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The FinTech development in China and the risk they face

STUDENT NAME: Qin Anqi

TUTOR'S NAME: Elisa Ughetto

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Abstract

This paper focuses on the development of FinTech in China. The first chapter briefly introduces the definition of FinTech and the basic information such as its advantages. Chapter 2 begins with a brief overview of FinTech development in China, aiming to demonstrate the need to study FinTech in the Chinese region. It also describes the characteristics of Chinese FinTech relative to those in Europe and the US in terms of heterogeneity, centrality, access, and supervising pattern. The third chapter focuses on six different dimensions: artificial intelligence patent applications, the scale of financing capital in the blockchain industry, the number of new registered FinTech companies, the market scale of database systems, the market scale of China's digital economy and the market scale of the cloud computing industry. Also, the extent of FinTech development in China is analyzed in detail and compared with global data. Finally, in Chapter 4, the main problems encountered in the development of FinTech in China are described from three perspectives: regulatory risk, data and privacy collection risk, and monopoly risk. As well as the main measures currently taken by the Chinese government, and the limitations of these measures.

1.Introduction

People's lives are altering at a rate that was never considered to be conceivable before the advent of fintech. FinTech companies are having an impact on the style of conducting business that was traditionally responsible for keeping traditional banks running profitably. FinTech companies are thriving in China in particular as a result of comparatively lenient government restrictions, a huge number of micro and small enterprises, private investors, and other investment needs that traditional banks have ignored for a significant amount of time.

1.1 Definition

2011 was the year that officially marked the beginning of the FinTech era, which is based on developing technologies like as artificial intelligence, big data, blockchain,

and cloud computing. The word "FinTech" was formally introduced in Silicon Valley, which is located in the United States, and London, which is located in the United Kingdom. According to the Financial Stability Board (FSB), the term "fintech" refers to "financial innovation that is enabled by a variety of new technologies that help create new business models, applications, processes, or products that have a significant impact on financial markets, financial institutions, or the way in which financial services are delivered" (Das, 2019).

1.2 Advantages of FinTech

The first significant advantage of FinTech is that it can improve financial services and further enable financial inclusion. As mentioned, FinTech companies use technology to create financial products and services for consumers not reached by traditional banks and financial institutions. Through FinTech, consumers can access services more quickly and easily, establishing credit and accessing capital to grow their businesses. This change has benefits for the entire financial ecosystem.

The other obvious advantage of using FinTech is cost saving: FinTech can provide services to consumers at a lower overhead cost. In the traditional process of financial services such as consulting business, applying for loans, and buying financial products, the institution typically needed to offer not only a vast amount of tangible cost, including human resources costs, rent of the office and equipment costs, etc. but also a lot of intangible costs. For example, to evaluate the applicant's credit rating, the time cost are necessary, which also means that the associated opportunity costs has to be paid. Thus, the application of FinTech will significantly reduce unexpected costs. The evaluation based on big data is viewed as even more credible after an assessment based on the consumer's past credit rating, financial status, etc. FinTech can effectively reduce the risk of errors. To some extent, FinTech could avoid possible errors and omissions caused by traditional manual methods and minimize unregulated operations.

However, FinTech also brings benefits to financial institutions, and it also brings effective services to consumers. The application of FinTech leads to faster transaction

response, shorter approval processes, and more accurate and comprehensive user data. Customers could quickly access required information without the limitation of time and place. Artificial intelligence customer services can support businesses even with time differences. This characteristic is especially useful in international business. Due to artificial intelligence, following business processes can also be fast-tracked.

1.3 The application of FinTech

1.3.1 Digital Currency and Mobile Payment

Digital currency is a digital alternative to paper money and is a digital payment tool with value characteristics. It does not require an account to transfer property rights, does not require a bank account to be bound when transferring money, and can even realize "double offline payment." Double offline payment is a kind of data transmission technology that does not require the Internet. It can realize the payment of digital money without the need to link the Internet between the remittance and the recipient. Even in remote mountain villages without network signal coverage, transfers can be made. This feature is especially suitable for developing countries and regions where the "digital divide" is severe.

On the other hand, mobile payments rely on the Internet to make payments. Mobile payment refers to using electronic products such as cell phones by mobile clients to make electronic payments. Mobile payment effectively unites the Internet, terminal devices, and financial institutions to form a new payment system. According to the QR code payment report released by Juniper Research, a UK-based market research firm, the world's top five mobile payment software are Alipay, Paypal, WeChat, Google Pay, and UnionPay International. As of December 2021, Alipay had 796 million active users and 357 million daily active users. The support of domestic Chinese users has made it successful in occupying the top spot in the list of payment companies. Mobile payment is not yet a mainstream payment method in European and American markets, mainly because mobile payment has the risk of leaking privacy.

Moreover, Europe and the United States already have a complete set of consumer

systems; the popularity and use of credit cards have a history of 50 years, and the use of credit cards can also clarify the destination of funds to avoid the risk of money laundering. However, due to the covid19 pandemic, some people started to use mobile payment methods to achieve contactless payment. These payment habits were retained after the pandemic's end, and mobile payments may become the trend with time of development.

1.3.2 Blockchain Finance

Blockchain finance is the application of blockchain technology in the financial sector. Blockchain is an underlying technology based on Bitcoin, essentially a decentralized trust mechanism. The security and accuracy of information are achieved by sharing in distributed nodes to maintain a sustainably growing database collectively. Through blockchain, both parties to a transaction can conduct an economic activity without a third-party credit intermediary, thereby reducing the cost of global asset transfers.

Blockchain is an IT technology invented by Satoshi Nakamoto in 2008 as the underlying technology for Bitcoin to handle transactions. Bitcoin was the first and, by far, the most successful application of blockchain technology.

In addition, blockchain features can be applied to the insurance field. The customization of blockchain technology can strengthen the identification of insurance types, provide guarantees for corporate credibility, safeguard customer rights, simplify marketing procedures, reduce marketing cost loss, improve the efficiency of claims settlement, and effectively avoid fraudulent insurance situations.

1.3.3 Digital Inclusive Finance

Digital inclusive finance is the financial service model that serves disadvantaged groups and small, medium, and micro enterprises through digital technology. Through the technology of the Internet, the application of a series of related technologies in the field of finance, such as information processing, data communication, extensive data analysis, and cloud computing through computers, promotes the sharing of information, effectively reduces transaction costs and the threshold of financial services, and expands the scope and coverage of financial services.

In China, for example, there are 60 to 70 million micro and small business owners and merchants, 120 to 150 million low-income wage earners, and 180 to 200 million rural residents, the long-tail market in the mouth of traditional commercial banks. They lack a perfect credit portrait and do not have enough adequate collateral, so if they want to provide financial services, they will undoubtedly need to invest in a colossal workforce, as well as highly complicated information data collection, credit audit, and surrogate purchase management. The single business amount of such customers is negligible for traditional commercial banks. However, the cost is high, and such characteristics lead to commercial banks being almost unwilling to invest costs in ordinary small customers. Fintech that combines an extensive data risk control system solves these user dilemmas.

1.3.4 Artificial intelligence-based financial transactions

Artificial intelligence technology is an innovative, intelligent device that resembles human intelligence. According to a report in the Financial Times on August 1, 2017, JPMorgan Chase & Co. in New York, USA, will use the A.I. robot LOXM to perform trading operations in its global equity algorithm business unit, which is much more efficient than traditional buying and selling methods. According to statistics, at the peak of financial trading in 2000, Goldman Sachs employed 600 traders at its advanced stock trading desk at its U.S. headquarters in New York, mainly responsible for buying and selling stocks for large orders, but in 2017, there were only two stock traders left here.

In addition, A.I. can also bring a better experience to financial institutions and customers through digital financial advisors, customer risk alerts, trade search transparency, contract analysis, predicting customer churn, valuation models, etc.

1.3.5 5G technology-based financial services

Finally, FinTech technology is combined with the latest 5G technology. 5G's low power consumption, high bandwidth, low latency, and fast speed can support the widespread use of big data, ai technology, and cloud computing technology to speed up the process. The references to 5G technology can enhance the various applications mentioned above. Many fields form the effect of more robust information collection

capability, wider data docking, and better identification and control of risks. 5G technology application makes the ability of fintech to drive economic development strengthened.

2. The current state of FinTech development in China

2.1 The necessity of FinTech Research in China

When focusing on the China region, the development of FinTech is more relevant to study. 2018 saw a vibrant FinTech ecosystem in China, making it the largest FinTech investment market in the world. According to Accenture's 2018 report, the total FinTech investment in China grew eightfold to \$25.5 billion, approaching the total global FinTech investment for 2017 (\$26.7 billion). In addition to that, the number of related investment deals more than doubled from 154 in 2017 to 348 in 2018. However, compared to the US market of 1,000 deals, there is still much room for growth.

To a large extent, the rapid growth of FinTech in China is attributed to relatively lax regulatory efforts and significant market demand. For a long time, China's regulators have kept a tight rein on interest rates in China's financial markets. Since July 2013, China's regulators have eliminated the minimum lending rate. This move has contributed to the liberalization of interest rates and has given financial institutions more autonomy in setting lending rates based on market forces. This initiative has energized the growth of FinTech in China, given the massive volume of users of Chinese FinTech institutions. In China, the leading mobile payment providers, Alipay and WeChat, have more than 400 million and 1.1 billion monthly active users, respectively. WeChat, an instant messaging software, has 700 million of the 1.1 billion daily active users accustomed to using WeChat Pay for mobile payments. In the mobile payment area, China is currently in the leading position, with about 47 percent of the population using mobile payments or digital wallets in terms of usage. The second place in this ranking is Norway, where about 42 percent of the population uses mobile payments, a much higher figure than in other European countries. Therefore, studying FinTech in China is representative and necessary for FinTech research.

