DOES FINTECH CHANGE THE MARKET POWER OF TRADITIONAL BANKS IN CHINA?

Hanying QI [1, 2], Keng YANG[3, 4], Weijia WANG[5*]

[1]The New Type Key Think Tank of Zhejiang Province's "Research Institute of Regulation and Public Policy", Zhejiang University of Finance and Economics, Hangzhou, China
[2]China Institute of Regulation Research,
Zhejiang University of Finance and Economics, Hangzhou, China
[3]Institute of Economics, Tsinghua University, Beijing, China
[4]One Belt-One Road Strategy Institute, Tsinghua University, Beijing, China
[5]Tailong Finance School, Zhejiang Gongshang University, Hangzhou, China

Abstract. This study assesses the impact of the development of financial technology (FinTech) on the market power of traditional banks. We analyze the relationship between FinTech companies and traditional banks based on the barriers-to-entry theory, and verify the resulting hypothesis by using panel data from 155 Chinese commercial banks from 2013–2018. The benchmark results show that FinTech has a significant U-shaped effect on the market power of banks. Furthermore, the U-shaped effects remain robust when we focus on the technology and business innovation channels that affect banks. These effects vary across banks with different ownership structures and business segments. Specifically, municipal commercial banks are more likely to be influenced by business innovation than by technological innovation. By contrast, state-owned banks have advantages in using technological innovation to reacquire market power through loan services. Private banks, meanwhile, struggle to acquire any market power under intense competition from FinTech companies. Given that the FinTech may enable some banks overly dominate the banking industry at certain development stages, regulators and practitioners need to prevent monopoly-related problems and promote the digital transformation of small and medium-sized banks.

Keywords: FinTech, traditional banks, market power, financial regulation, barrier to entry, Chinese banking.

JEL Classification: G21, L22, G28.

Introduction

The development of financial technology (FinTech) and emergence of FinTech companies is profoundly changing the operating and service models of traditional banks and may also

*Corresponding author. E-mail: *wangwj06@gmail.com*

influence their market power. This poses challenges for regulators to encourage fair competition (Restoy, 2021).

Scholars have studied the relationship between FinTech and the market power of traditional banks, but there are no agreed-upon, consistent answers about the nature or extent of this relationship. Most studies argue that the market power of existing banks is eroded because new, dedicated FinTech companies take over market share from traditional banks (Niu & Min, 2015; Ding & Wang, 2016; Vives, 2019; Hodula, 2021; Papadimitri et al., 2021). By contrast, others claim that the market power of banks is not significantly affected (Kerényi & Molnár, 2017; Alt et al., 2018). We argue that the reason for these conflicting conclusions is that these studies focus on different stages and dimensions of FinTech development.

The mechanisms by which FinTech alters the market power of banks also need to be incorporated into the framework of effects. We argue that one of these mechanisms involves FinTech changing competition across the sector by changing entry barriers (i.e., regulatory barriers and economic barriers) to the banking industry. Although researchers have examined certain entry barriers that have been affected by FinTech (Hirt & Willmott, 2014; Boot, 2016; Matsumura, 2018), the channels through which it impacts banks' market power based on the barriers-to-entry theory have not been discussed systematically. Moreover, the existing literature has not produced unanimous conclusions and lacks empirical analysis of the topic.

Accordingly, the aim of this paper is to empirically study the impact of FinTech on the market power of traditional banks. First, it proposes a two-channel mechanism where FinTech companies can affect traditional banks' market power through (a) technological and (b) business innovation. Second, the effects are examined using a database of 155 Chinese commercial banks from 2013–2018. Third, the paper empirically explores the heterogeneity of banks in terms of their ownership and business segments in the regression results.

This paper offers three main contributions. Firstly, in contrast to previous literature, which argues that FinTech either reduces (Vives, 2017; Boot, 2019; Ndwiga, 2020) or has no impact on banks' market power (Navaretti et al., 2017; Alt et al., 2018), it shows that there is a positive U-shaped influence from FinTech companies on the market power of banks in China. Secondly, the two channels considered in the mechanism analysis, namely technological innovation, and business innovation, have not previously been discussed in a systematic way. Finally, this article discusses the heterogeneity of the effects of FinTech on the market power of traditional banks due to their various ownership and business structures. Most studies have either focused on specific types of banks, such as listed banks, state-owned, or joint-equity banks (Niu & Min, 2015), or concentrated on particular kinds of banking services, such as credit loans or other asset-related businesses (Liu, 2014; Cheng & Cheng, 2017). Instead, this article complements the literature by considering four kinds of ownership as well as different types of business in its analysis of banks.

The rest of this paper consists of four sections. The first is a review of literature on the topic. The second section defines FinTech and provides the mechanism and hypotheses for the study. The third discusses methodology. The fourth section presents the empirical results, while the fifth concludes the paper.

1. Literature review

1.1. Market power and barriers-to-entry theory

Market power refers to an incumbent's ability to raise prices above marginal cost without losing market share. The term is commonly used to denote the ability of firms to raise prices in monopolistic and oligopolistic markets (Landes & Posner, 1981). Market power is an important element of the analysis of market structure and market competition.

The factors that impact market power are various and include market share, substitutes in consumption, substitutes in production, the output of fringe firms, and the entry of new competitors (Landes & Posner, 1981). Among those factors, market share is usually used to measure market power (Palmer, 1974). Substitutes in production, substitutes in consumption, and the output of fringe firms, all define the relationship between incumbent firms. The notion of market entry represents the relationship between incumbents and new firms. Specially, barriers-to-entry have a key impact on long-term market power (Schmalensee, 1982).

In this paper, our study is mainly based on barriers-to-entry because FinTech changes the nature of access to banking services and many new institutions have been established to compete with traditional banks (Bilotta & Romano, 2019). In addition to legal and regulatory barriers (Keeley, 1990), leverage advantages, absolute cost advantages, and the product differentiation of established banks should also be considered (Alhadeff, 1974). FinTech may affect those barriers and thus alter the market power of traditional banks (Financial Stability Board [FSB], 2019).

1.2. The market power of traditional banks in China

In China, banks have traditionally played a dominant role in the financial sector. For banks, the access policy is strict (Barth et al., 2013). The establishment of business operations by new commercial banks is impossible without a banking license.

Since the establishment of state-owned banks in the 1980s, China's traditional banks had been deregulated (Gao et al., 2019). The traditional monopoly market structure has been transformed into a multi-level, all-round competitive field (Su et al., 2020). Even so, it is difficult for new banks or non-banking financial institutions to enter and to engage in banking operations. Entry is controlled through administrative means (Gao et al., 2019) and the economic barriers-to-entry are high (Su et al., 2020). Some scholars argue that the main characteristic of China's banking industry is monopolistic competition, which means that banks which have a large market share still show high market power (Sun & Luan, 2019).

China's financial sector was regarded as a poor and underdeveloped institutional system for a long time. However, the rise of FinTech has changed the status quo. With the emergence of e-commerce, China began to develop FinTech rapidly, and it can now compete with other developed countries on the world stage (Shim & Shin, 2016). Therefore, FinTech is important for the marketization of China's banking industry.

The question of whether traditional banks can maintain their original market position in the FinTech era has increasingly attracted attention. Changes in market competition are closely linked to the efficiency and stability of the financial system, which is a cause for

concern (FSB, 2019). Regulators therefore need to develop new frameworks to address the challenges of FinTech (Bilotta & Romano, 2019). In this context, an in-depth analysis of the mechanisms of influence and the effects of FinTech on market power can support further research on financial stability in this new era.

