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QUO VADIS? A COMPARISON OF THE FINTECH REVOLUTION IN CHINA AND THE WEST

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Quo Vadis? A Comparison of the Fintech Revolution in China and the West

"*Fintech heralds the dawn of narrow banking and portfolio optimization. It will change the nature of money, shake the foundations of central banking and deliver nothing less than a democratic revolution for all who use financial services*."

Mark Carney, Governor of the Bank of England
Mansion House Speech, June 2016

"*If banks don't change, we will change banks*."

Jack Ma. CEO of AliBaba

1. Introduction

Fintech is transforming the global economy and the way we think about our financial future. Since 2010, Fintech has attracted more than USD 50 billion in investments in approximately 2,500 companies. Between 2014 and 2015, global Fintech investment grew from USD 12.2 billion to USD 22.3 billion (Accenture, 2015). After 2015 Fintech IPOs became more commonplace. Currently, there are twenty-seven Fintech "unicorns"[1] including China Rapid Finance, Yirendai, Alibaba, Lending Club and Stripe. As of August 2018, there are 12,131 Fintech startups worldwide (Statista, 2018). By 2023, it is expected that Fintech will account for more than 17% of consumer banking services in North America (or equivalent to USD 203 billion) (Citi, 2016). In 2017, the global Fintech transaction value was USD 3.6 trillion, and with an estimated average growth rate of 18.4% p.a., it is expected to reach USD 8.4 trillion by 2022 (Statista, 2018).

Broadly speaking, the term "Fintech" describes new technologies, services and companies that have changed the financial services industry. "Fintech" was the original name of the Financial Services Technology Consortium, a project initiated by Citicorp in the early 1990s (Arner et al., 2015). The interlinkage of finance and technology has a long history and has evolved over three distinct eras (Arner et al., 2015). The current Fintech industry is not as straightforward to define but it is much more than just an amalgamation of finance and technology.

For the purposes of this paper, we will use the Financial Stability Board (2017a) definition of Fintech:

"*technology-enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on the provision of financial services*."

Table One details the broad categories of Fintech including cryptocurrencies, blockchain,[2] robo-advising, smart contracts, crowdfunding, mobile payments and artificial intelligence platforms.

Table 1 – An Overview of the Fintech Sector

Categories	**Product Areas**	**Examples**
Blockchain	- Cryptocurrencies - Smart Contracts	Coinbase, Bitcoin, Ethereum ChainThat
Analytics	- Artificial Intelligence - Machine Leaning - Deep Learning - Big Data	Kensho Avant Shift Technology
Deposit and Lending	- P2P Marketplaces - Crowdfunding (both investing and lending)	Lending Club, Zopa, SoFi. CreditKarma KickStarter ZestFinance
Payment	- Money Transfer - Online Payment - Mobile Payment	Transferwise Stripe, Adyen M-Pesa, One97
Insurtech	- Insurance	Ping An
Banking Infrastructure	- Self-service banking - Identity and security issues - Open bank (API) - Personal financial management	Rocketbank iDGate FidorOS3 PostFinance, Qontis
Investment Management	- Robo Advising - Social trading - Hybrid Models	WealthFront, Betterment ZuluTraining, Stockwits
RegTech	- Compliance, transaction monitoring	Abide Financial
PropTech	- Real estate	LendInvest, CapitalRise

The financial services industry is clearly ripe for disruption. Fintech's rapid growth can be attributed to more volatile bank performance, higher regulatory constraints (e.g. Basel III) and a lack of confidence and trust in the banking system after the 2008 financial crisis, prolonged low interest rates, an abundance of global capital flows chasing yield,

changing customer expectations, the mass adoption of smartphones and cheaper data processing. Barriers to entry in the financial services industry are being reduced. New currencies (esp. the promise of digital currencies) and credit systems have impacted investment and banking. This has been made possible through the increased use of blockchain, or distributed ledger technology. Artificial intelligence (AI), cloud computing and big data have created an affordable infrastructure to spur Fintech innovation.