2.2 The characteristics of FinTech in China

2.2.1 Heterogeneity of regional development

FinTech in China has a more robust development in the East than in the West. China's overall economic development is uneven due to vastly different geographical conditions and population density. Hu Huanyong, a famous Chinese geographer, proposed in 1935 that a line with an inclination of about forty-five degrees should divide China into two parts: the East and the West.

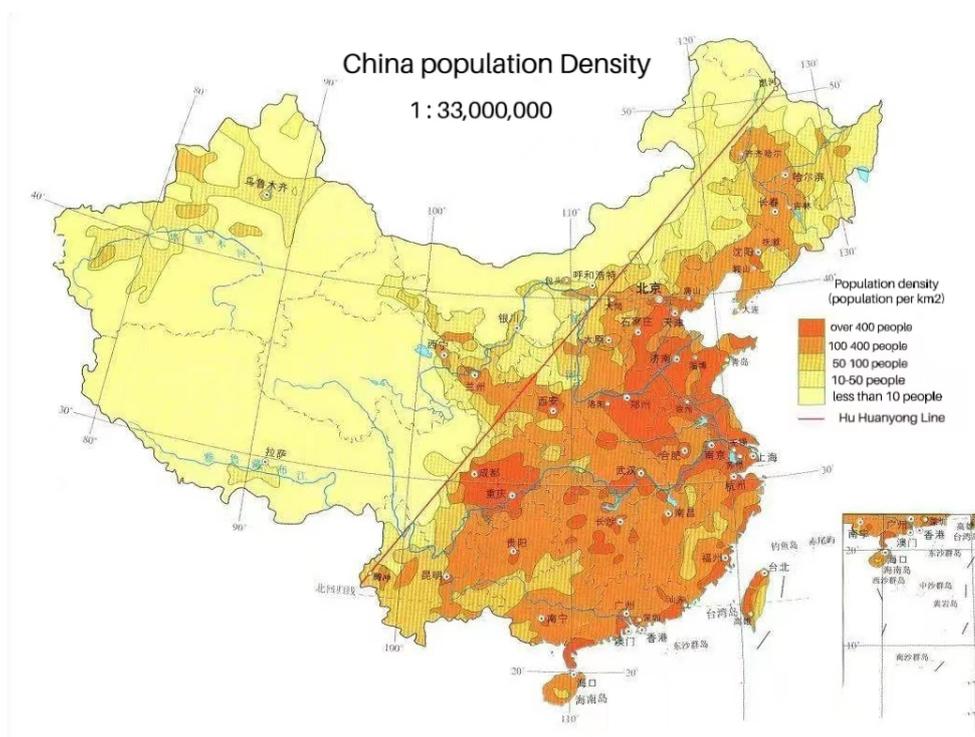


Figure1 China population density(with Hu Huanyong Line)

To the right of this line currently resides approximately 96% of China's population, while to the left resides only 4% of China's population. The Hu Huanyong line has long been seen as the dividing line between China's population and economic and social development. On the other hand, the FinTech industry tends to develop in regions that have already accumulated financial, e-commerce, and data science technologies.

The 2022 Global FinTech Hub Cities report ranked Beijing as the top city for the fourth consecutive year, with San Francisco, New York, London, and Shanghai rounding out the top five. Among the top ten cities, four cities in China made the list,

all located in eastern China.

At the same time, the existence of the digital gap in China is severe. The latest statistics show that 40.4% of China's population does not have Internet access (Internet Society of China, 2019). According to the World Bank World Development Indicators, in 2018, this ratio was 56.2% in South Africa, 65.5% in India, and even higher in poor African countries.

Residents in developed regions have difficulty accessing the Internet and using FinTech products, further contributing to the regional heterogeneity of FinTech development. The KPMG 2022 China FinTech Enterprise Chief Insight Report shows that the Beijing-Tianjin-Hebei Region, Yangtze River Delta, and Guangdong-HongKong-Macao city clusters have a more pronounced industry cluster effect. The cities above are all located east of the Hu Huanyong line. The following chart demonstrated that, although the concentration is slightly lower compared to 2020 and 2021, the top five significant cities still account for around 87% of the number of companies surveyed.

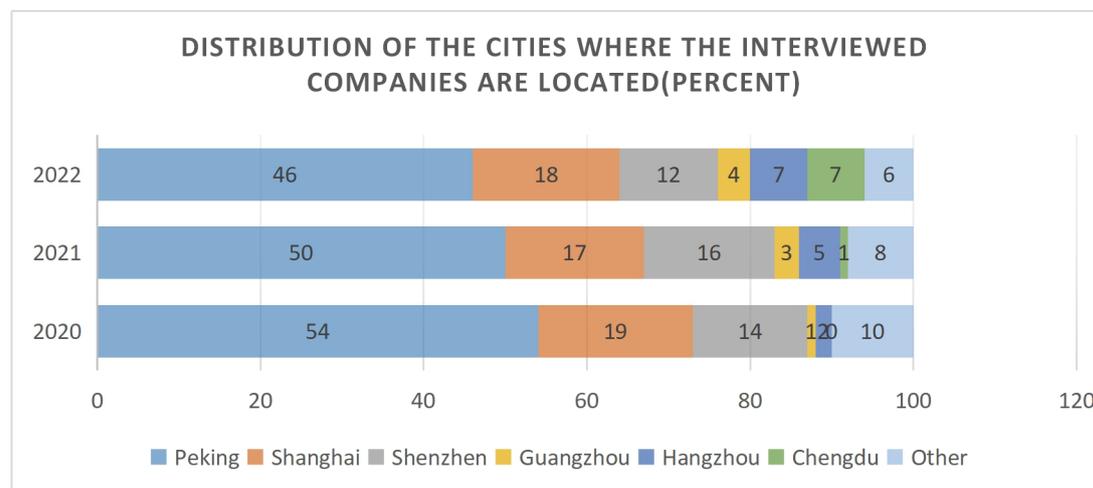


Figure 2 Distribution of the cities where the interviewed companies are located

However, as China develops economically and socially, the economic differences between the East and West will continue to shrink. Some researchers suggested that the number of people living east of the Hu Huanyong line has decreased by 2% over several years. As shown in the chart, with 2010 as the dividing line, the net migration of the population in the middle and western regions begins to decrease, and the population growth in the eastern regions begins to slow down. (Source: Projections

based on 1990, 2000, 2010, and 2020 national censuses and 1995, 2005, 2015, and 2019 national 1% population sample surveys; the projected results correspond to the year-end of each region's demographic data).

This slowdown is due to a reduction in population outflow from the middle and western regions and a return of population that previously flowed out to the East to their hometowns. The reason for population return could be multiple. However, one of the most significant reasons is that the development of the western region has made it more attractive for residents there to stay and live in their hometown or a large city near their hometown. The accelerated urbanization of the western region may also be evidence of the above situation. This phenomenon will further alleviate the barriers to FinTech development caused by the digital gap issue.

