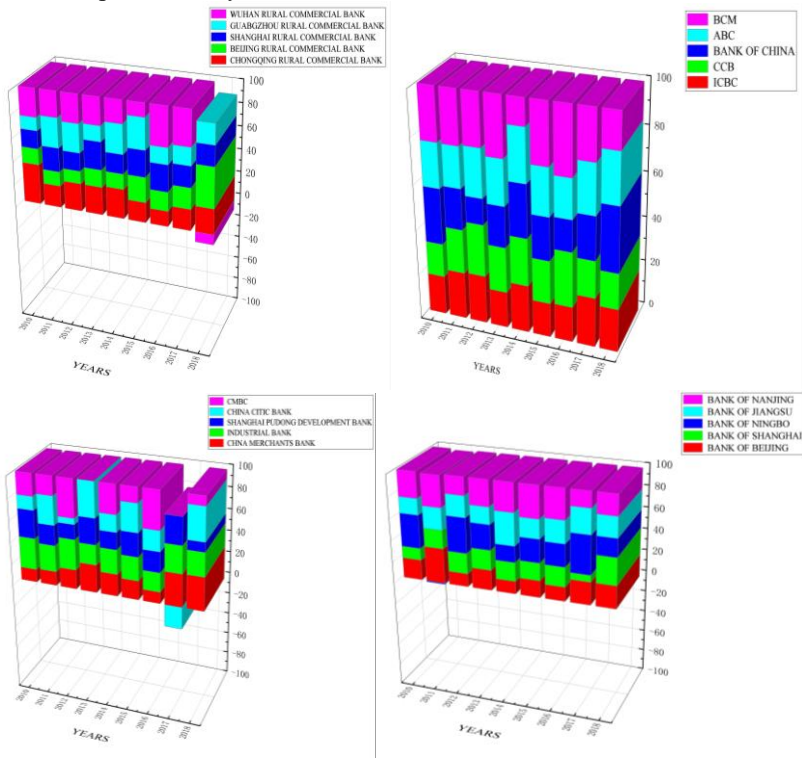

Fig. 2. Summary of Top 5 Asset Growth Rates of Various Commercial Banks in China (%) [Owner-draw]

Source: Wind database

difference between the total Asset Growth at the end of this year and the total Asset Growth at the beginning of this year.

[4] Non-interest income Ratio refers to the Ratio of non-interest income to total income of a bank, which is commonly used to measure the innovation ability of a bank.
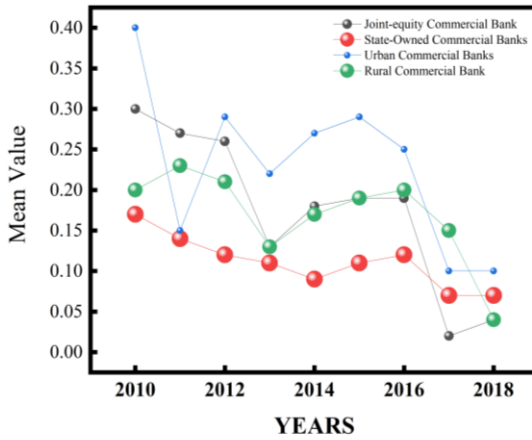
Fig. 3. Summary table of average growth rate of assets of various commercial banks in China [Owner-draw]