Fintech has the potential to reduce information asymmetry and mitigate risk as well as perform maturity transformation and more effectively allocate capital. The unit cost of US financial intermediation has remained at approximately 2% for 130 years (Philippon, 2016). After the 2008 financial crisis, the cost of financial intermediation declined only marginally in Europe and the US (Philippon, 2016; Bazot, 2013). By delivering lower cost transactions, Fintech has the potential to disrupt existing industry boundaries and structures in what Carney (2016) calls an "*Uber moment*"[3]. Carney (2016) also refers to the unbundling of banking services as "*a revolution*" and "*a reformation*" and states that Fintech offers the possibility of "*restoration*" or reinforcing incumbent banks to become more efficient and profitable. Many incumbent Western banks have already partnered with Fintech companies. Fintech also stands to affect monetary policy transmission, which has deep implications for central banks[4].

Fintech has impacted both the developed and developing world. Fintech offers more possibilities for financial inclusion. This is best illustrated by the significant social impact Fintech is making in emerging markets. There are approximately 1.7 billion adults (about 31% of adults) who are "unbanked" (World Bank, 2017). In these countries, cash economies are being supplemented by mobile access to digital funds (for example, M-Pesa and BitCoin Pesa in Kenya).

As banks now adhere to stricter Basel III capital requirements, they may be forced to reduce lending to small and medium sized enterprises (SMEs). The International Finance Corporation (IFC) reports a "funding gap" of more than USD 2 trillion for (SMEs) in emerging markets. Viewed another way, 200 to 245 million SMEs are unbanked or underbanked (IFC, 2013). The World Bank and G20 share a common goal to help SMEs worldwide and Fintech offers a potential resolution to the issue, especially in terms of job creation.

Most research focuses on specific Fintech sectors that appear in Table One. For example, in the area of crowdfunding, researchers examine the geography and incentives of

investor behavior (Lin and Viswanathan, 2015; Dushnitsky et al., 2016; Haddad and Hornuf, 2016; Hildebrand et al., 2016). Dushnitsky et al. (2016) provide an analysis of the European crowdfunding market. There has also been considerable research in P2P lending (Galloway, 2009; Atz and Bhohat, 2015; Agrawal et al., 2011; Agrawal et al., 2013; Morse, 2015; Duarte et al., 2012; Morse, 2015; De Roure et al., 2016; Einav et al., 2016; Serrano-Cinca et al., 2015). Cryptocurrencies and blockchain have been examined by (Nakamoto, 2009; Yermack, 2013; Kelly, 2014). Lee et al. (2015) detail Fintech startup success and Cumming and Schwienbacher (2016) examine venture capitalist investments in global Fintech startups. Haddad and Hornuf (2016) find that Fintech startup formations tend to occur more frequently in countries where the latest technology is readily available, capital markets are well-developed, and people possess more mobile telephone subscriptions.

In the available literature there is a dearth of papers providing cross-country comparisons of Fintech development. In this paper, we propose to fill that gap in the literature. Specifically, we compare the evolution of Fintech in China with three Western markets (US, UK and Sweden). These were chosen since it is where the majority of Fintech investment is being made and they represent very different legal (common versus civil law) and cultural frameworks. The US is chosen because of major Fintech hubs in New York and Silicon Valley. The UK is a leader in payments, marketplace lending and blockchain and is the global leader for Fintech investment in Q1 2018 (KPMG, 2018). This is due to a supportive regulatory regime, effective tax incentives, and London's position as a global financial center. Swedish SMEs are heavily dependent upon banks for funding (World Economic Forum, 2015) and Fintech provides an alternative. Of the Nordic countries, the Stockholm Fintech hub is a flourishing market (Wesley-James et al., 2015). Sweden has the highest degree of electronic payments in the world and is effectively moving to a cashless society.

China and the West are at different stages of Fintech maturity. China has moved well beyond the tipping point and now represents the largest Fintech market in the world[5]. Why is there such a radical difference between Fintech in China and the US and UK? One reason is that China was traditionally not a card-based economy like the US and UK, so the issuance of debit and credit cards was limited. China is a market that has historically been underserved by the traditional banking sector and this is reflected in quite different Fintech models. The Chinese Fintech unicorns focus on customer-oriented business models known as business to customer (B2C). This is different to the European case (including Sweden)

which focuses on business to business (B2B) models. Finally, there is the emergence of a massive middle class with an unprecedented toleration for financial innovation in China and consumers are increasingly more tech savvy.