1.3. FinTech and the market power of banks

Much of the literature is dedicated to the relationship between FinTech and traditional banks. Here, we mainly focus on the market power of banks. At present, the mainstream literature argues that FinTech promotes the competition in the banking industry, that it reduces the market power of traditional banks, and that FinTech companies capture market share from banks. Technology giants such as Alibaba and Amazon, have seized market share from banking institutions in the payments and credit industries through their technological innovations, customer information resources, user interface controls and other advantages (Boot, 2019; Feyen et al., 2021). FinTech accounts for 35% of the rapid development of shadow banking (Buchak et al., 2018). The emergence of the mobile banking has lowered the market power of banks in the Kenya (Ndwiga, 2020). Social media firms hold sufficient user information to develop financial services and to divert customers from bank (Vives, 2017).

Others have argued that FinTech has not had a significant impact on traditional banks. Kerényi and Molnár (2017) contended that the vigorous development of FinTech enterprises and solutions has not reduced banks' market share significantly. Although information technology (IT) and other scientific and technological factors accelerate the proliferation of digital finance and Internet finance, the degree of vertical integration in the banking sector remains high (Alt et al., 2018). Navaretti et al. (2017) believed that FinTech companies will not replace most of the key banking functions, and traditional banks will use new technologies and methods to provide existing services.

For China's banking industry, some Chinese scholars have studied the impact of FinTech on the market power of Chinese banks. Some analyzed the influence of emerging online credit platforms on the credit monopoly profits of traditional banks and concluded that monopoly profits have fallen or even disappeared (Liu, 2014). Using panel data from 16 listed banks over the period between 2005 and 2013, Niu and Min (2015) empirically tested the hypothesis that the rise of online payments can reduce the market power of commercial banks. With the industry boundaries broken by FinTech, FinTech companies entered the financial sector across borders and came to occupy an increasingly important market position in payment methods, wealth management products, loans and other markets (Cheng & Cheng, 2017).

Existing research has explored the effect of FinTech on banks' market power, but some gaps remain. Firstly, the research conclusions are controversial. Secondly, existing research focuses on the impact of a single FinTech business on banks' market power. Analyses that focus on a single business are one-sided. Thirdly, little has been said of the channel in which FinTech affects the market power of banks. Finally, existing research is mostly qualitative. There is little empirical research that is based on relevant data, especially empirical research on the later stages of the development of FinTech.

2. Research hypotheses

2.1. Definition of FinTech

Scholars have proposed a range of definitions of FinTech as a concept. Financial function, organization, and technical attributes are the three principal dimensions on which these definitions center (Alt et al., 2018; Gai et al., 2018). In this paper, Fintech is defined on the basis of a conceptual framework of digital finance built by Gomber et al. (2017). The framework includes three dimensions: technology, financial functions, and institutions (see Figure 1). Elements of these three dimensions intertwine to form various FinTech subfields, which make the framework not only dynamically expandable but also diverse and specific. The FinTech company subfield is the research object of this paper. The development of FinTech companies can be divided into two levels, namely information technological innovation and business innovation[1].
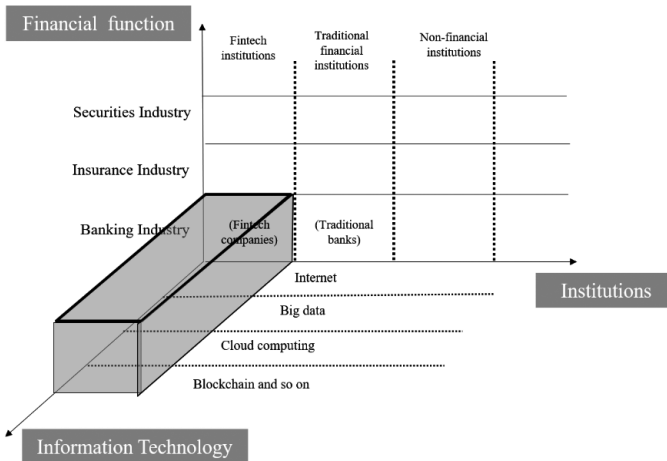

Figure 1. The three-dimensional conceptual framework for defining FinTech

2.2. Mechanism and hypotheses

The development of FinTech companies in China since 2008 occurred in two stages (Shim & Shin, 2016). The first was between 2010 and 2014, when the number of FinTech companies entering the financial markets peaked, as shown in Figure 2. In the second stage of development, after 2014, not only do traditional banks work on their own FinTech innovations but they also collaborate with FinTech companies. In brief, FinTech is currently the most important innovation in the financial sector and will continue to be so in the future (Abdeldayem & Aldulaimi, 2020).

---

[1] Here, the concepts of FinTech and internet finance should be distinguished. The concept of internet finance is popular mainly in Chinese academia and practice. Internet finance is more commonly regarded as a business innovation from the early development of FinTech, that is, it focuses on the financial application of the internet. Therefore, in the three-dimensional framework of FinTech, internet finance pertains to the financial function of FinTech. The concept of FinTech in this paper is broader than that of internet finance.
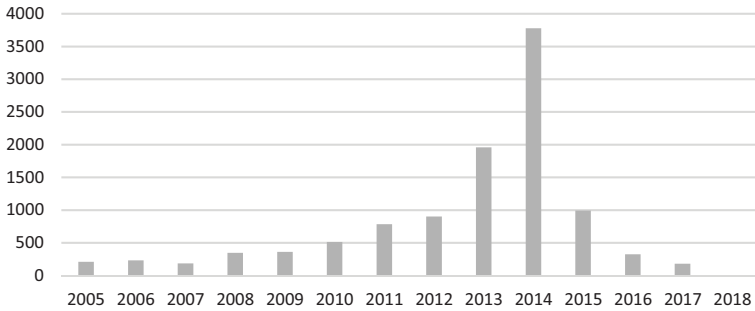
Figure 2. The number of new FinTech entrants in China (source: The China's FinTech Companies Database, established by Tsinghua University, http://www.fintechdb.cn/)

In the early stage of FinTech, traditional banks and FinTech companies compete with each other. FinTech companies provide similar services to traditional banks and have disruptive potential (Lacasse, 2021), which is mainly reflected in two aspects. The first is the advantages FinTech companies have in acquiring customers – especially BigTech companies (Panetta, 2018). Due to insufficient innovation, traditional banks have shortcomings when it comes to customer experience, personalization, and diversified services (Fang, 2014). By contrast, FinTech companies can provide unique services to acquire more customers using real time information. The second aspect is the limited regulation of Fintech companies' balance sheets (Tanda & Schena, 2019). FinTech companies impact the balance-sheet business of traditional banks, which reduces traditional banks' marginal profit (FSB, 2019), thus further reducing their market power.

In the long term, traditional banks begin to transform because of the pressure from competition with FinTechs. Many such banks seek to cooperate with FinTech companies. FinTech companies would like to cooperate with traditional banks (Bömer & Maxin, 2018). Even the regulator will guide both sides to cooperate (Hung & Luo, 2016), to maintain financial stability. Through cooperation, banks can benefit from the advanced technology and busi-
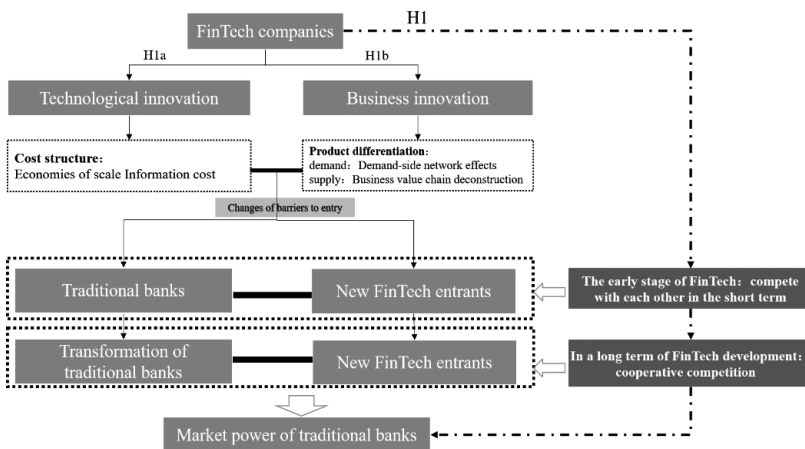

Figure 3. The mechanism of FinTech's influence on the market power of traditional banks

ness innovation of FinTechs and can regain more market power. We propose the following hypothesis:

H1: The development of FinTech companies has a U-shaped effect on the market power of traditional banks in China.