Source: Wind database

The picture shows that the overall growth rate of the assets of the Chinese banking industry has shown a downward trend, with the asset growth rate of all types of commercial banks dropping to 10% or below in 2018. The asset growth rate of joint-stock commercial banks dropped from 30% in 2009 to 4% in 2018. The decline of state-owned large commercial banks is less than that of joint-stock commercial banks, but it has also fallen below 10% in recent years. The overall decline in the growth rate of city commercial banks' assets was less than that of other banks, reaching 10% in 2018, showing good development potential. The asset growth rate of rural commercial banks was roughly the same as that of urban commercial banks, but in 2018, there was a big decline, and some banks even experienced negative growth.
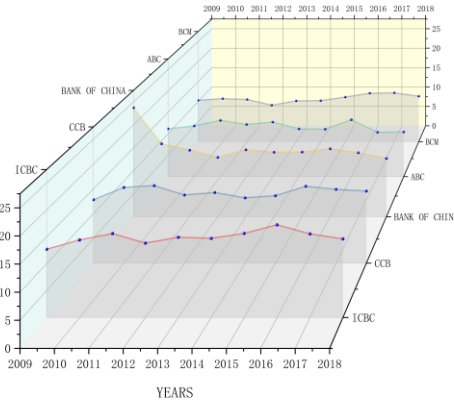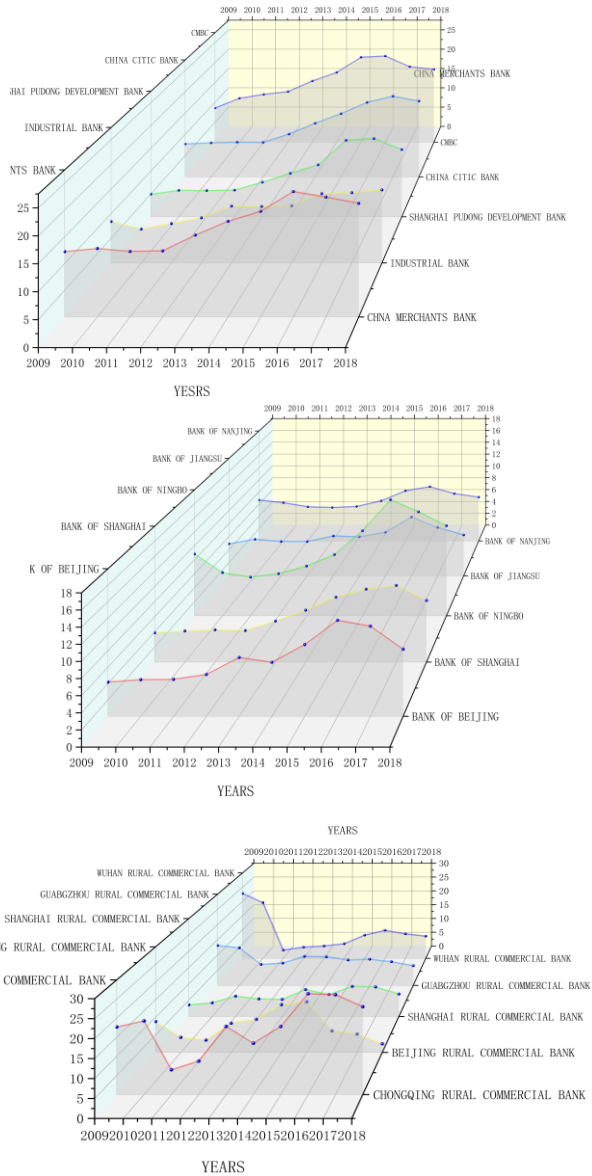
Fig. 4. Top5 Non-interest Income Ratio of China's commercial banks (%)[5] [Owner-draw]

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[5] ICBC: Industrial and Commercial Bank of China; CCB: China Construction Bank; ABC: Agricultural Bank of China; BCM: Bank of Communications; CMBC: China Minsheng Banking.

Source: Wind database

The chart shows that different types of banks in China show different development trends. Large commercial banks[6] on the whole showed a downward trend, but still at a high level, with an average of 12.26 in 2018. The proportion of non-interest income of joint-stock commercial banks[7] is higher than that of other types of commercial banks, shows a growing trend of with each passing year. The non-interest income of urban commercial banks[8] and rural commercial banks [9]is low. Urban commercial banks have increased in recent years but are still below 10%, while rural commercial banks have been fluctuating around 10%, showing poor innovation ability.