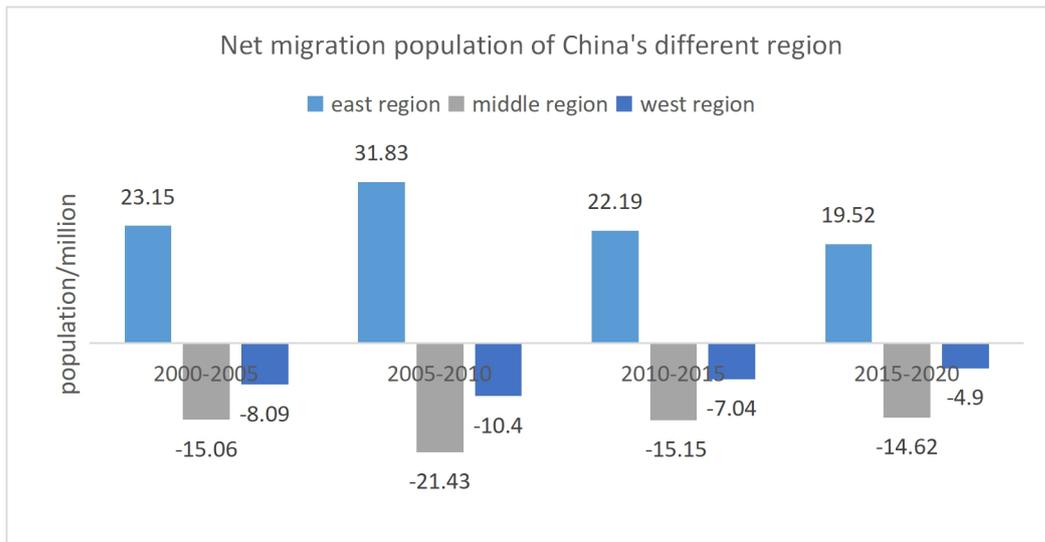


Figure 3 Net migration population of China's different region

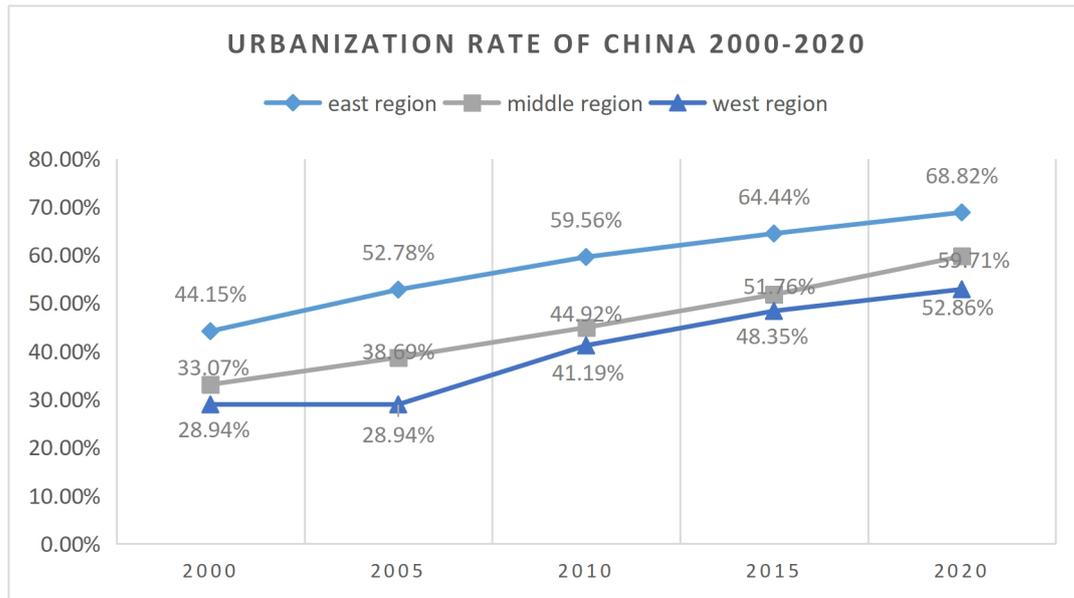


Figure 4 urbanization rate of China 2000-2020

2.2.2 FinTech is concentrated in the hands of a few giants

Second, the fintech space in China is dominated by a handful of unicorns, such as Ant Financial Services Group, Tencent, Baidu, and Jingdong Digital. This characteristic is significantly different from the other area of the world. In North America and Western Europe, the fintech space is swamped by many smaller companies.

High concentration makes the volume of Chinese FinTech companies relatively large. In the "2018 FinTech 100" list of KPMG, China accounted for four of the top 10 companies. According to the statistics of Ariadne Consulting, in 2016, the valuation of 1 billion to 3 billion yuan (USD 145 to USD 434 million) FinTech enterprises accounted for 36%, and the valuation of more than 20 billion yuan (USD 3 billion) FinTech enterprises accounted for 9%; in 2018, the valuation of 1 billion to 3 billion yuan (USD 145 to USD 434 million) FinTech enterprises accounted for 50%, accounting for 14% higher than in 2016, and the valuation of more than 20 billion yuan (USD 2.89 billion) FinTech enterprises accounted for 3% higher than in 2016, with the scale of FinTech enterprises snowballing. According to the graph, only 9% of companies with a valuation more significant than 20 billion yuan in 2016. Until 2018 this figure grew to 12%. On the other hand, companies with a valuation of less than \$3 billion accounted for 66% in 2016, which has fallen by 6% in two years. (Source of figures: Peking University Digital Inclusive Finance Index)

Ant Financial Service Group		China	Oscar Health		America
JD Finance		China	Nubank		Brazil
Grab		Singapore	Robinhood		America
Du Xiaoman Finance		China	Atom bank		United Kingdom
SOFI		America	Lufax Holding Ltd		China

Figure 5 Top 10 Global Financial Companies in 2018(Source: KPMG)

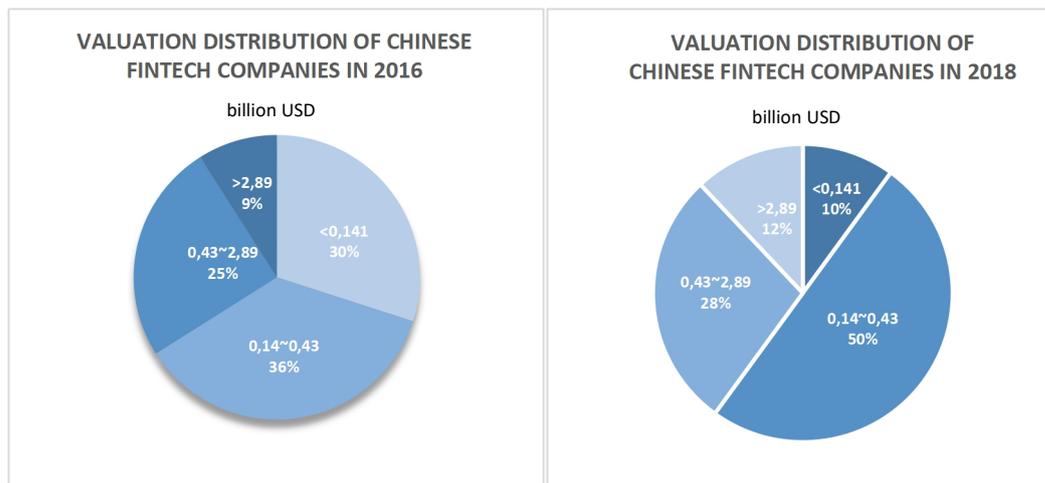


Figure 6 Valuation Distribution of Chinese Fintech Companies in 2016 vs. 2018

(Data source: Peking University Digital Inclusive Finance Index)

2.2.3 Customers are mainly acquired on social networking platforms

The FinTech company in China adopts different methods of customer acquisition. In China, FinTech companies can quickly acquire customers by leveraging large social media platforms such as WeChat and Alipay. In Europe, FinTech companies face more significant challenges in acquiring customers due to the dominance of established financial institutions.

FinTech development in China started around 2000 due to the high management needs of the Chinese financial industry. Services such as e-banking, SMS platforms,

and remote authorization have greatly improved the efficiency of processing documents, emails, and images, advancing the paperless office in the banking industry. However, FinTech still mainly serves the traditional banking industry at this stage. Taking 2010 as the cut-off year, traditional banks and fintech companies lost their edge in the micro-payment sector. This situation is mainly because fintech companies can quickly acquire users on social platforms.

Take, for example, one of China's two largest mobile payment providers: WeChat. It started as an instant messaging software developed by Tencent. Like Whatsapp, it has a complete chat function. However, as WeChat's social properties were further developed, users became accustomed to "sending red envelopes" on the software to enhance their relationships. In order to implement the online transfer function, the payer needs to bind their bank card on WeChat. The recipient must also bind a bank card in WeChat to withdraw the cash in WeChat for use.

The combination of the service and the user habit, which support small transfers (less than € 30 per transaction) and the traditional Chinese holiday custom of "holiday red envelopes," has helped WeChat to build up an initial user base of fintech services at an exponential rate. Unlike in Europe, where traditional financial institutions dominate, FinTech companies face a more significant challenge in acquiring customers quickly.

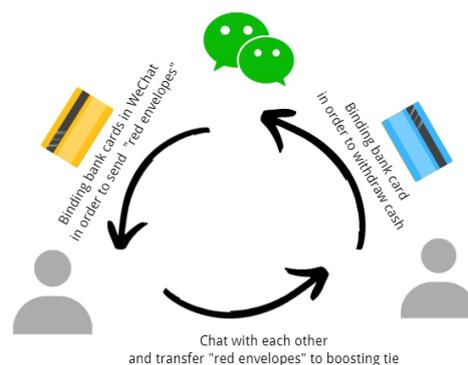


Figure 7 WeChat trading model

2.2.4 Relatively lax regulatory regulations

Through the promotion and development of technologies such as big data in China, technology companies have introduced financial services, including payment, transfer, lending, and other core business of traditional banks. While efficient and high-quality services have impacted traditional banking business, they have also raised many concerns, such as non-reciprocal regulation, data security, financial risk contagion, etc.

The spread of FinTech has enhanced relationships across institutions, regions, and environments, but it can also lead to an increased correlation of risks resulting in cross-contamination. Stephen Meyer, Chairman of the European Securities and Markets Authority (ESMA), said at the Asian Financial Forum 2018 that regulators need to strike a balance. While taking full advantage of the benefits of financial innovation, it is also important to be alert to its risks to financial markets.

The Chinese government needs to prepare for the fast-growing technology finance. According to a KPMG report, more than 40 percent of companies have either launched or plan to launch operations overseas. Southeast Asia, Hong Kong, Macau, and Taiwan are their main destinations. Nevertheless, China and other countries and regions still need to establish cross-border regulatory mechanisms. Europe and the U.S. offer more opportunities for Chinese technology companies to develop overseas markets due to having regulatory policies such as financial data sharing, such as PSD2. However, data privacy in China is vaguely defined, and the Chinese companies facing challenges to data privacy protection may be subject to sanctions from other countries.

According to CB Insights' The State of RegTech, the global RegTech industry raised \$1.3 billion in 2017, with 148 transactions, and is widely distributed in the areas of compliance (59%), anti-fraud (29%) and reporting (12%). According to The RegTech Universe, published by Deloitte in 2017, the UK and the US have 42 and 41 RegTech organizations, respectively, accounting for 25% of the global 54 , but China has yet to have a RegTech organization on the list.