In the previous sub-section, we discussed the overall impact of FinTech companies on banks' market power. Regarding the specific impact mechanism, we argue that FinTech companies' development changes economic barriers in banking and thus influences the market power of banks via two channels, as shown in Figure 3. The first channel is technological innovation, which concerns finance-related innovations in IT, such as cloud computing, big data, artificial intelligence, and so on. The second channel is business innovation. This includes novelties in financial services that result from technological innovation in FinTech, such as online loans, online wealth management, and online payments, among others.

(1) Technological innovation

In the short term, technological innovations lower the market power of banks in two ways. Firstly, technological innovation changes the way information is collected, produced, and processed, and weakens the control of incumbent banks over customer information. Incumbent banks control most of the market share by possessing massive amounts of customer information via channels such as credit and payment intermediaries (Parlour et al., 2019; Armantier et al., 2021). Prospective entrants face enormous costs in acquiring this information. The popularization of IT and big data has since lowered the costs of obtaining customer information (Thakor, 2020). FinTech companies can now obtain non-financial data on customers via multiple technical channels at a low cost, and unstructured data are better than credit ratings in predicting loan approval and default (Costa et al., 2015; Agarwal et al., 2019). This weakens the advantages of the "soft information" held by traditional banks which is not numerical information (Matsumura, 2018).

Secondly, technological innovation lowers the minimum efficient scale for new entrants such as FinTech companies. The barrier of economies of scale refers to an economic phenomenon in which a company is unable to achieve low-cost production before seizing a certain market share and hence has difficulty entering the market. IT can lower fixed costs, minimizing efficiencies of scale (Varian et al., 2004; Feyen et al., 2021). For example, application programming interfaces (APIs) can lower the transaction costs of banking services and make the multiple-platform supply of banking products possible (Boot, 2016). Plug-and-play digital assets reduce fixed costs for new entrants (Hirt & Willmott, 2014; Boot, 2016).

Over the long term, especially from 2015 onward, as many FinTech companies have entered the industry, traditional banks have started to transform and upgrade by quickening the application and innovation of FinTech (Ngai et al., 2016). A rising number of financial technologies are intended specifically for banking services, which can be considered an effect of traditional banks' FinTech reform (Kerényi & Molnár, 2017). Given that IT infrastructure is often characterized by high asset specificity and low marginal cost, monopoly is an inherent characteristic of the IT industry (Varian et al., 2004). Large financial institutions can be ahead of their competitors in technology by having an advanced IT or solid IT infrastructure (Plesser et al., 2019). Accordingly, FinTech has strong effects on economies of scale, and

banks that own substantial financial infrastructure using FinTech will have greater market power in the long run. More precisely, traditional banks with capital advantages can recapture market power by cooperating with new entrants and absorbing the advantages of FinTech companies in terms of technology and customer information (Organization for Economic Co-operation and Development [OECD], 2020). Thus, the influence of FinTech differs as it evolves. We propose the following hypothesis:

Hypothesis 1a: The influence of the technological innovation of FinTech on the market power of banks in China is U-shaped.

(2) Business innovation

Offering vertically and horizontally differentiated products is another way for traditional banks to retain their own market power (Alhadeff, 1974). However, in the era of FinTech, new types of business will change these differentiated advantages.

In the early stages of FinTech development, FinTech companies provide new quasi-banking products in a niche market of banking. This has two aspects. In terms of the supply side of banking, FinTech business innovation speeds up the breakdown of the banking value chain (Boot, 2016). FinTech products are personalized, scenario-specific, intelligent, and free of financial regulation. For example, FinTech companies may use multi-scenario personal behavior data to set up a credit rating database to do online loan business (Jagtiani & Lemieux, 2017). Payment-service-based money management services offered by FinTech companies may compete with banks' deposit services (Navaretti et al., 2017).

Regarding the demand side, product differentiation increases users' search costs (Gehrig & Stenbacka, 2004), but intelligent and polymerized FinTech products lower the costs of searching and switching for users (Chen & Hitt, 2005; Feyen et al., 2021). In addition, various new types of business (online loans, third-party payment, online wealth management, etc.) have apparent effects on network externalities. The effects of network externalities are also known as demand-side economies of scale and have the characteristics of a competitive monopoly (Zhu & Sun, 2004). The stronger the network effect, the higher the level of market monopoly (Wen & Chen, 2002). For traditional banks, bank cards also have strong network effects. FinTech has quickly overcome the network effects of the bank card system and has created stronger network effects than those of traditional payment systems.

In the long term, as the entry of FinTech companies becomes generally stable, traditional banks gradually offer services that incorporate FinTech through business innovation or cooperation with FinTech companies (Wang & Kapron, 2020). For example, traditional banks may introduce payment tools that they develop independently or distribute financial products via the platforms of various FinTech companies. Meanwhile, in a banking market, FinTech companies, especially Big Tech companies, that hold a monopoly will have more opportunities to cooperate with banks (de la Mano & Padilla, 2018). As a result, traditional banks can cooperate with these FinTech companies in banking services to maintain their market power and regain their market share. We propose the following hypothesis:

Hypothesis 1b: The influence of the business innovation of FinTech companies on market power of Chinese banks is U-shaped.

3. Research methods

3.1. Empirical models

There are many ways of measuring market power that have been carried out in China and internationally. Mainstream measurement instruments include the Lerner index (Bian et al., 2017; Liu et al., 2017; Shaffer & Spierdijk, 2020), the Boone index (Tabak et al., 2012; Li, 2015), the net interest margin (Freixas & Rochet, 2008; Bremus, 2015), and the interest rate spread of deposits and loans based on the Monti-Klein model (Freixas & Rochet, 2008).

Among these measures, the Monti-Klein model measures market power under imperfect competition conditions. The model surveys monopolistic banks with a negative slope curve for loan demand and a positive slope curve for deposit supply. Moreover, the model assumes that the inverse demand functions for bank loans and deposit supply are $r_L(L)$ and $r_D(D)$, respectively. In formular (1), r represents the equilibrium interest rate in the banking industry market and is usually measured by the interbank market rate, L is the number of bank loans, and D is the number of bank deposits. The interbank net position is $M = (1-\alpha)D - L$, with α representing the deposit reserve ratio. The profit of a bank can be expressed by formula (1).

$$\pi = r_L(L) + rM - r_D(D)D - C(D,L). \tag{1}$$

On the condition that π is convex, the first-order conditions for profit maximization of a monopolistic bank are $\partial\pi/\partial L = 0$, $\partial\pi/\partial D = 0$. The model introduces the concepts of the elasticity of loan demand and the elasticity of deposit supply, namely $\varepsilon_L = -\left(r_L L'(r_L)\right)/L(r_L) > 0$ and $\varepsilon_D = -\left(r_D D'(r_D)\right)/D(r_D) > 0$.

Using the first-order conditions for profit maximization, the relationship between the interest rate spread and elasticity can be calculated.

$$(r_L^* - (r + C_L'))/r_L^* = 1/\varepsilon_L(r_L^*); \tag{2}$$

$$(r(1-\alpha) - C_D' - r_D^*)/r_D^* = 1/\varepsilon_D(r_D^*). \tag{3}$$

Formulas (2) and (3) represent banks' market power (Freixas & Rochet, 2008; Forssbæck & Shehzad, 2015). The formula $(r_L^* - (r + C_L'))/r_L^*$ is the Lerner index for loans and ($r(1-\alpha) - C_D' - r_D^*)/r_D^*$ is the Lerner index for deposits. According to the equations above, the interest rate spread ($r_L^* - r_D^*$) can be calculated by the sum of Eqs (2) and (3). This sum can also be regarded as the sum of the Lerner index for loans and deposits, meaning that a higher interest rate spread represents a higher market power (Freixas & Rochet, 2008).