Currently, digital payments and alternative lending (including P2P lending) are the largest Fintech segments respectively (Statista, 2018). Chinese Fintech dominates three Fintech areas: online (P2P) lending; mobile payments and artificial intelligence. This paper will focus on these three areas in a Chinese context. We link differences in the Chinese and Western Fintech sectors to variations in legal, political and cultural regimes. We describe why the selected Fintech sectors have grown more rapidly in China relative to the West. We also provide an overall assessment of the Fintech regulatory framework in these markets. Finally, we propose to offer a roadmap for future research in light of current challenges.

The paper is set out as follows: Section 2 details the development of the Chinese financial system. Section 3 provides a detailed overview of the four chosen Fintech markets. Peer-to-peer (P2P) lending is the basis of discussion in Section 4, followed by a discussion of Fintech and mobile payments in Section 5. The growing field of artificial intelligence (AI) in finance is discussed in Section 6. Regulatory framework challenges are the focus of Section 7 and Section 8 concludes with directions for future research.

2. Background of Chinese Financial System

After 30 years of a centrally planned economy, Deng Xiaoping announced new major economic reforms in 1978 and the country shifted to a socialist market economy. Starting in 1979, this shift to a manufacturing and export market, resulted in rapid economic growth (approximately 10% per annum) for the next three decades. In 2001, China joined the World Trade Organization, linking it more closely to the global economy.

For at least the last decade China's growth has been truly remarkable. Pistor et al. (2000) argue that both the quality and effectiveness of legal frameworks are necessary for financial development. Yet based on the existing literature on law, financial institutions and growth, China is a remarkable counterexample of what we expect to see. La Porta et al. (1997, 1998) detail large differences in market performance and capitalization across differing legal traditions (civil versus common) and families (English, German, French, Scandinavian). The US and UK represent English common law countries. English common law countries provide the strongest legal protection to both shareholders and creditors (La

Porta et al., 1998, 2000). Additionally, in common law-based markets there are more efficient courts and accounting standards, as well as less corrupt courts.

China's model can be best described as being under the primary stage of socialism whereby the state controls access to capital, influences investment decisions and stock market listings. The model combines state power with capitalist tools (Chen et al., 2016). Historically, individuals have had few alternatives to invest their savings and bank deposit rates in banks have been low and deliberately fixed and controlled by the state. Even though it is low by international standards, Chinese household debt has risen quickly in recent years. Most Chinese household debt is comprised of residential mortgages and credit-card penetration is low. Over time Chinese policymakers have shifted the country's growth model towards consumption in order to reduce reliance on investment and exports. Consumer finance is a natural product to evolve out of such a policy shift. As a consequence, consumer lending has become more important to China's financial system.

China engaged in financial reforms after the 1970s and the regulatory system is frequently referred to as a "patchwork system". What supports the growth of the private sector are alternative financing channels as well as reputational and relationship mechanisms. Chinese private enterprises are often credit-rationed by state banks and are charged higher interest rates. China's state owned enterprises (SOEs) are large relative to global standards and account for two-thirds of China's stock market capitalization in 2014 (Chen et al. (2016)). State monopolies affect only a handful of strategically important industries like banking, energy and telecommunications. Privileged state groups tend to allocate capital in a non-value-maximizing manner with soft external budget constraints. In fact, the goal of the Chinese Communist Party is not solely the maximization of shareholder value (as it is in Anglo-American markets), but also the pursuit of a "harmonious society" (Chen et al., 2016). This doctrine aims at avoiding social unrest from job losses.

The banking sector plays a key role in China's economy where 66% of income in the Chinese banking system comes from traditional financial intermediation (CBRC annual report, 2011). The Chinese banking system is categorized into four levels. The first category contains the three main state-owned policy banks. In the second category are five large commercial banks which were previously state owned but where the Chinese central government is the largest shareholder (Battaglia and Gallo, 2015). The third banking category is based on twelve joint stock commercial banks. The last category is complex given

there are 144 city commercial banks, 212 rural commercial banks, 190 rural cooperative banks, 2265 rural credit cooperatives and one postal savings bank. The majority of these banks are institutionally oriented, leaving retail investors underserved.