China proposed work on regulatory technology in 2017; the People's Bank of China (PBOC) set up a financial technology committee in 2017, formally proposing to

strengthen the application of regulatory technology, and adopted the "13th Five-Year Plan for the Development of Information Technology in China's Financial Sector" in the same year. In August 2018, the Securities and Futures Commission (SFC) formally released and implemented the Overall Construction Program for Regulatory Technology. Unlike most international countries, China has not adopted a large number of "regulatory sandboxes" to regulate fintech.

Regulatory sandboxes are a proactive approach to regulation. The Financial Conduct Authority (FCA) of the United Kingdom (U.K.) first proposed a global "regulatory sandbox" for fintech in November 2015, aiming to establish a regulatory application framework to provide institutional safeguards for the operation of financial innovation. Specifically, in the process of innovation, fintech companies first need to ensure that consumer rights are effectively protected and meet the FCA's application conditions for the "regulatory sandbox"; then submit an application to the FCA in accordance with the requirements of its specific approval process; and after the fintech company obtains limited authorization from the FCA, it can then apply to the FCA within the scope of application set out by the FCA. Once a fintech firm has obtained a limited authorization from the FCA, it can test within the scope of application specified by the FCA, and the FCA will monitor and evaluate the testing process to determine whether to grant a formal regulatory authorization to the fintech firm. Access to the "sandbox" is determined by the applicant and the duration, and the "sandbox" will be opened in phases and reserved for firms that can demonstrate fintech innovation.

China's regulation of fintech is passive. That is, the regulatory logic of "development first, regulation later". For example, since 2017, China has strengthened the regulation of Internet consumer finance, ICO token issuance, crypto digital currency and other areas.

China often adopts the "pilot reform" model in its regulatory model, and does not adopt the "regulatory sandbox" regulatory model that is commonly applied internationally. Although there are similarities between the "regulatory sandbox" and the "pilot reform" systems, there are significant differences in their regulatory logic. The "Pilot Reform" regulatory model was more traditional, focusing more on

prudential operations and defining business boundaries, while other aspects of regulation and rules were less stringent.

However, according to the New York Times, financial companies from China are losing out on this policy dividend as the country's fintech regulations continue to improve. In April 2021, Alibaba, one of China's largest fintech companies, was fined 18.2 billion yuan (2.8 billion USD) for alleged monopolistic practices. Online taxi giant DDT has also been piped up, with its security practices being investigated by officials shortly after its Wall Street IPO. While Alibaba's punishment could make startups in the space more competitive, said He Zhiguo, who studies Chinese finance at the University of Chicago. But who would bother starting the next Ant Group if running a big tech finance company meant being subject to the same regulations as banks?

In the final risk analysis section of the article, the specific risks facing China's fintech development and the measures the Chinese government has put in place to address them will be discussed in detail. At the same time, the parts of China's fintech regulatory policy that deserve to be improved will also be presented.

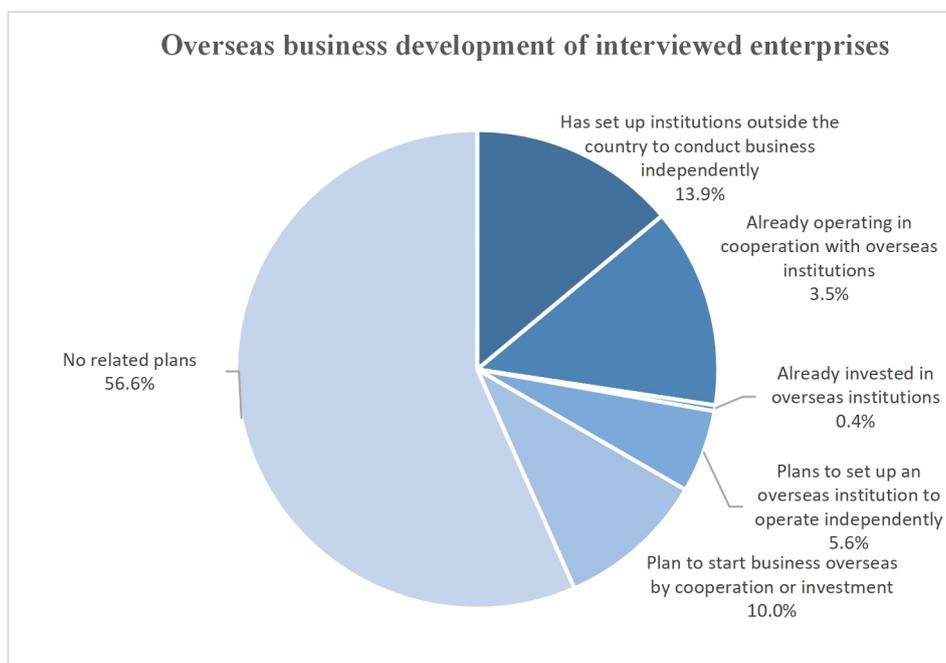


Figure 8 overseas business development of interviewed enterprises

(Source:KPMG)

3. Overall Trends

When determining the overall trends of FinTech development in China, FinTech's development measurement dimensions should be clarified. In this regard, scholars have different views. Macroscopically, the study can be measured by the following four dimensions: access to financial services, depth of financial services, efficiency of financial services, and stability of financial services. However, these dimensions are difficult to measure quantitatively.

Therefore, in this paper, some more detailed and easily measurable indicators are chosen to determine the development dimensions of FinTech. If we define FinTech development from a 'supply-side' perspective, some data dimensions could be considered related to the development of fundamental technologies, FinTech infrastructures, and FinTech providers. They are artificial intelligence patent applications, the scale of financing capital in the blockchain industry, the number of newly registered FinTech companies, the market scale of database systems, the market scale of China's digital economy, and the market scale of the cloud computing industry.

3.1 Artificial intelligence patent application

An essential quantitative indicator reflecting a country's FinTech development is AI patent applications. The higher the number of AI patent applications, the more a country holds the right to speak in the relevant technical field. When applied to the financial sector, these AI patents will help to efficiently detect fraud, implement monitoring of banking transactions, and respond to potentially fraudulent behavior—more accurate verification of user identity, replacing the traditional cumbersome username and password approach. Improving the user service experience, AI can bring 24/7 online service and retrieve answers to customers' questions faster compared to traditional manual customer service. In addition to this, it can also help with user behavior analysis, customize personalized experiences and help with loan approval. The maturity of artificial intelligence technology will, at the same time, drive the development of technology-based finance.

According to the "China Artificial Intelligence Development Report 2018" released by the China Science and Technology Policy Research Center of Tsinghua University, China has become the country with the most extensive AI patent layout globally. The number of patents is slightly ahead of the United States and Japan. Moreover, these three countries' combined number of patents accounts for 74% of global patent disclosures.

Nevertheless, another distinctive feature is that in China, research institutes and universities dominate relative to companies in terms of the number of applications, 52% and 48%, respectively. Regarding single applicants, the world's top three patent-holding companies in AI are IBM, Microsoft, and Samsung. The State Grid Corporation of China came in fourth place. These phenomena indicate that Chinese companies must catch up to domestic universities, research institutions, and companies in other countries in patent filings.

According to the database of Baiten, a Chinese company engaged in intellectual property services, before 2011, the annual growth of patent applications was prolonged. The number of new AI patent applications in the Chinese region showed a trend of increasing numbers and higher growth rates yearly from 2012 to 2021. 2022 saw a slight decline in the number of patents, which may be related to the maturing of AI technology and the slowdown in developing new technologies.

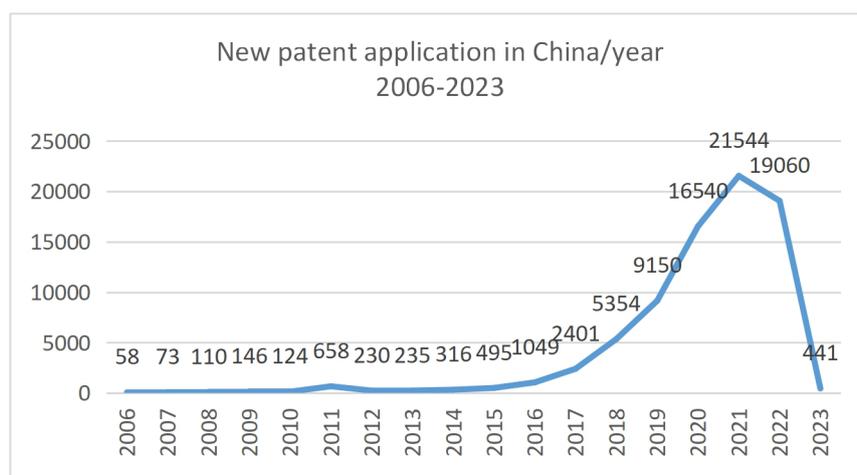


Figure 9 Number of new patent applications in China each year

(Sourcing Baiten database)

When expanding the data to the number of global AI applications, the trend of rising

patent numbers has been going on since at least 2000, and this trend does not change until 2021, while 2022 shows the same decrease in the number of new patents. As we can see from these two graphs, China is a late developer of AI but is developing more rapidly due to its latecomer advantage.