Moreover, Monti-Klein extended the model to cover the imperfect competition market environment with many banks. The number of banks in the market is N. The profit of a bank can be expressed as follows:

$$\max_{(D_i, L_i)} \left\{ \left(r_L\left(L_i + \sum_{j\neq i}L_j^*\right) + rM(D,L) - r_D\left(D_i + \sum_{j\neq i}D_j^*\right)D_i - C_i(D,L)\right)\right\}; \tag{4}$$

$$\text{s.t } C_i(D,L) = \gamma_D D + \gamma_L L, \qquad (5)$$

where: $D_i = D/N$, representing the number of deposits of bank i; and $L_i = L/N$, representing the number of loans of bank i. According to formulas (4) and (5), the interest rate spread of one bank can be expressed by formula (6):

$$\Delta R = r_L^* - r_D^* = (r \times \partial M / \partial L_i + \gamma_L) / (1 - 1/(N\varepsilon_L)) - (r \times \partial M / \partial D_i - \gamma_D) / (1 + 1/(N\varepsilon_D)). \quad (6)$$

In this model, the interest rate spread of one bank is influenced by the elasticity of loan demand as well as the elasticity of deposit demand. It is also influenced by the number of companies that have entered the market. According to the analyses in section 1.2, China's banking industry is currently closer to the model of imperfect competition among N banks. So, the interest rate spread is used as a key variable to measure the market power of banks.

With regard to control variables in the model, there are two types of factors: micro-level bank factors and macro-level market factors. The main micro-level factor is the cost of the banking business conducted. Primary macro-level factors are the interbank net position and interbank market rate. Meanwhile, the interest rate elasticity of deposits and loans is influenced by changes in gross domestic product (GDP), financial development, and other factors.

We built three regression models to test our hypotheses, respectively. For Hypothesis 1, the model is as follows:

$$\Delta R = \alpha_0 + \gamma \Delta R_{t-1} + \alpha_1 FinTech_{jt-1} + \alpha_2 \left(FinTech_{jt-1}\right)^2 + \alpha_3 Bank_{it} + \alpha_4 \Pr ovince_{jt} + \varepsilon_{it}. \quad (7)$$

Technological and business innovation are two different levels of FinTech. Furthermore, the variables of technological and business innovation are strongly correlated. Therefore, this article presents two models to analyze the influence mechanism of different FinTech channels on banks' market power:

$$\Delta R = a_0 + \gamma \Delta R_{t-1} + a_1 Tech_{jt-1} + a_2 \left(Tech_{jt-1}\right)^2 + a_3 Bank_{it} + a_4 \Pr ovince_{jt} + \varepsilon_{it}; \quad (8)$$

$$\Delta R = b_0 + \gamma \Delta R_{t-1} + b_1 Func_{jt-1} + b_2 \left(Func_{jt-1}\right)^2 + b_3 Bank_{it} + b_4 \Pr ovince_{jt} + \varepsilon_{it}. \quad (9)$$

ΔR is the interest rate spread, representing the market power of banks as defined by the Monti-Klein model. In addition, since the market power of banks is auto-correlated to some extent, a lag phase of the interest rate spread was introduced as an explanatory variable to solve this problem. $FinTech_{jt-1}$ is the comprehensive indicator of the development of a FinTech company. $Tech_{jt-1}$ and $Func_{jt-1}$ signify the indicators to measure FinTech at the technical and business levels, respectively. *Bank* stands for the indicators of the bank that influence interest rate spread; $Province_j$ expresses macro-level control variables.

3.2. Definitions of variables

3.2.1. Dependent variable

The dependent variable is the interest rate spread of commercial banks, expressed as ΔR. ΔR = (total interest income/interest-bearing assets) – (total interest expenses/interest-bearing assets). Interest-bearing assets are expressed as the arithmetic mean of interest-earning assets at the beginning and end of a period.

3.2.2. Independent variable

$Fintech_{jt}$ is the aggregate index of FinTech company development. We use the Digital Financial Inclusion Index (DFII), introduced by Peking University (Guo et al., 2020). The DFII is an aggregated indicator that measures the development of China's FinTech companies and includes three dimensions: the breadth of business coverage, the depth of business usage, and the level of digitization.

$Tech_{jt}$ is the technological innovation development index. We choose the sub-indicator of DFII, the level of digitization, as the indicator of $Tech_{jt}$. Digitization is an important part of FinTech technological innovation and is related to mobile IT, QR code technology, and credit scoring technology, among others.

$Func_{jt}$ is the business innovation development index of FinTech. We choose the sub-indicator of DFII, the depth of business usage, as the indicator of $Func_{jt}$. This is because this index covers the use of various innovations by the FinTech company, in areas such as payment, money fund, credit, insurance, and investment.

3.2.3. Control variable

Various factors that may affect banks' market power are controlled. They are selected based on existing research and the analysis in section 3.1. $PreLoan_{it}$ represents the loan loss reserve rate; $Marketsize_{it}$ is the market share of a bank in a province; $Cost_{rate}$ is the union cost of bank assets; $Shibor_t$ is the annual rate offered by Shanghai Interbank; $GDPgrow_{jt}$ is the economic growth rate. $Finance$ is the level of financial development as measured by the ratio of social funds divided by GDP; $Regulation$ is the number of banks authorized by the government to enter the banking market.

3.3. Data sources and descriptive statistics

This paper uses unbalanced panel data collected for 155 banks over a six-year period (2013–2018).[2] There are six major state-owned commercial banks, 12 joint-stock commercial banks, 128 city commercial banks,[3] and nine private banks,[4] totaling 155 commercial banks. The

---

[2] Some banks were established after 2013 and have an observation period of less than 5 years.

[3] Until 2018, there were 134 city commercial banks in China. Because some of them did not issue financial reports, only 128 could be used as data sources.

[4] Until 2018, there were 18 private banks in China. Because some of them did not issue their financial reports, finally 9 private banks were chosen. They are Beijing Zhongguancun Bank, NewUp Bank of Liaoning, Sichuan Xinwang Bank, Kincheng Bank of Tianjin, Blue Ocean Bank, Wenzhou Minshang Bank, Wuhan Zhongbang Bank, Zhejiang E-Commerce Bank, Chongqing Fumin Bank.

data source for FinTech company development is the Peking University Digital Financial Inclusion Index of China[5]. The index covers 31 provinces. The data for control variables are mainly from the Wind economic database, the Bankscope database, the financial statements of banks and the Shanghai interbank offered rate.

Descriptive statistical results are reported in Table 1. The standard deviation of FinTech is considerable. This suggests that the development of FinTech, including even technology and business innovation, vary greatly. The following section 4.2 further analyzes the heterogeneity of effects.

Table 1. Descriptive statistic of variables

Variable	Mean	Standard deviation	Min	Max	Observations
ΔR (%)	2.76	1.33	−5.481	11.23	870
Fintech	236.70	56.13	118.00	377.70	870
Tech	322.17	61.92	217.9	453.7	870
Func	230.41	67.76	107.3	400.4	870
$Preloan(\%)$	3.14	0.94	0.56	7.99	870
$Marketsize(\%)$	0.82	2.09	0.00	15.95	870
$GDP_{grow}(\%)$	0.06	0.05	−0.23	0.17	870
$Cost_{rate}(\%)$	0.94	0.44	0.32	7.34	870
$Shibor(\%)$	4.11	0.56	3.10	4.96	870
Finance	18.48	6.14	9.47	38.82	870
Regulation	7.76	10.31	0.00	56	870

4. Results

4.1. Benchmark regression results

This study adopts the system generalized method of moments (system GMM) for dynamic panel model regression analysis. Table 2 reports that the relationship of FinTech and traditional banks' market power is U-shaped. Hypothesis 1 is therefore verified.