Historically, the country's banking system has been dominated by four state-controlled banks, which have provided half of the loans. In 1995, the government owned 99.45% of the top 10 commercial banks in China (compared with 0 in US/UK and 23.2% in Sweden) (La Porta et al., 2002). This has not hindered growth of the Chinese private sector. Yet it was a problem for the top four state owned banks, being the result of poor lending decisions. After 2012, non-performing loans (NPL) continue to be a lingering problem which financial institutions have attempted to solve with an aggressive NPL securitization program (Buchanan, 2015). In fact, with regard to China's shadow banking system there is concern at its alarming growth rate (McMahon, 2018). In 2014, China's shadow banking system was equivalent to 40% of GDP, whereas two years later it was 80% of the country's GDP.

For SOEs that privatized, equity ownership is concentrated narrowly between the state and founder's families. Chen et al (2016) show that Chinese firms rely much more heavily on capital obtained from fellow group members rather than from the external capital markets. After China entered the World Trade Organization in 2001, new loans by SOE banks declined, whilst new loans by "shareholding" banks rose. Allen et al (2005) describe important financing sources: state budget, self-fundraising bank loans and foreign direct investment. Therefore, in China alternative financing channels are important. Allen et al (2005) attribute inefficiencies in the Chinese stock market due to poor and ineffective regulation. They document that Chinese private enterprises are often credit rationed by state banks and face higher interest rates. Added to this are poor disclosure rules, accounting standards and judicial systems.

How does China differ when it comes to Western banking infrastructure? In the Western model banks often have physical branches near customers and ATMS are within easy reach of the population and government institutions have supported their funding and structure. According to 2016 World Development Indicator data, there are 32.7 bank branches per 100,000 adults in the US; 25.1 in the UK; 17.6 in Sweden and 8.8 in China. There is a mismatch between China's physical banking infrastructure and its non-physical telecommunications infrastructure. Based on WDI data, China has exhibited the fastest growth in mobile phone subscriptions during 2007 – 2017. Based on mobile phone

subscriptions per 100 people, China has an annual growth rate of 9.96% p.a.; compared to 4.00% in the US; 1.31% in Sweden and -0.05% in the UK.

China's main financial regulatory bodies are: People's Bank of China (PBOC); China Securities Regulatory Commission (CSRC); China Banking Regulatory Commission (CBRC); China Insurance Regulatory Commission (CIRC) and the Ministry of Industry and Information Technology (MIIT). China has a complex and inefficient retail banking sector which has driven increased customer demand for Fintech alternatives. In the next section we explore the rise of the Chinese Fintech sector.

3. Overview of Fintech Markets

Fintech is democratizing finance by providing more accessible financial services to all kinds of customers. For institutions, the benefits of Fintech include new cross-selling opportunities; better risk-management and reduction in operating costs. For individuals and SMEs, the benefits are better mobility and accessibility; simpler and faster access to credit and a more customer-centric focus.

Four key factors are driving Fintech innovation in the global financial services industry:

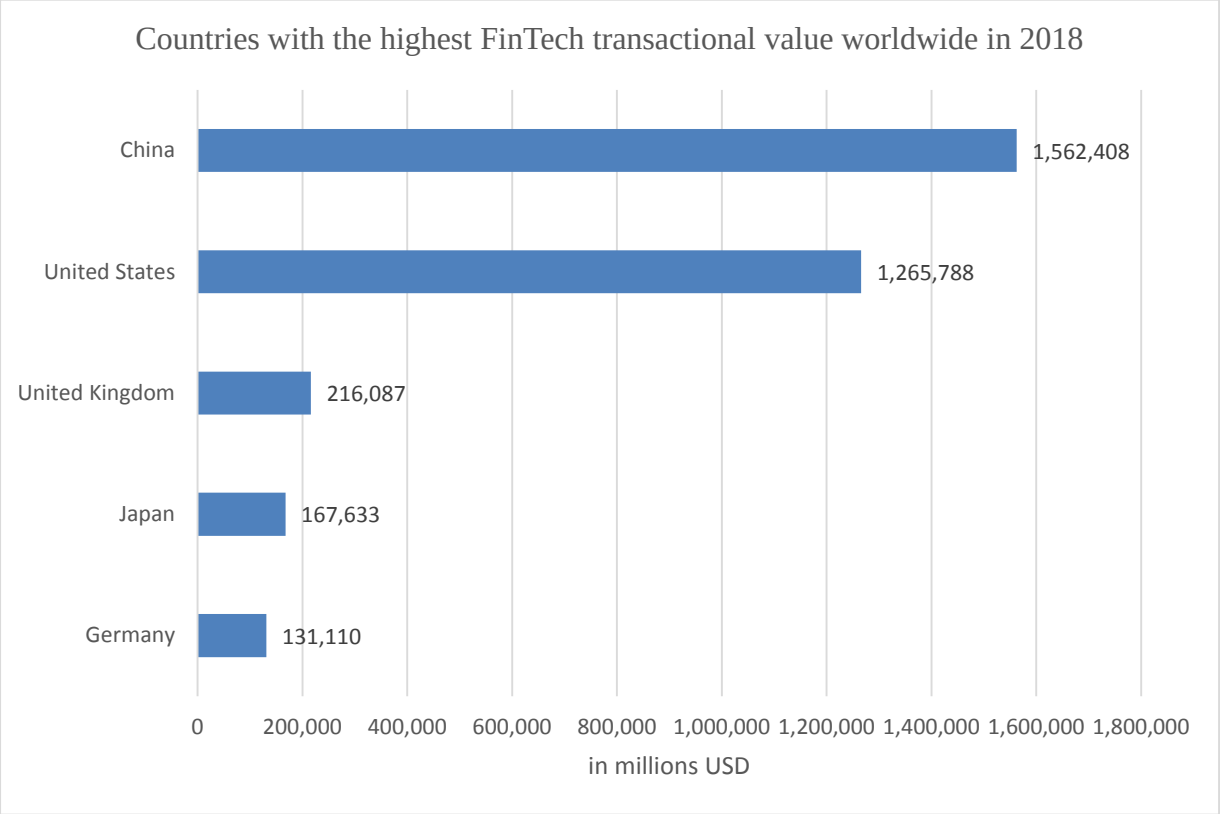
(1) Consumer behavior and expectations in regard to financial services have changed.

(2) Artificial intelligence (AI), cloud computing and big data have created an affordable infrastructure.

(3) New currencies (esp. the promise of digital currencies) and credit systems have impacted investment and banking.

(4) Due to mobile phone and other improved access methods, the barriers to entry in the financial services industry are being reduced.

Figure 1



Source: Statista (2018)

Figure 1 displays the most recent transactional value data for the global Fintech sector. Clearly, China dominates the market, followed by the US and UK. In terms of Fintech adoption rates, an EY (2017) report covers 20 markets. Whilst Fintech adoption is gaining traction around the world (the average adoption is 33%, compared with 16% in 2015), it is doing so at very different rates. The US has an average rate of adoption (33%) compared with the UK (42%) and China (69%). In fact, China is the highest Fintech adopter of the 20 surveyed markets. A key factor to China's success of high adopters is tapping into a tech-savvy, but financially underserved, market. China does not have many of the legacy systems that provide hurdles in the US and UK digital economies.

London has the world's largest financial services sector. With convenient access to global capital, a well-educated workforce, cutting edge digital services, regulatory and government support and demographic diversity, London is the largest European Fintech hub. As a global financial center, London also has effective tax incentives. In 2015, it was host to the largest UK Fintech IPO – Worldpay, and in 2018 is facing another large IPO with

Funding Circle. London's role as a global Fintech hub has been spurred by continued interest from government agencies in supporting innovation. For example, there is the Bank of England's Fintech accelerator program and the Financial Conduct Authority (FCA) Project Catalyst Program. There are also a significant number of challenger banks which compete with traditional banks for market share. Examples include Monzo Bank, Atom Bank, Starling Bank and Tandem. These challenger banks make extensive use of AI and big data and focus on mobile and an excellent customer experience.

The US Fintech sector is concentrated around Silicon Valley and New York City. In the case of New York, Wall Street provides a huge capital base and need for Fintech innovation, as well as a ready supply of technology and engineering talent, Silicon Valley and New York City combine to offer a well-funded ecosystem for Fintech innovators. Both the US and UK already have highly developed retail banking sectors, and, in both countries, there is a wide range of Fintech services (offering all the products listed in Table One). One of the biggest success stories out of this hub is OnDeck, which is a lending platform for small businesses. As of 2017, it has loaned over USD 2 billion to SMEs across 700 industries in the US and Canada. US Fintech is particularly strong in terms of AI and one successful Fintech venture is Betterment. Betterment is an automated investing service, and in 2016 was valued at USD 700 million. Over 120,000 customers have invested more than USD 3 billion with Betterment. However, the major challenge both countries face in growing the Fintech sector is the cost of customer acquisition. Compared with China the value proposition is not as compelling. In the US and the UK there is a process of collaboration (for example, the R3 consortium of major banks) and growth by acquisition to access capital and increase Fintech growth.