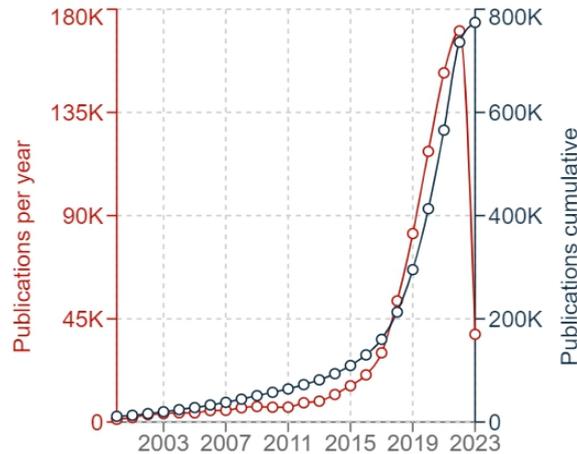


Figure 10 Number of new patent applications worldwide per year

(Source: European Patent Office)

3.2 The scale of financing capital in the block chain industry

Blockchain is also one of the critical areas of focus for FinTech. The combination of blockchain technology and the financial sector can help financial settlements. Blockchain technology's decentralized and tamper-evident nature allows it to replace traditional financial settlement systems. Blockchain technology could also be used in letter of credit management, improving the efficiency and security of letter of credit management. Asset trading is also a promising application; blockchain technology can be used for asset trading, such as trading stocks and bond trading. It can improve the efficiency and security of transactions and reduce transaction costs. Besides blockchain can also be used in insurance, exchange, smart contract, loan, financing, etc. The scale of financing capital in the blockchain industry broadly represents a country's degree of FinTech development.

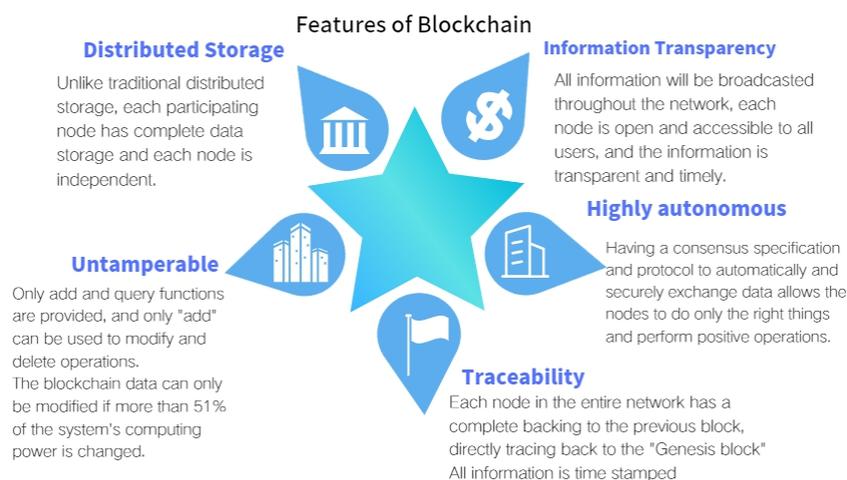


Figure 11 Number of new patent applications worldwide per year

(Source: European Patent Office)

According to the data, 1,786 cumulative global blockchain financing investments occurred in 2021, 93% of which were equity investments, with the rest being token investments, M&A, and IPOs. Divided by the investment area, the Americas had the highest number of blockchain equity financing, accounting for 542. Asia and Europe followed closely behind. These three regions account for over 65% of equity investments in global blockchain investments and financing. In terms of amount, blockchain investments in the Americas region in 2021 amounted to \$128.975 billion, accounting for 56% of the total financing. The second place is Europe, which accounts for 24%, while Asia is half of Europe, 12% of the total.

When focusing attention on the overall investment and financing volume in China, the number of blockchain companies/projects financed from 2016 to 2018 showed a significant upward trend until 2018, when the number of financing peaked at 344. After 2018, the Chinese government launched a series of policies to regulate this field, and the blockchain industry returned to "rationality." Both the number of financing and the number of companies have fallen back. From a peak of 344 funding rounds, the number of funding rounds dropped sharply to 177. This figure did not achieve positive growth until 2021.

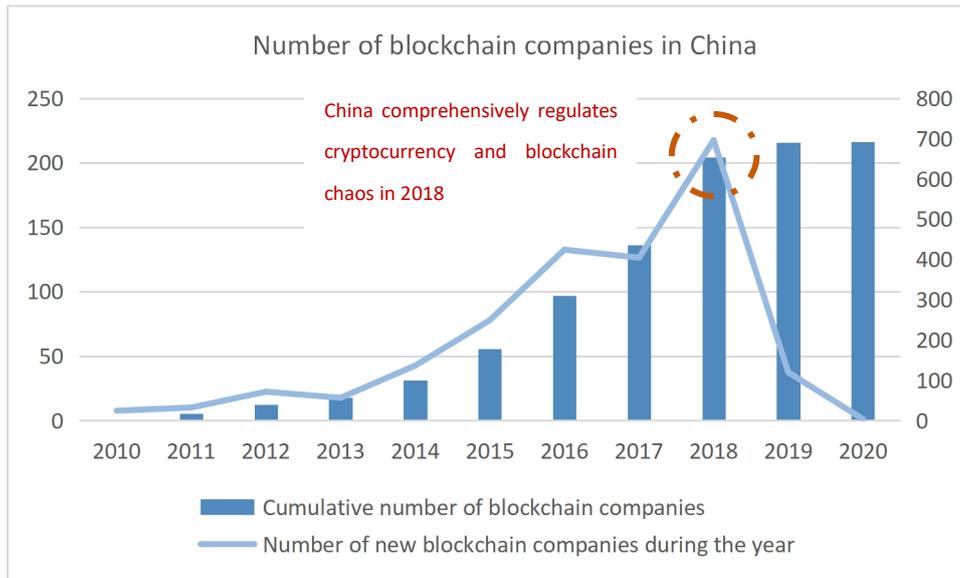


Figure 12 Number of blockchain companies in China

source:(China Academy of Information and Communications Technology, GF Securities Development Research Center)

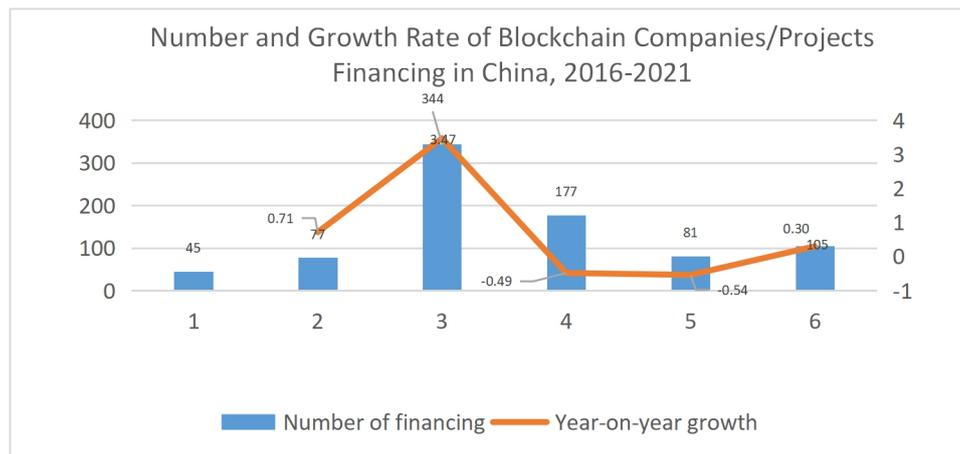


Figure 13 Number and Growth Rate of Blockchain Companies/Projects Financing in China, 2016-2021

Data Source: Observation and Research Report.com "China Blockchain Market Status Deep Analysis and Future Investment Forecast Report (2022-2029)

3.3 The number of new registered FinTech companies

Another critical dimension in assessing the extent of FinTech development is the number of newly registered FinTech companies. In the "2020 IDC Global FinTech 100" list published by IDC, a leading global market research and data firm, U.S. FinTech companies are the strongest performers, accounting for 50 percent of the list, followed by technology companies from the European Union and the United Kingdom. These three regions combined account for approximately 70% of the total

list. Only one company from China, xQuant, made the list, ranking 94th.

When searching for technology finance companies established in 2022 on QCC, China's leading corporate information search platform, the figure stood at 25,896 companies, a 19% increase from 2021. The total number of technology finance companies established in China as of December 31, 2022, is 184,677. This figure is almost ten times higher than in 2014. The most significant number of all FinTech companies are established in the central China region of Shandong Province at about 15.4%, followed by Guangdong Province at 11.7%, Jiangxi Province at 9.0%, Zhejiang Province at 7.6%, Beijing with 5.5% and Shanghai with 4.8%. The above six regions and cities already account for more than 50% of the total number of fintech companies in China. These data show that FinTech in China is highly concentrated, mainly in provinces and cities with large populations and rapid development.