2.4   The impact of fintech on banking industry

Fintech will significantly change the risk exposure faced by banks and is an important financial risk management tool. The application of fintech broadens the "data surface" of bank credit review [2-4] and makes it possible for information assets to become collateral substitutes [4-5]. It plays an important role in identifying financial fraud, reducing risk assessment costs and improving transaction security [6-10].

Yang Wang, Xu Huilin, Tan Xiaofen and Xue Xiangyu (2020) believed that fintech significantly ameliorated the productiveness of commercial banks by driving the strategic transformation of commercial banks through financial innovation, technology spillovers and market competition. Banks with the characteristics of deep integration with fintech, strong business innovation ability, younger decision-making level and high degree of cross-regional operation are more likely to absorb the impact of fintech to improve total factor productivity. Mechanism analysis shows that fintech intensifies competition, increases the cost of bank liabilities, and encourages banks to choose riskier assets to make up for the loss of liabilities, which indirectly promotes the improvement of operational efficiency.[11]

Gao Haoyu, Fang Jincheng and Li Meng (2022) analyzed that fintech can reduce bank risk by mitigating information asymmetry, promoting business margin expansion and enhancing risk coping ability. At the same time, the improvement of market supervision ability and the enhancement of credit investigation awareness of urban residents can further enhance the risk management empowerment effect of fintech. The mechanism analysis verifies that the development of fintech can significantly reduce information asymmetry, promote business expansion, and strengthen the risk management capabilities of banks, thus helping to reduce the risks of banks. [12]

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[6] Large commercial banks: Industrial and Commercial Bank of China, China Construction Bank, Bank of China, Agricultural Bank of China, Bank of Communications of China.
[7] Joint-stock commercial banks: China Merchants Bank, Industrial Bank of China, Pudong Development Bank of China, China CITIC Bank, China Minsheng Bank.
[8] Urban commercial banks: Bank of Beijing, Bank of Shanghai, Bank of Ningbo, Bank of Jiangsu, Bank of Nanjing.
[9] Rural commercial banks: Chongqing Rural Commercial Bank, Beijing Rural Commercial Bank, Shanghai Rural Commercial Bank, Guangzhou Rural Commercial Bank, Wuhan Rural Commercial Bank.

Chen et al. (2017) compared the strategies and organizational adjustments of Citibank and Industrial and Commercial Bank of China in dealing with the development of fintech, and analyzed their achievements, finding that fintech is conducive to the transformation and upgrading of commercial banks. [13]

2.5   The impact of fintech on the profitability of banks' retail operations

Wang Junshan (2020) believes that fintech has a U-shaped influence on the profitability of commercial banks' retail business. In the early stage, fintech will reduce the earnings-generating capacity of commercial banks' retail business to a some degree, but in the later stage, with the deepening of cooperation with fintech companies, both sides will gradually achieve win-win cooperation. Fintech will boost the profitability of commercial banks' retail businesses. The impact of fintech on retail business of commercial banks is heterogeneous, and the impact of fintech on the profitability of retail business of commercial banks varies with the size of commercial banks.[14]

2.5.1 Fintech helps banks to continuously improve the benefit contribution of retail business.
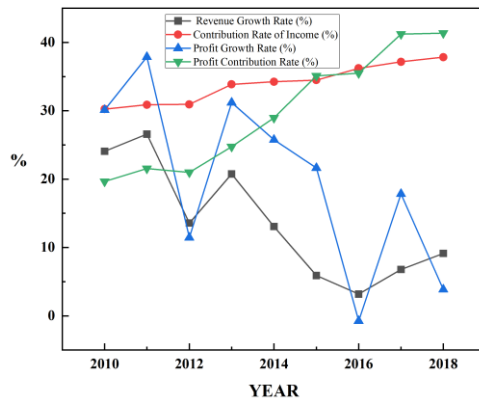

Fig. 5. Revenue and profit of retail business of China's five major State-owned commercial banks[10] from 2010 to 2018 [Owner-draw]

Source: authors collates the annual report data from China's five major commercial banks