It is important to note that the data derives from a large FinTech company (Ant Financial Services Group) in China. This U-shaped curve indicates that, although large FinTech companies weaken the market power of traditional banks in the early stages, as they expand, traditional banks begin to cooperate with FinTech companies more and regain their market power. For example, syndicated loans provided by traditional banks and FinTech companies together enable traditional banks to gain more customers through large FinTech companies and to improve their market power. Traditional banks' market power is improved even further as they engage in more innovation and use more FinTech resources. However, a range of risks arise from this process that merit additional study and regulation.

---

[5] Available at: https://idf.pku.edu.cn/yjcg/zsbg/index.htm

Table 2. Benchmark regression results for H1

	(1)	(2)	(3)
	ΔR	ΔR	ΔR
$Fintech_{t-1}$	−0.00093	−0.02653***	−0.03045***
	(−1.19555)	(−5.57229)	(−7.85526)
$Fintech_{t-1}^2$		0.00006***	0.00006***
		(5.52386)	(8.10066)
$Cost_{rate}$			−0.47253***
			(-6.98230)
$Preloan$			−0.04267
			(−1.14562)
GDP_{grow}			1.68860**
			(2.35831)
$Marketsize$			−0.09941***
			(−4.32447)
$Shibor$			0.14884***
			(4.33373)
$Finance$			0.05582***
			(5.12418)
$Regulation$			0.00347
			(1.41011)
L.ΔR	0.81601***	0.80199***	0.82147***
	(15.38967)	(14.59545)	(36.87190)
_cons	0.54150**	3.42070***	2.85965***
	(1.97155)	(5.51368)	(6.22125)
N	714	714	714
Sargan			0.20
AR (2)			0.10

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

We have examined the effects of different channels, and the results are reported in Table 3. Column (1) shows that the influence of FinTech technological innovation on banks' market power is U-shaped, verifying Hypothesis 1a. Column (2) reports the influence of FinTech business innovation. This influence is also a U-shaped curve. Hypothesis 1b is verified.

Table 3. The effects of different channels on banks' market power

	(1)	(2)
	ΔR	ΔR
$Tech_{t-1}$	−0.01550***	
	(−4.26098)	

End of Table 3

	(1)	(2)
	ΔR	ΔR
$Tech_{t-1}^2$	0.00002***	
	(3.88209)	
$Func_{jt-1}$		−0.00712***
		(−3.05243)
$Func_{jt-1}^2$		0.00001***
		(3.47950)
Control variables	YES	YES
$L.\Delta R$	0.79242***	0.84143***
	(59.88442)	(69.22511)
_cons	2.31492***	0.33751
	(4.13458)	(1.33575)
N	714	714
Sargan	0.16	0.17
AR (2)	0.10	0.10

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

4.2. Heterogeneity

4.2.1. Ownership

In this section, traditional banks are divided into four categories: state-owned, joint-equity, municipal, and private commercial banks. To identify the differences between the four types of banks, three dummy variables were established. These dummy variables were multiplied by independent variables to build the interactions.

Column (1) in Table 4 shows that there are significant differences in the impact of Fin-Tech on various types of banks in terms of market power. We fit the U-shaped parabola for each type of bank based on the results in Column (1), as shown in Figure 4. State-owned banks reach the bottom of the parabola later than municipal and joint-equity banks but earlier than private banks. At the current stage of FinTech development (see Table 1), the market power of private banks is still declining. This is mainly because most private banks were established in recent years and are still in their infancy. Even if they adopt advanced FinTech operating models, they need time to grow.

At the same time, state-owned banks regain market power later than municipal and joint-equity banks. There may be two main reasons for this: 1) the scale of state-owned banks is too large, and the transformation of FinTech is slower than that of joint-equity and municipal banks; 2) state-owned banks face national competition. This difference is also evident in the results of the business channels.

Table 4. Ownership heterogeneity of the effects of FinTech on market power

|	(1)	(2)	(3)
	ΔR	ΔR	ΔR
$Fintech_{t-1}$	−0.08536***		
	(−10.06479)		
$Fintech_{t-1}^2$	0.00009***		
	(8.20804)		
$Tech_{t-1}$		0.03171***	
		(2.58793)	
$Tech_{t-1}^2$		0.00002	
		(1.40081)	
$Func_{jt-1}$			−0.03648***
			(−7.52021)
$Func_{jt-1}^2$			0.00002***
			(4.29954)
$Fintech_{t-1} \times state$	0.03787***		
	(5.08322)		
$Fintech_{t-1} \times joint$	0.04256***		
	(5.72791)		
$Fintech_{t-1} \times municipal$	0.04246***		
	(5.72783)		
$Tech_{t-1} \times state$		−0.04108***	
		(−5.10576)	
$Tech_{t-1} \times joint$		−0.04329***	
		(−5.40371)	
$Tech_{t-1} \times municipal$		−0.04601***	
		(−6.10333)	
$Func_{t-1} \times state$			0.02365***
			(6.57359)
$Func_{t-1} \times joint$			0.02379***
			(6.65837)
$Func_{t-1} \times municipal$			0.02513***
			(7.15587)
Type	YES	YES	YES
Control variables	YES	YES	YES
$L.\Delta R$	YES	YES	YES
_cons	17.34367***	−10.99809***	7.08041***
	(8.68893)	(−3.03127)	(7.24083)
N	714	714	714

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

As for the influence of different channels, the results in Column (2) indicate that the influence of FinTech's technological innovation on market power is U-shaped but not significant. Column (3) reports that FinTech's business innovation has a U-shaped influence on different types of banks and has a more significant influence on municipal commercial banks and joint-stock banks.

We have also calculated the vertex of the U-shaped parabolas (Figure 4) for Column (3). Municipal banks reach the bottom of the parabola first, followed by joint-equity and then state-owned banks. Municipal commercial banks reach the bottom of the parabola earlier than joint-stock banks because they usually operate on a smaller scale within a province or a region and hence are less impacted by FinTech. In fact, when facing competition from FinTech companies, Chinese municipal commercial banks usually adopt the strategy of attracting deposits by offering high interest rates on saving accounts to increase customer acquisition. As a result, the return of market power is faster. However, this operation model carries greater risks.

Meanwhile, joint-stock banks operate nationwide, and the business functions of FinTech have been expanded nationwide through the internet. Joint-stock commercial banks are smaller than state-owned banks and are pioneering FinTech innovations. They have prompted China's FinTech revolution. Hence, the market power of joint-stock banks recovers more quickly.
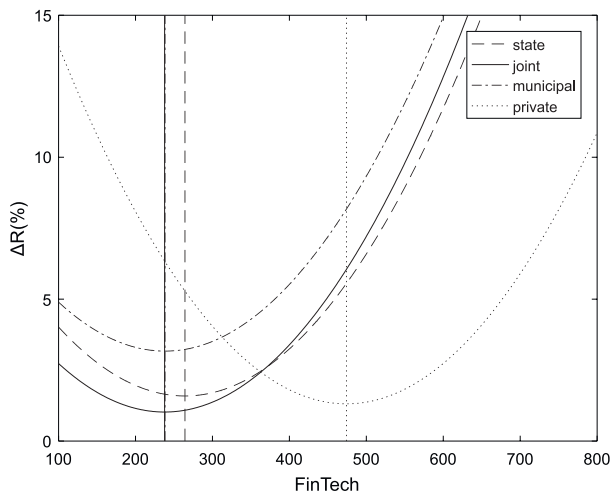
Note: In the figure, the symmetry axes of joint-equity and city commercial banks coincide.