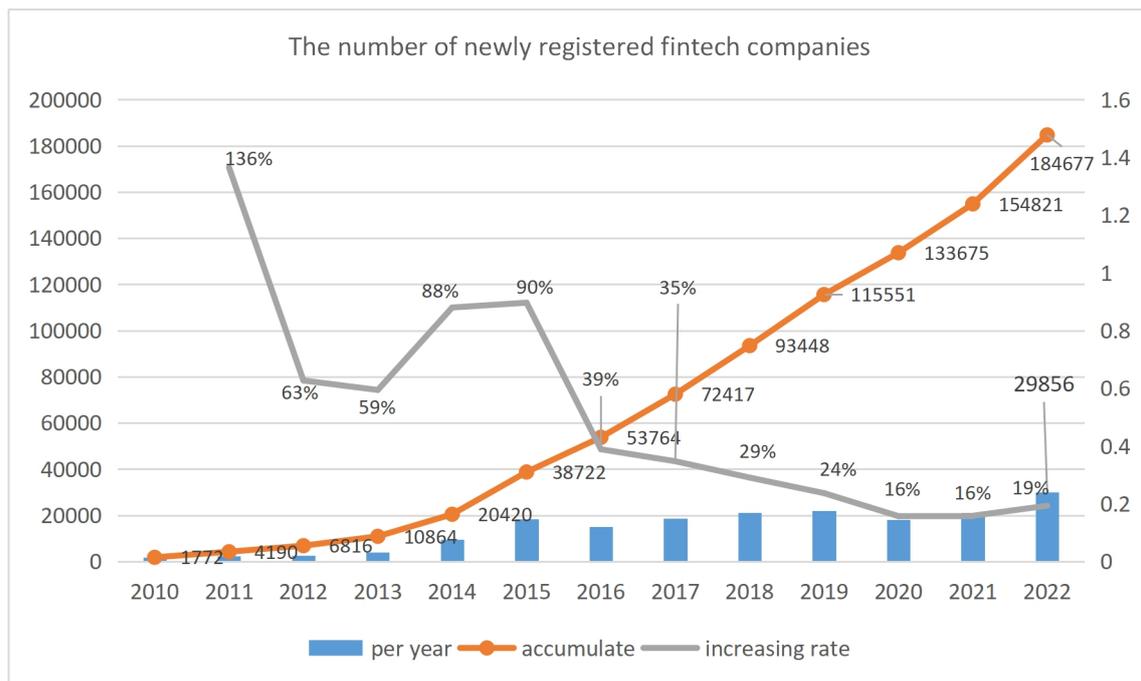


Figure 14 Number of Fintechs in China

(source:QCC database)

3.4 The market scale of database systems

A database is a warehouse that organizes, stores, and manages data according to its data structure. According to the data model, databases can be divided into two

categories: relational and non-relational. Relational databases store structured data in two-dimensional tables, while non-relational databases mainly store semi-structured and unstructured data.

Before 2000, the whole market was monopolized by vendors from other countries; Oracle entered China in 1989, Sybase in 1991, and IBM in 1992. At the same time, DB2 and Informix had already established a stable position in the financial industry market. By 1997, Oracle had also established its leading position in the telecom market. Until around 2000, the productization of databases in China started about 20 years later compared to other countries. At the beginning of the 21st century, due to the support of Chinese national policies such as the 863 program, Nuclear High Foundation, and 937 program plan. Local Chinese vendors were established in cooperation with famous Chinese universities, including NPC Jincang, Wuhan Damon, NTU General, Shenzhou General, and other companies. Until today, local companies in China's database industry do not only rely on universities as background but with the development of the Internet and cloud computing, several cloud vendors and startups have entered the game. For example, Tencent, Ali, Huawei's Ping CAP, Star Ring Technology, and Giant Sequoia Database have entered the game one after another. Regarding data, the global database market size has shown an upward trend since 2018. It has grown from USD 46.1 billion in 2018 to USD 80 billion in 2021, and it is expected that the whole market will exceed USD 1000 by 2024.

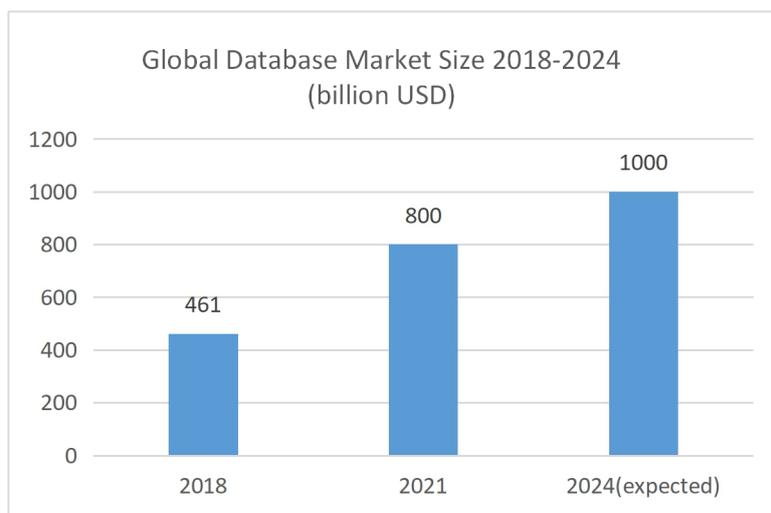


Figure 15 global database market size 2018-2024

Source: Huajing Industry Research Institute

In the Chinese database market the market size of the Chinese database in 2020 was 24.09 billion yuan(USD 3.5 billion). The market size is expected to reach 68.8 billion yuan(USD 10.0 billion) in 2025. Although many local companies are in the Chinese market, they are growing rapidly. Nevertheless, the main competitors of local companies are still well-known multinational companies. Companies such as Microsoft, AWS, Oracle, Google, IBM, etc., have absolute dominance in the global market, and the total market share of these companies accounts for more than 80% in 2021. When companies with enough advantages in the global database field expand their business in China, the experience accumulated in the global market helps them take more market share. According to data from the Huajing Industry Research Institute, multinational companies will hold 48.5% of the market share in the Chinese database market by 2021. The companies that follow closely behind are Huawei and Ali, accounting for 14.7% and 5.7%, respectively.

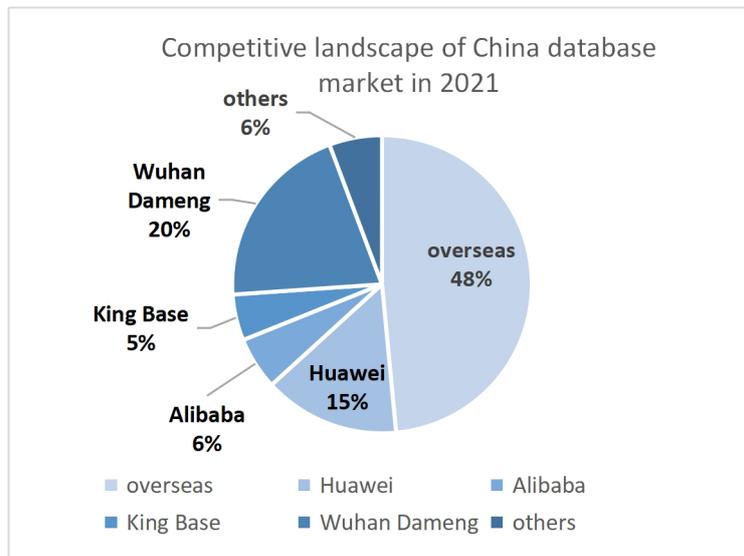


Figure 16 Competitive landscape of China database market in 2021

Source: Huajing Industry Research Institute

It can be inferred from the data above that the development of Chinese databases started late. Although many local enterprises flourish due to policy encouragement, there still needs to be a considerable gap between globalized and well-known enterprises.

3.5 The market scale of China's digital economy

From the economics perspective, the digital economy is a step for human beings to identify, select, filter, store, and use big data, and finally achieve rapid and optimal allocation and regeneration of resources. Finally, it realizes the high-quality development of the economy. According to the "White Paper on China's Digital Economy Development in 2022" released by the China Academy of Information and Communications Technology, how the digital economy can empower high-quality development - a dual domestic and international circular perspective, China's digital economy is the second largest in the world at US\$7.1 trillion. The report also points out that in 2021, the measured digital economy value-added scale of 47 countries is USD 38.1 trillion, with a year-on-year growth of 15.6%, accounting for 45.0% of GDP. Developed countries have a clear lead in the digital economy compared to developing countries. From the data in 2021, the scale of the digital economy in developed countries reaches US\$27.6 trillion, accounting for 72.5% of the total of 47 countries. In terms of percentage, the digital economy of developed countries accounts for 55.7% of GDP, far exceeding the 29.8% level of developing countries. In terms of growth rate, the developing countries digital economy grew by an average of 22.3% year-on-year, higher than the digital economy growth rate of 9.1% in developed countries during the same period. However, Norway has the highest growth rate, with a year-on-year digital economy growth of 34.4%, ranking first globally.

According to the strength of individual countries, the U.S. digital economy is firmly in first place in the world. Not only does it rank first in the global competitiveness of digital enterprises, it also leads to the strength of digital technology research and development. In 2021, the U.S. digital economy reigned as the world's No. 1, with a scale of \$15.3 trillion, and China ranks second with a figure of \$7.1 trillion. In terms of the share of GDP, Germany, the United Kingdom, and the United States' digital economy it has accounted for more than 65% of their GDP.

However, when the single dimension of market size is put aside, there is no single

conclusion on measuring the total development level of a country's digital economy. The European Commission developed a Digital Economy and Society Index (DESI) to mature the development of a country. The DESI is calculated by evaluating 30 secondary indicators in five main areas: broadband access, human capital, Internet adoption, digital technology adoption, and the extent of digital public services. Each secondary indicator has a different weighting, as shown in the table

Level 1 Indicators	Level 2 indicators
Broadband access (25%)	Fixed Broadband, Mobile Broadband, Speed, Affordability
Human Capital / Digital Skills (25%)	Basic skills and application, advanced skills and development
Internet applications (15%)	Content, communication, processing (including online content such as video, music, games, consumption, internet communication, online shopping and online banking)
Integration of digital technology (20%)	Digitization of business, e-commerce
Degree of digital public services (15%)	E-Government

Figure 17 EU Digital Economy and Society Index Indicator System

On August 4, 2022, the European Commission published the results of the Digital Economy and Society Index 2022. The results say Finland, Denmark, the Netherlands, and Sweden remain among the top EU member states. However, in critical areas: the use of county digital technologies such as artificial intelligence and big data is still below 30%, which should have reached 75% by 2030. However, overall, the EU's digitization is on the rise. In particular, Italy, Poland, and Greece have significantly improved their DESI scores over the past five years and are also receiving more financial support from the EU.