This picture shows that the operating income and profit of retail business of Chinese commercial banks have shown a trend of rapid growth in recent years. From 2010 to 2018, the compound growth rate of operating revenue of retail business of China's five major state-owned commercial banks reached 13.4%, and the revenue contribution

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[10] China's five major state-owned commercial banks: Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, Bank of Communications.

increased to 37.8%, an increase of 7.6 % compared with 2010. From 2010 to 2018, the compound growth rate of operating profit of retail business of the five major state-owned commercial banks reached 19.2%, and the profit contribution increased to 41.4%, an increase of 21.7% compared with 2010. At the end of 2018, the operating revenue of retail business of China's five major state-owned commercial banks reached 104 trillion yuan and the operating profit of retail business reached 51.5 trillion yuan.

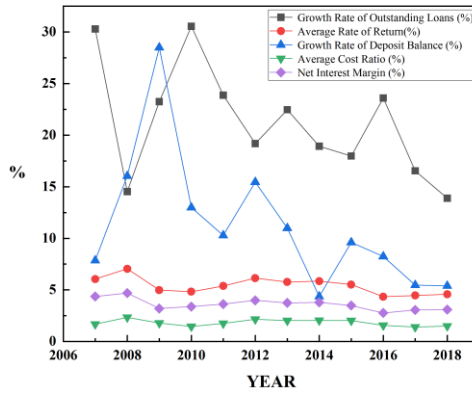### 2.5.2 Impact of fintech on asset and liability structure.

Fig. 6. Retail deposit and loan business of China Construction Bank from 2007 to 2018 [Owner-draw]

Source: authors according to China Construction Bank annual report data collation.

This picture shows that the proportion of savings deposits in various deposits of CCB in recent years has basically remained around 45%, while the net interest margin of CCB's retail business continues to narrow. In 2018, the net interest margin between the average rate of return on retail loans and the average cost rate of savings deposits was 3.09%, a decrease of 65 BP compared with 2013. From the overall situation of CCB, by the end of 2018, the return on total assets of CCB was 1.13%, a decrease of 34 BP compared with 2013; Return on equity was 14.04%, down 719 BP from 2013.

2.5.3 Fintech boosts the steady growth of retail deposit and loan business.
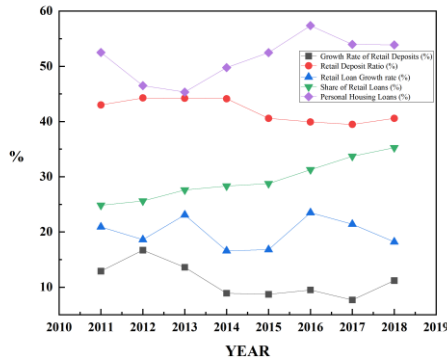

Fig. 7. Development of retail deposits and loans business of China Commercial banks from 2011 to 2018 [Owner-draw]

Source: authors according to the People's Bank of China data collation.

This picture shows that from 2010 to 2018, the compound growth rate of savings deposits in China's commercial banks reached 11.1 percent. The overall growth rate will remain around 9%. At the end of 2018, the balance of savings deposits was 71.6 trillion yuan, up 11.2% year on year. Also, the proportion of savings deposits in all deposits of financial institutions has declined. At the end of 2018, savings accounts accounted for 40.6 percent of all deposits, down 2.4 percent compared with 2010. From 2010 to 2018, the compound growth rate of retail loans of Chinese commercial banks reached 19.8%. At the end of 2018, retail loans of Chinese commercial banks reached 47.9 trillion yuan, up 18.2% year on year. At the end of 2018, retail loans accounted for 35.3% of all loans, up 11.8% from 2010. Personal housing loans, which have been a major part of retail loans, have stabilized at a level of just over 50% in recent years, with outstanding personal housing loans accounting for 53.9% of all retail loans at the end of 2018. This shows that personal consumption loans and business operations of commercial banks have also developed rapidly, and have occupied a certain proportion in retail loans.