Figure 4. The fitted parabolas for the empirical results in Column (1) of Table 4

4.2.2. Business segments

This study also examines differences in FinTech's influence on banks' market power in terms of the various business segments of banks, particularly loan and deposit services, which are the most important segments for commercial banks. This study divides the interest rate spread into the disparity between the loan rate and interbank offered rate (ΔR_loan) and the disparity between the interbank offered rate and deposit rate ($\Delta R\_deposit$). Table 5 describes

the business heterogeneity of the effects of FinTech on banks with different types of owner-ship. Columns (1) to (3) indicate the influence of FinTech on the interest spread of deposit services. The results reveal that there is no significant impact on deposit services.

Table 5. Business heterogeneity of the effects of FinTech on market power

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta R\_deposit$	$\Delta R\_deposit$	$\Delta R\_deposit$	ΔR_loan	ΔR_loan	ΔR_loan
$Fintech_{t-1}$	−0.03148***			−0.19444***		
	(−2.65529)			(−2.93714)		
$Fintech_{t-1}^2$	0.00002			0.00019**		
	(1.52024)			(1.97992)		
$Tech_{t-1}$		−0.05073			−0.14294***	
		(−1.55765)			(−2.82987)	
$Tech_{t-1}^2$		0.00007**			0.00017***	
		(2.01884)			(3.11314)	
$Func_{t-1}$			−0.04211*			−0.10214***
			(−1.91262)			(−3.03270)
$Func_{t-1}^2$			0.00003			0.00011**
			(1.05490)			(2.31935)
$Fintech_{t-1} \times$ state	0.01823*			0.09741**		
	(1.95910)			(2.46532)		
$Fintech_{t-1} \times$ joint	0.01781*			0.06321		
	(1.77877)			(1.58780)		
$Fintech_{t-1} \times$ municipal	0.02328**			0.08921**		
	(2.46314)			(2.38276)		
$Tech_{t-1} \times$ state		0.02860			0.07753**	
		(1.29417)			(2.26609)	
$Tech_{t-1} \times$ joint		0.00989			0.02445	
		(0.44784)			(0.71680)	
$Tech_{t-1} \times$ municipal		0.00610			0.01873	
		(0.29321)			(0.58297)	
$Func_{t-1} \times$ state			0.01802			0.02648
			(1.32533)			(1.27856)
$Func_{t-1} \times$ joint			0.02077			0.01955
			(1.56523)			(0.96427)
$Func_{t-1} \times$ municipal			0.02722**			0.04054**
			(2.34320)			(2.29688)
Lag (1)	YES	YES	YES	YES	YES	YES
Type	YES	YES	YES	YES	YES	YES

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta R\_deposit$	$\Delta R\_deposit$	$\Delta R\_deposit$	ΔR_loan	ΔR_loan	ΔR_loan
Control variables	YES	YES	YES	YES	YES	YES
_cons	18.03985***	29.3011***	31.05464***	81.43589***	75.3034***	17.56350*
	(3.34158)	(3.19592)	(5.78627)	(5.88391)	(5.32131)	(1.72648)
N	714	714	714	714	714	714

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

By contrast, Columns (4) to (6) demonstrate that FinTech companies have a significant influence on the market power of different types of banks in terms of loan services. Column (4) shows that FinTech in its entirety has a U-shaped influence on state-owned banks and municipal commercial banks. Furthermore, state-owned banks regain market power over loan services earlier than other bank types. In addition, according to columns (5) and (6), the technological innovation channel has a U-shaped influence on state-owned banks, while the business innovation channel has a U-shaped influence on municipal banks; this means that the loan services of state-owned banks focus more on technological innovation, while the loan services of municipal banks focus more on business innovation.

4.3. Robustness checks

To check the robustness of our results, a random sampling approach is used for the estimation of benchmark regression model. We used STATA 16.0 to randomly choose 150 banks from all banks in the sample and established new panel data. The regression results are presented in Table 6. The results show that our conclusion is highly robust.

Table 6. Robustness results

	(1)	(2)	(3)
	ΔR	ΔR	ΔR
$Fintech_{t-1}$	−0.02761***		
	(−7.26336)		
$Fintech^2_{t-1}$	0.00005***		
	(7.64401)		
$Tech_{t-1}$		−0.01634***	
		(−4.07387)	
$Tech^2_{t-1}$		0.00002***	
		(3.73082)	
$Func_{t-1}$			−0.00554**
			(−2.48422)

	(1)	(2)	(3)
	ΔR	ΔR	ΔR
$Func_{t-1}^2$			0.00001***
			(2.96470)
Control variables	YES	YES	YES
Lag(1)	YES	YES	YES
_cons	2.46469***	2.35364***	0.22138
	(5.64637)	(4.04557)	(0.96076)
N	689	689	689
Sargan	0.15	0.12	0.13
AR (2)	0.10	0.08	0.09

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

Conclusions

With the emergence of FinTech, traditional banks have struggled to retain market power. This paper provides a novel investigation into where the competitive landscape is headed. According to the empirical results, we draw the following four main conclusions. Firstly, the development of FinTech companies has a significantly U-shaped impact on the market power of traditional banks. Both technological innovation and business innovation channels have a similarly U-shaped impact in this respect. Secondly, municipal commercial banks are more likely to be influenced by the business innovation channel than the technological innovation channel. Thirdly, state-owned banks have advantages in reacquiring loan service market power via the technological innovation channel. Finally, it is hard for private banks to acquire market power under the intense competition from FinTech companies.

The theoretical implications for researchers are twofold, as demonstrated here. (i) This paper analyzes FinTech's effects through the lens of the theory of market competition and the barriers-to-entry theory, which expands the application of industrial organization theory to FinTech and banking industry research. (ii) The paper establishes a framework for analyzing FinTech's influence on traditional banks' market power. This provides a theoretical basis to improve understanding of FinTech's impact on the banking industry. Both contributions should be helpful for researchers in related areas.

There are two implications for regulators and bank operators. (i) Traditional banks in China are regaining market power through FinTech. Since the Chinese banking industry is a monopolistically competitive market, some banks with strong market power may regain monopoly status. Regulators should keep an eye on this and prevent monopoly-related financial stability issues between FinTech companies and banks to balance innovation, stability, and competitiveness. (ii) It is hard for private banks to gain market power quickly following the impact of FinTech companies. For private bank operators, it is more important to focus on cooperation with FinTech companies and other banks to develop more differentiated and innovative products.

There are several limitations to this study which can also be further investigated in the future. The first, as mentioned in Section 4.1, is that risk-taking behavior related to shifts in market power have not been discussed. The main reason for this omission is that it is beyond the scope of this paper. In a new framework, risk-taking can play a significant role in analysis of FinTech and market power. Second, rural commercial banks, rural credit cooperatives, and other banking institutions have not been included in the analysis because they do not publish financial reports. If such reports become available in the future, the analysis can be more comprehensive. Lastly, while we deal here mostly with competitive behavior, it may be promising to devote further research into the effects of different competitive cooperation models, which are far from settled. For example, a systemic theoretical model along the lines of Hart and Tirole could be developed to analyze the effects of the vertical integration of FinTech firms and banks on market competition.

Funding

Author contributions

Conceptualization, Hanying Qi; methodology, Hanying Qi and Weijia Wang; software, Hanying Qi.; validation, Hanying Qi., Keng Yang and Weijia Wang; formal analysis, Hanying Qi; investigation, Weijia Wang; resources, Keng Yang; data curation, Keng Yang; writing—original draft preparation, Hanying Qi; writing—review and editing, Hanying Qi; visualization, Keng Yang and Weijia Wang; supervision, Weijia Wang; project administration, Hanying Qi; funding acquisition, Weijia Wang. All authors have read and agreed to the published version of the manuscript.