On the other hand, China has adopted a different standard in assessing the development of the digital economy. China's National Bureau of Statistics (NBS) released the Statistical Classification of the Digital Economy and its Core Industries in 2021 to define and classify the digital economy. The Digital Economy Classification defines the basic scope of the digital economy and its core industries in

terms of the entire economic and social sectors and the development of digital industrialization, respectively. The scope of digital economy industries is defined as five major categories, 32 medium categories, and 156 subcategories.

Level 1 Indicators	Level 2 indicators
Digital Product Manufacturing	Computer manufacturing, communications and radar equipment manufacturing, digital media equipment manufacturing, intelligent equipment manufacturing, electronic components and equipment manufacturing, other digital product manufacturing
Digital Product Services	Digital products wholesale, digital products retail, digital products leasing, digital products repair other digital products service industry
Digital Application Technology Industry	Software development, telecommunications / radio and television and satellite transmission services, Internet-related services information technology services, other digital technology applications industry
Digital elements drive the industry	Internet platform, Internet wholesale and retail, Internet finance, digital content and media information infrastructure construction, data resources and property rights trading, other digital factors driving the industry
Digital efficiency improvement industry	Smart agriculture, smart manufacturing, smart transportation, smart logistics, digital finance, digital commerce, digital society, digital government, and other digital efficiency improvement industries

Figure 18 China National Bureau of Statistics Digital Economy Statistics Classification (2021)

Since the standard was introduced, China's National Bureau of Statistics has been piloting in four cities - Tianjin, Liaoning, Jiangsu, and Chongqing - and no relevant data or reports have been published.

3.6 The market scale of the cloud computing industry

Cloud computing is a distributed computing method in which a network "cloud" breaks down a large amount of data processing into smaller programs, which are then processed and analyzed by multiple servers, and the results are delivered to users.

As the epidemic's impact wanes, the global cloud computing market has primarily returned to pre-epidemic growth levels by 2021. Data show that the global cloud computing market reached USD 330.7 billion in 2021, up 32.44% year-on-year. Preliminary statistics for 2022 global cloud computing market size is USD 405.3 billion, an increase of 22.6%.

At the same time, China's cloud computing industry is in a booming stage of development, with a market size of USD 65.88 billion in 2022, a growth rate of

33.5%.

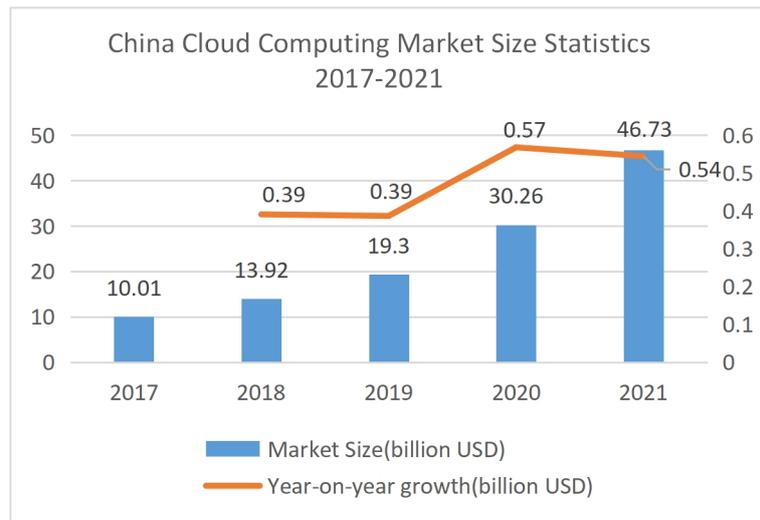


Figure 19 China cloud computing market size statistic 2017-2021

Source: ICT

Further subdivided by service type, cloud computing can be divided into three types: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). IaaS provides users with virtualized computing resources and is a relatively basic approach to cloud computing, with relatively low overall cost and price and lower scale than SaaS and PaaS; PaaS provides a platform for developers to build applications and services over the global Internet. Compared with other services, the advantage of PaaS is that it provides not an application but a service platform on which application developers can develop applications, reducing costs while increasing speed and also allowing more time and energy to innovate applications. SaaS provides users with complete and directly accessible software applications. These applications run on a cloud infrastructure and can be accessed through various client devices.

From the above three market segments, the global SaaS market size in 2022 is USD 181.6 billion, accounting for 44.8%; PaaS market size is USD 109.4 billion, accounting for 27.0%; IaaS market size is USD 114.3 billion, accounting for 28.2%.

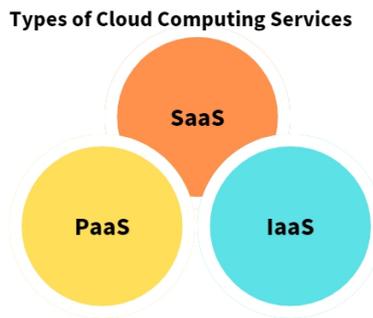


Figure 20 types of cloud computing services

The situation is different in China; according to the data in 2020, the Chinese cloud services market has the largest share of IaaS, about 67%, followed by SaaS and PaaS, accounting for 27% and 6%, respectively. Gartner released the global IaaS market data share in 2021, showing that the top five IaaS vendors in 2021 are Amazon, Microsoft, Ali Cloud, Google Cloud, and Huawei Cloud. Chinese company Ali Cloud has the third largest global market share, with a market share of 9.55%; Huawei Cloud is in fifth place, with a market share of 4.61%.

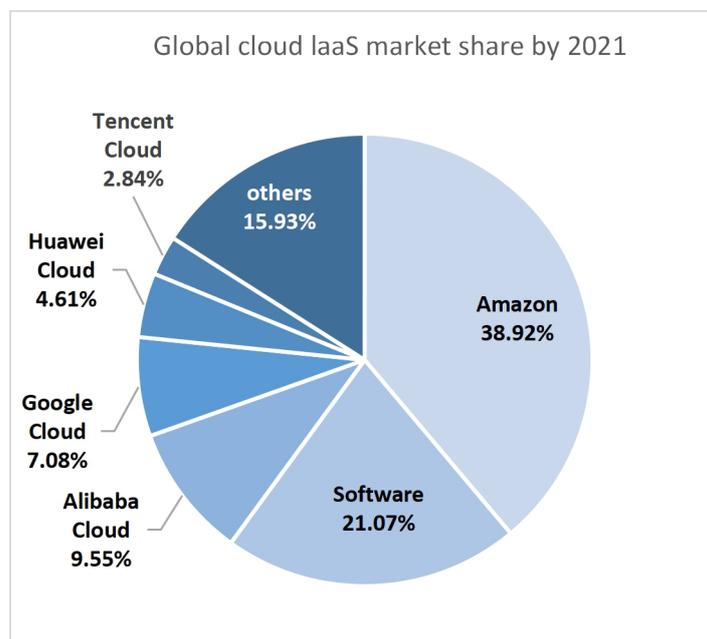


Figure 21 global cloud IaaS market share by 2021

If classified by operating mode, cloud computing can be divided into three types: public, private, and hybrid. Enterprises or organizations mainly use public clouds to serve users outside the enterprise or organization by using external clouds, which can

reduce the cost of building cloud computing facilities. The enterprise or organization usually owns private clouds, and specific cloud service functions are not open to the public. A hybrid application that includes both of these clouds is a hybrid cloud. Hybrid clouds can ensure control over parts such as sensitive data through private clouds while reducing costs through outsourcing.

Before 2007, China's cloud computing was dominated by the public cloud for government services; the private cloud had not yet appeared. In 2009, Ali Cloud announced the establishment of cloud computing into the Internet giant competition stage; Tencent, Kingsoft, and other Internet giants have been involved. 2015, After 2015, the cloud computing industry entered a rapid development phase. Around 2020, China's cloud computing was vigorously promoted. Until now, among many cloud computing products Ali Cloud, Huawei Cloud, Tencent Cloud, and Baidu Smart Cloud occupy 80% of China's cloud computing market, holding a dominant position.

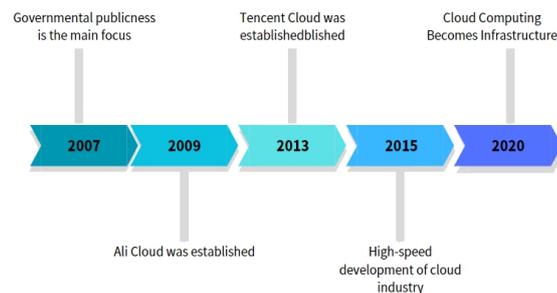
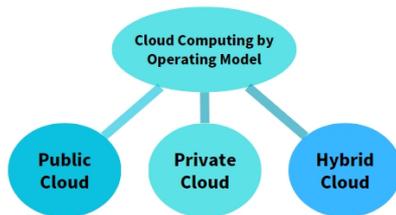


Figure 22 Cloud computing by operating modal

Figure 23 China Cloud Computing Development

The booming cloud computing market is also contributing to the development of financial technology. Thanks to the unique network architecture and resource-sharing capability of cloud computing, commercial banks have effectively reduced the management cost of their unit accounts by using cloud computing. Since the development of traditional commercial banks, the financial products derived from them are often diverse and complicated to manage. Since 2010, commercial banks have changed from a centralized bus architecture to an internet bus architecture, in which cloud computing technology has effectively increased the maintainability of the system, reduced maintenance costs, and improved the collection, integration, and management efficiency of information resources. In 2014, China's first Internet bank,

WeBank, was established by Tencent, and led by other well-known enterprises, with the approval of the China Banking Regulatory Commission. Subsequently, through research and development of cloud computing, big data, blockchain, artificial intelligence, and other financial technologies, WeBank was certified as a national high-tech enterprise. With the backing of Tencent and using cloud computing and other FinTech technologies, WeBank's annual IT operating cost per account is only RMB 3.6, compared to RMB 18 for large Chinese state-owned banks (USD 14 for Citibank and USD 37 for HSBC).