2.6   China's banking industry optimization scheme

National policy aspects, reinforce the infrastructure promotion of the digital economy, dispel obstacles to the application of fintech in the banking sector, to leverage the important role of basic science and technology research in promoting fintech innova-tion, we also need to continue the digital transformation of traditional infrastructure and boost the universal use of Internet of things technologies. Also, the training of financial technology professionals in China should be optimized, establish a more scientific and innovative personnel training system, and set up a fintech talent team with reasonable level, excellent technology and high degree of specialization into the top design of the

innovation of China's financial service industry as a long-term strategy. At the same time, Chinese education authorities should encourage domestic universities to learn from developed countries' training model for fintech talents, design a clear training system, and add courses related to emerging technologies such as big data, blockchain and AI, so as to provide talent sources for the superior growth of China's banking industry. Also, we cooperate with universities to research fintech projects and learn the excellent talent training model of universities in other countries.

Banking supervision and regulation aspects, in the process of development of fintech in China, there is a lack of relevant laws, regulations and industry standards. At the same time, in order to reduce the risks in the development of fintech in banks, the Chinese regulatory bureau should formulate systematic laws and regulations for fintech and establish standardized and unified information publication standards; Grasp the characteristics of various types of fintech, understand the risks it may bring, establish and improve the monitoring and feedback mechanism and accountability mechanism for fintech innovation; At the same time, a corresponding industry regulatory framework needs to be established to guide and supervise financial institutions to establish a fintech security system with the aim of ensuring the safety and compliance of new technologies.

Bank Development aspects, the Chinese government has comprehensively used the advantages of emerging technologies to enhance its financial services capabilities. The emergence of emerging technologies represented by big data, artificial intelligence and cloud computing has brought a strong impetus to the transformation and upgrading of traditional banking businesses. Actively search for the correspondency of new technology and business, financial science and technology to strengthen the risk management effectiveness, reduce operating costs, improve operational efficiency advantage, optimize business processes, improve the service mode, improve the flexibility of financial services and precision, broaden the fields the width and depth of the financial business, to develop the digital pratt & finance, To provide quality financial services to the real economy.

3   Conclusion

Banking plays a very significant role in China's financial system, and whether its normal operation will affect the healthy grow of the national economy and society. As a traditional financial industry, China's banking industry has undoubtedly been strongly affected by the impact of fintech. This paper focuses on the phenomenon that China's fintech has a significant impact on the banking industry, which is of great practical significance. Firstly, it comprehensively combs the previous academic research results, shows the different definitions of fintech, and finds that fintech is a comprehensive concept. Then it introduces the development of China's fintech from four stages: big data, cloud computing, AI and peer-to-peer lending. The development ability of China's banking industry is analyzed from two aspects: asset growth rate (AG) and non-interest income ratio (NIR). Then, the influence of fintech on the retail business operation of Chinese commercial banks is selected as the research question, and the purpose of the

research is to explore the mechanism and results of the influence of fintech on the retail business operation of commercial banks. This paper analyzed the income and profit of retail business of China's five major state-owned commercial banks from 2010 to 2018, the retail deposits and loans of China Construction Bank from 2007 to 2018, and the development of retail deposits and loans of China's commercial banks from 2011 to 2018. The results showed that: (1) all kinds of commercial Banks in China between the development level and ability has certain gap, but China's large state-owned commercial Banks and joint-stock commercial bank's competitiveness relative to the city and rural commercial banks has a larger advantage, city commercial Banks and rural commercial bank more development potential.(2) Fintech helps banks to continuously improve the benefit contribution of retail business; Fintech has impacted the balance sheet structure of Chinese banking industry; Fintech promotes the steady growth of retail deposit and loan business in the banking sector. Finally, this paper provides optimization measures to accelerate the organic integration of China's banking industry and fintech and enhance the competitiveness of the banking industry from the three aspects of national policy, banking supervision and banking development.

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