Disclosure statement

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

Abdeldayem, M. M., & Aldulaimi, S. (2020). Trends of global Fintech education practices and the GCC perspective. *International Journal of Advanced Science and Technology*, *29*(03), 7150–7163. http://sersc.org/journals/index.php/IJAST/article/view/7577

Agarwal, S., Ghosh P., Alok, S., & Gupta, S. (2019). *Fintech and credit scoring for the millennial generation* [Conference presentation]. Annual Conference. Asian Bureau of Finance and Economic Research.

Alhadeff, D. A. (1974). Barriers to bank entry. *Southern Economic Journal*, *40*(4), 589–603. https://doi.org/10.2307/1056377

Alt, R., Beck, R., & Smits, M. T. (2018). FinTech and the transformation of the financial industry. *Electronic Markets*, *28*(3), 235–243. https://doi.org/10.1007/s12525-018-0310-9

Armantier, O., Doerr, S., Frost, J., Fuster, A., & Shue, A. K. (2021). Whom do consumers trust with their data? US survey evidence. *BIS Bulletin*, *42*, 1–7.

Barth, J. R., Li, L., Li, T., & Song, F. (2013). Reforms of China's banking system. In G. Jr. Caprio, T. Beck, S. Claessens, & S. L. Schmukler (Eds.), *The evidence and impact of financial globalization* (pp. 345–353). Elsevier. https://doi.org/10.1016/B978-0-12-397874-5.00005-1

Bian, W., Shen, Y., & Shen, M. (2017). Bank competition, policy incentives and SME lending: Evidence from County-level financial institution. *Journal of Financial Research*, *439*(1), 114–129 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2017&filename=JRYJ201701009&uniplatform=NZKPT&v=vGFPy9GNQ-vv56E3SWDSXYc439Ye5N3HQT29-u2hhanRkPGq3Y9NlBN4eTfnvKYV

Bilotta, N., & Romano, S. (2019). *Tech giants in banking: The implications of a new market power*. Istituto Affari Internazionali. http://www.jstor.com/stable/resrep19672

Bömer, M., & Maxin, H. (2018). Why Fintechs cooperate with banks – Evidence from Germany. *Zeitschrift Für Die Gesamte Versicherungswissenschaft*, *107*(4), 359–386. https://doi.org/10.1007/s12297-018-0421-6

Boot, A. W. A. (2016). Understanding the future of banking scale and scope economies, and Fintech. In A. Demirgüç-Kunt, D. D. Evanoff, & G. G. Kaufman (Eds.), *World scientific studies in international economics: Vol. 55. The future of large, internationally active banks* (pp. 431–449). World Scientific Publishing Co. Pte. Ltd. https://doi.org/10.1142/9789813141391_0025

Boot, A. W. A. (2019). Bank strategy in the world of Fintech. *International Banker*, *2019*(Winter), 52–55. https://dare.uva.nl/search?identifier=cbcec4bf-60c9-4adf-b837-1b7dd25c86cb

Bremus, F. M. (2015). Cross-border banking, bank market structures and market power: Theory and cross-country evidence. *Journal of Banking & Finance*, *50*, 242–259. https://doi.org/10.1016/j.jbankfin.2014.10.008

Buchak, G., Matvos, G., Piskorski, T., & Seru, A. (2018). Fintech, regulatory arbitrage, and the rise of shadow banks. *Journal of Financial Economics*, *130*(3), 453–483. https://doi.org/10.1016/j.jfineco.2018.03.011

Chen, P., & Hitt, L. M. (2005). Information technology and switching costs. In *Handbook on economics and information systems* (Vol. 1, pp. 437–470). Elsevier. https://doi.org/10.1016/S1574-0145(06)01008-7

Cheng, H., & Cheng, W. (2017). Economic new normal, the new economy, and the development and transformation of commercial banks. *Financial Regulation Research*, (2), 81–92 (in Chinese). https://www.cnki.net/kcms/doi/10.13490/j.cnki.frr.2017.02.006.html

Costa, A., Deb, A., & Kubzansky, M. (2015). Big Data, Small Credit: The digital revolution and its impact on emerging market consumers. *Innovations: Technology, Governance, Globalization*, *10*(3–4), 49–80. https://doi.org/10.1162/inov_a_00240

de la Mano, M., & Padilla, J. (2018). Big Tech banking. *Journal of Competition Law & Economics*, *14*(4), 494–526. https://doi.org/10.1093/joclec/nhz003

Ding, Z., & Wang, H. (2016). Research of country banking industry market competition in China – based on the empirical analysis of Panzar-Rosse model. *Journal of Nanjing University of Finance and Economics*, (1), 7–12 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2016&filename=NJJJ201601007&uniplatform=NZKPT&v=a4-UB4bvd4krXVTCy_v2X-M_kztMC-u1_F94c-ahVSkBjM9kvCg7CkDxQcSllwJl

Fang, F. (2014). *China's banking industry IT solution market 2014–2018: Forecast and analysis*, IDC (in Chinese).

Feyen, E., Frost, J., Gambacorta, L., Natarajan, H., & Saal, M. (2021). *Fintech and the digital transformation of financial services: Implications for market structure and public policy* (BIS Papers No 117). Bank for International Settlements.

Financial Stability Board. (2019). *FinTech and Market structure in financial services: Market developments and potential financial stability implications*. http://www.Fsb.Org/2019/02/Fintech-And-Market-Structure-In-Financial-Services-Market-Developments-And-Potential-Financial-Stability-Implications/

Forssbæck, J., & Shehzad, C. T. (2015). The conditional effects of market power on bank risk – Cross-country evidence. *Review of Finance*, *19*(5), 1997–2038. https://doi.org/10.1093/rof/rfu044

Freixas, X., & Rochet, J. C. (2008). *Microeconomics of banking*. The MIT Press.

Gai, K., Qiu, M., & Sun, X. (2018). A survey on FinTech. *Journal of Network and Computer Applications*, *103*, 262–273. https://doi.org/10.1016/j.jnca.2017.10.011

Gao, H., Ru, H., Townsend, R., & Yang, X. (2019). *Rise of bank competition: Evidence from banking deregulation in China* (NBER Working Paper No 25795). https://doi.org/10.3386/w25795

Gehrig, T., & Stenbacka, R. (2004). Differentiation-induced switching costs and poaching. *Journal of Economics & Management Strategy*, *13*(4), 635–655. https://doi.org/10.1111/j.1430-9134.2004.00026.x

Gomber, P., Koch, J. A., & Siering, M. (2017). Digital finance and FinTech: Current research and future research directions. *Journal of Business Economics*, *87*(5), 537–580. https://doi.org/10.1007/s11573-017-0852-x

Guo, F., Wang, J., Wang, F., Cheng, Z., Kong, T., & Zhang, X. (2020). Measuring China's digital financial inclusion: Index compilation and spatial characteristics. *China Economic Quarterly*, *19*(4), 1401–1418 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?doi=10.13821/j.cnki.ceq.2020.03.12

Hirt, M., & Willmott, P. (2014). *Strategic principles for competing in the digital age*. McKinsey Quarterly.

Hodula, M. (2021). Does Fintech credit substitute for traditional credit? Evidence from 78 countries. *Finance Research Letters*, 102469. https://doi.org/10.1016/j.frl.2021.102469

Hung, J., & Luo, B. (2016). FinTech in Taiwan: A case study of a Bank's strategic planning for an investment in a FinTech company. *Financial Innovation*, *2*(1), 15. https://doi.org/10.1186/s40854-016-0037-6

Jagtiani, J., & Lemieux, C. (2017). *Fintech lending: Financial inclusion, risk pricing, and alternative information* (Working Paper No. 17-17 of Research Department). Federal Reserve Bank of Philadelphia. https://doi.org/10.21799/frbp.wp.2017.17

Keeley, M. C. (1990). Deposit insurance, risk, and market power in banking. *American Economic Review*, *80*(5), 1183–1200. https://www.jstor.org/stable/2006769

Kerényi, Á., & Molnár, J., (2017). The impact of the fintech phenomenon – Radical change occurs in the financial sector? *Hitelintézeti Szemle*, *16*(3), 32–50. https://doi.org/10.25201/FER.16.3.3250

Lacasse, R. M. (2021). *A digital tsunami: FinTech and crowdfunding*.