4. Main sources of risk

4.1 Regulatory Risk

For traditional banks, banking regulators will require a certain amount of reserves to be set aside, and there will be restrictions on the direction of credit placement. Since the additional cost of compliance for the global financial industry exceeded USD 100 billion in 2017 alone, a significant amount of financial activity has been shifted to technology companies that are not required to meet the relevant banking regulatory requirements.

However, due to the lack of relevant regulations, FinTech companies can circumvent such regulations at this stage, and this regulatory mismatch magnifies the risk to consumers. Although some countries, such as the United States, are moving to add FinTech as a new financial industry to the traditional regulatory framework, more governments have yet to regulate FinTech adequately.

The "regulatory sandbox" is widely adopted as one of the new regulatory models in the United States. As defined by the Financial Conduct Authority (FCA), a "regulatory sandbox" is a "safe space" in which FinTech companies can test their innovative financial products, services, business models, and marketing approaches without having to be immediately subject to regulatory rules when their activities encounter problems. The U.S. has many financial regulators, not just at the federal level but also at the state level, which has led to a more fully coordinated regulatory

sandbox. The U.S. judicial system and consumer protection system are relatively well developed, and even if the sandbox provides regulatory amnesty, it is not always possible to organize consumers to initiate class action lawsuits against violations of the sandbox experiment, thus hindering the further promotion of regulatory sandboxes. On the one hand, the regulatory sandbox is an essential innovation of regulatory technology in the FinTech era. On the other hand, it acts as a regulatory tool for developing the FinTech innovation industry. This effective regulation, in turn, promotes the development and innovation of FinTech. The relationship diagram is as follows:

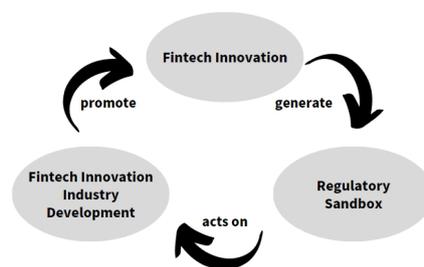


Figure 24 Relationship between FinTech innovation, regulatory sandbox and FinTech innovation industry development

Moreover, China's financial regulation draws on the experience of countries such as the U.S. and Singapore. On August 24, 2020, with the public announcement of the last two pilot regions, the Chengdu and Guangzhou projects, China's FinTech innovation regulation pilot was officially implemented. China's FinTech innovation regulation pilot covers nine pilot regions, including Beijing, Shanghai, Shenzhen, and Chongqing, but the regulatory sandbox has not yet formed a perfect set of management methods.

4.2 Data and privacy risks

Financial institutions and FinTech companies are "blocked" from working together because people focus on concerns about data security and privacy protection risks. Many financial consumers currently face the risk of excessive information collection. Although technology companies inform consumers in advance of a series of app authorization terms, consumers still have difficulty understanding the terms of the exemptions that contain complex terminology. However, consumers still have

difficulty understanding waivers of rights that contain complex terminology. With a limited choice between "all or none," consumers are forced to accept them all.

Traditional banks have been the trusted keeper of data for their customers. Banks usually spend enormous financial and human resources to safeguard data and privacy. However, the lack of legal regulation and supervision of FinTech companies has often raised public questions about collecting, processing and storing personal information. Various breaches are common, and in 2018, it was revealed that as many as 50 million Facebook users' information was "stolen" by a company called "Cambridge Analytica." The company analyzes data and builds models to predict and influence the public's choices in political campaigns. The company has been employed by President Donald Trump's campaign and the "Leave" camp, pushing for a referendum on Britain's departure from the European Union. Facebook's stock price plunged after the news was reported, shrinking its market value by \$37 billion.

The views of top executives of Chinese FinTech companies on privacy breaches are also worth pondering. Also, in 2018, Robin Li, CEO of Baidu, one of China's largest FinTech companies, once said, "Chinese people are more open and relatively less sensitive to privacy issues. If they can trade privacy for convenience, security, or efficiency, in many cases, they are willing to do so. Of course, we have to follow some principles; if the data can benefit the users and they are willing to give it to us, we will use it. I think that is the basic criteria for what we can and cannot do. " His remarks also sparked a lively discussion in the online media about whether users' "privacy for convenience" behavior is voluntary or helpless. The reason for the huge public outcry over Lee's comments is that the FinTech giants have long ignored the core interest of users, "Privacy," and users have minimal choices. It is this unequal relationship that has caused growing concern about FinTech companies.

In response to this concern, on August 25, 2022, the CBRC issued the "Measures for Internal Control Management of Wealth Management Companies," proposing establishing a chief compliance officer system. The chief compliance officer is mainly established in central enterprises, and the general counsel is also the chief compliance officer. The chief compliance officer shall sign the compliance review opinions on

significant decision-making matters and provide explicit opinions on the compliance of the decision-making matters. As early as November 2021, the Standing Committee of the Chinese People's Congress passed the "Law of the People's Republic of China on the Protection of Personal Information," especially in Article 28 of the law, which clearly defines the scope of sensitive personal information. However, the compliance protection of personal privacy information still needs to be improved. The current supervision policy is still mainly based on internal supervision, and there are problems such as unequal rights, unequal responsibilities, and imperfect liability mechanisms.

4.3 the data monopoly risk of FinTech companies

As laws and regulations become stricter on FinTech, FinTech platform giants will face a more stringent external regulatory environment when conducting financial business, leading to higher compliance costs. As a result, many FinTech platforms are experiencing more intense competition. The stifling M&A by FinTech platform giants to limit or even eliminate effective competition from small and medium-sized FinTechs will help FinTech giants eliminate potential competitors and increase market concentration. However, at the same time, it will also hinder technological innovation. When a few FinTech giants dominate the market, these firms can push consumers to agree to "unequal" terms and gain excessive access to user data. When FinTech data monopolies become entrenched, this can lead to data abuse, price discrimination, and other violations of consumer interests. One practical example is "personalized pricing algorithms. FinTechs have studied users' spending habits and re-priced insurance products and credit rates, resulting in consumers not receiving a uniform price. Excessive deprivation of consumer surplus and over-crediting of long-tail users can damage a company's image and offset the positive effects of price discrimination.

In February 2021, the Chinese government promulgated the "Anti-monopoly Guidelines of the Anti-monopoly Committee of the State Council on the Platform Economy," which clarifies the criteria for determining "big data price discrimination" and "abuse of dominant market position to restrict transactions. The guidelines clarify

the criteria for judging "big data price discrimination" and "abuse of dominant market position to restrict trading behavior." It defines the concepts of "market dominance" and "platform-related market." However, now, the mechanism of power collaboration still needs to be improved. There are some overlapping functions between financial regulators and antitrust enforcement agencies.

5.Summary

China's FinTech industry may have started later than other developed countries, but it has made up for lost time by leveraging technology and experience from Europe and the United States. Thanks to the "latecomer effect," Chinese companies have been able to develop at a relatively fast pace, especially after 2010 when FinTech started taking off in China.

One of the reasons for this rapid development is the Chinese government's open and tolerant attitude towards FinTech. However, this has not always been the case, as there have been periods of regulation. Nevertheless, the government's overall stance has been supportive of the industry, which has enabled it to thrive.

Because of China's specific national conditions, the financial technology industry in China exhibits features distinct from those of FinTech in other countries, as well as difficulties, possibilities, and risks that are unique to China. In light of these threats and challenges, the government of China is attempting to follow a strategy for monitoring and resolving them that is analogous to that used in Europe and the United States. However, in terms of the solution, there is a significant amount of potential for development still available. It's possible that this will be a drawn-out process that requires ongoing trial and error in addition to adaptation.

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(Source:KPMG)

Figure 9: Number of new patent applications in China each year
(Sourcing Baiten database)

Figure 10: Number of new patent applications worldwide per year
(Source: European Patent Office)

Figure 11: Number of new patent applications worldwide per year
(Source: European Patent Office)

Figure 12: Number of blockchain companies in China
source:(China Academy of Information and Communications Technology, GF Securities Development Research Center)

Figure 13: Number and Growth Rate of Blockchain Companies/Projects Financing in China, 2016-2021

Data Source: Observation and Research Report.com "China Blockchain Market Status Deep Analysis and Future Investment Forecast Report (2022-2029)

Figure 14 :Number of Fintechs in China
(source:QCC database)

Figure 15: global database market size 2018-2024
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Figure 22: Cloud computing by operating modal

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Figure 24: Relationship between FinTech innovation,
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