Landes, W. M., & Posner, R. A. (1981). Market power in antitrust cases. *Harvard Law Review*, *94*(5), 937–996. https://doi.org/10.2307/1340687

Li, G. (2015). Estimation of the degree of competition in China's bank loan market based on Boone indicator. *The Journal of Quantitative & Technical Economics*, *32*(05), 131–146. (In Chinese). https://www.cnki.net/kcms/doi/10.13653/j.cnki.jqte.2015.05.009.html

Liu, L. (2014). Impact Analysis of Internet Financial Credit Reporting to China's Commercial Bank Credit Monopoly. *South China Finance*, (8), 21–26 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2014&filename=GDJR201408004&uniplatform=NZKPT&v=zeMWDIaTO7WKogzhAXi34jGncb-1xSoqopvynk8t_pbPg9iMSis0c-F6EFKbqBx_

Liu, L., Yu, J., Yang, J., & Zhu, X. (2017). Is competition a double-edged sword for the bank credit structure adjustment? Evidence from the Proccess of Interest Rate Liberalization in China. *Economic Research Journal*, *52*(5), 131–145 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2017&filename=JJYJ201705018&uniplatform=NZKPT&v=-BUDyLuTJTpUDkKckp9F8_9Orn9C3qrJpWlMKhYY4L7NIJSYzUmUo9E9FuK0pMsq

Matsumura, Y. (2018). *Information advantage, relationship advantage and competition in banking industry*. https://web.iss.u-tokyo.ac.jp/~matsumur/matsumura2018OT.pdf

Navaretti, G. B., Calzolari, G., & Pozzolo, A. F. (2017). FinTech and banks. Friends or foes? *European Economy – Banks, Regulation, and the Real Sector*, (2), 9–30. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3099337

Ndwiga, D. (2020). *The effects of FinTechs on bank market power and risk-taking behaviour in Kenya* (KBA Centre for Research on Financial Markets and Policy Working Paper Series 44). Kenya Bankers Association (KBA). https://ideas.repec.org/p/zbw/kbawps/44.html

Ngai, J. L., Qu, J., & Zhou, N. (2016). *What's next for China's booming Fintech sector*? McKinsey & Company.

Niu, H., & Min, D. (2015). The Influencing mechanism of Internet financialization on commercial bank. *Journal of Hebei University of Economics and Business*, *36*(3), 66–71 (in Chinese).

OECD. (2020). *Digital disruption in banking and its impact on competition*. https://www.oecd.org/daf/competition/digital-disruption-in-banking-and-its-impact-on-competition-2020.pdf

Palmer, J. (1974). Barriers to entry as a measure of a firm's Monopoly Power. *The American Economist*, *18*(1), 33–35. https://doi.org/10.1177/056943457401800105

Panetta, F. (2018, May 12). *Fintech and banking: Today and tomorrow*. BIS Central bankers' speeches. https://www.bis.org/review/r180515d.htm

Papadimitri, P., Tasiou, M., Tsagkarakis, M., & Pasiouras, F. (2021). FinTech and Financial Intermediation. In M. Pompella & R. Matousek (Eds.), *The Palgrave handbook of fintech and blockchain* (pp. 347–374). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-66433-6_16

Parlour, C. A., Rajan, U., & Zhu, H. (2019). *FinTech disruption, payment data, and bank information*. https://www.semanticscholar.org/paper/FinTech-Disruption%2C-Payment-Data%2C-and-Bank-Parlour-Rajan/71952a2b43594c3f6331ce68114173f9df36cc4e#citing-papers

Plesser, S., Aurora, D., & Browne, B. (2019). *The future of banking: The growth of technology*. S&P global rating. https://www.spglobal.com/en/research-insights/articles/the-future-of-banking-the-growth-of-technology-and-its-impact-on-the-u-s-banking-sector

Restoy, F. (2021). *Fintech regulation: How to achieve a level playing field* (Occasional paper No. 17). Financial Stability Institute of Bank for International Settlements. https://www.bis.org/fsi/fsipapers17.htm

Schmalensee, R. (1982). Another look at market power. *Harvard Law Review*, *95*(8), 1789–1816. https://doi.org/10.2307/1340649

Shaffer, S., & Spierdijk, L. (2020). Measuring multi-product banks' market power using the Lerner index. *Journal of Banking* & *Finance*, 117, 1–15. https://doi.org/10.1016/j.jbankfin.2020.105859

Shim, Y., & Shin, D. (2016). Analyzing China's Fintech industry from the perspective of actor-network theory. *Telecommunications Policy*, *40*(2–3), 168–181. https://doi.org/10.1016/j.telpol.2015.11.005

Su, C., Qin, M., Rizvi, S. K. A., & Umar, M. (2020). Bank competition in China: A blessing or a curse for financial system? *Ekonomska Istraživanja*, *34*(1), 1244–1264. https://doi.org/10.1080/1331677X.2020.1820361

Sun, G., & Luan, X. (2019). Two-track interest rate pricing and the pricing of the loan rate in the context of the loan market of monopolistic competition. *Finance* & *Trade Economics*, *40*(11), 81–97 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?doi=10.19795/j.cnki.cn11-1166/f.20191111.003

Tabak, B. M., Fazio, D. M., & Cajueiro, D. O. (2012). The relationship between banking market competition and risk-taking: Do size and capitalization matter? *Journal of Banking* & *Finance*, *36*(12), 3366–3381. https://doi.org/10.1016/j.jbankfin.2012.07.022

Tanda, A., & Schena, C. (2019). *FinTech, BigTech and banks*. Springer Nature. https://doi.org/10.1007/978-3-030-22426-4

Thakor, A. V. (2020). Fintech and banking: What do we know? *Journal of Financial Intermediation*, *41*, 1–13. https://doi.org/10.1016/j.jfi.2019.100833

Varian, H., Farrell, J., & Shapiro, C. (2004). *The economics of information technology*. Cambridge University Press. https://doi.org/10.1017/CBO9780511754166

Vives, X. (2017). The impact of Fintech on banking. *European Economy - Banks, Regulation, and the Real Sector*, (2), 97–157.

Vives, X. (2019). Competition and stability in modern banking: A Post-crisis perspective. *International Journal of Industrial Organization*, (64), 55–69. https://doi.org/10.1016/j.ijindorg.2018.08.011

Wang, L., & Kapron, Z. (2020). *The future of Fintech cooperation – A report from Kapronasia* & *Ant Financial*. Kapronasia.

Wen, Z., & Chen, J. (2002). Study on network effect and barriers to entry. *Systems Engineering – Theory* & *Practice*, (2), 61–66 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2002&filename=XTLL200202009&uniplatform=NZKPT&v=kcdeKhm3qtgKDB7S_GtBLeE2k2_BPlkuXqxPPH8Q7BtiJ0V78W0p4WMwBZ4oC34g

Zhu, W., & Sun, Y. (2004). The research of new classical theory about the market structure of competitive monopoly in new economy. *Jinan Journal (Philosophy* & *Social Sciences)*, (5), 1–5+133 (in Chinese). https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFD2004&filename=JNXB200405000&uniplatform=NZKPT&v=OzRi62A85kP4ED0tCdrutdk3VIoLMOBVOzRJBvk3zOCBmnvMReQzsgDUoUYg-fLG