Stockholm attracts one-fifth of all Fintech investment and is the second largest Fintech hub in Europe. After Silicon Valley and Beijing, Stockholm is number three in the world and number one in Europe (since 2003) as the birthplace of the world's most successful billion-dollar companies[6]. Currently, there are more than 200 companies registered with the Stockholm Fintech Hub (Wesley-James et al., 2015). Swedish Fintech companies have been leaders in transforming the banking model. Many Swedish Fintech services are basically a development and refinement of existing financial services. It is essentially based on the creation of different solutions intended to make it easier for consumers to manage their private finances, mainly through payment and automated

advice. The payments market is the largest Fintech industry segment in Sweden. In fact, Sweden has not used cheques since the 1980s and from a global perspective the country has one of the highest degrees of electronic payments systems in the world.

Stockholm is also becoming a blockchain and digital currency hub. In July 2016, Sweden became the first western country to explore the use of blockchain in a real estate context. At the same time the Swedish Land Registry partnered with blockchain startup ChromaWay to test how parties to a real estate transaction – the buyer, seller, lender, government – could track the deal's progress on a blockchain. In the last few years a number of crowdfunding services have also been established in Sweden. Crowdfunding services in Stockholm are increasingly popular and are meeting places for investors/lenders and entrepreneurs/borrowers. The exchange of capital is conducted through company ownership or through debt instruments. Fintech asset management has not been as large but is a growing segment within the Stockholm hub.

What attracts Fintech investment to Stockholm is a strong technology infrastructure, a well-educated workforce with strong technological and multilingual skills and an international business mindset. In 2014, "programmer/system developer" was the most common profession in Stockholm. Finansinspektionen (2017) considers two important factors behind the growth in Swedish Fintech to be a stable economy and a well-functioning public sector. The Internet penetration rate among Swedish consumers is also very high (in 2017 it was 95%, Statista) and there is widespread use of smartphones (the 2017 figure is 81%, Statista). Swedish consumers are also very open and receptive to new innovations and technologies. SMEs are heavily dependent upon banks for funding (World Economic Forum, 2015). As banks adhere to stricter Basel III capital requirements Swedish Fintech solutions are a response to that funding gap.

The Swedish payments market was developed for consumer online purchases; simplified payment procedures for small businesses; digitalized administration of receipts; solutions for more secure payments for online purchases; P2P lending platforms; and automated advice on investments. Stockholm is host to high profile Fintechs such as iZettle, Klarna, Tink, Toborrow, Sparlån and Svaelend. Klarna is an e-commerce company that provides payment services for online storefronts and has been one of Europe's fastest growing companies. iZettle provides Fintech solutions for small businesses, including payments, point of sales, funding and partner applications.

The use of digital identification has also encouraged the growth of innovation in the Swedish payment services market. Specifically, NFC (near field communication) technology and root codes (QR codes, Quick Response codes) are aimed to simplify the customer experience in the payments market. Companies like Klarna and iZettle make it possible for businesses to receive card payments during payment transactions. Additionally, aggregation services are proving popular in the Swedish Fintech sector. Currently, consumers are more likely than ever before to use several different banks or credit institutions for their financial service needs. Aggregators obtain information from consumers' bank relationships and then present them in different compilations. A more fragmented overview for the consumer results from a larger number of suppliers of financial services and aggregators can bridge this gap and provide consumers with a single user experience.

3.1 Overview of the Chinese Fintech Sector

China represents the world's largest Fintech market. Shenzhen is considered to be the Chinese equivalent to Silicon Valley and is located in a special economic zone. It is China's leader in patent filings and important in the development of the Internet of Things (IoT). Shenzen's Fintech development has been spurred by rising middle class demand for more products, services and convenience. Shanghai is the traditional Fintech hub in China where there is significant investment in big data, AI and blockchain.

China's Fintech success derives not just from a technological advantage and unprecedented innovation, but also from integrating finance and real-life needs. Since most Chinese consumers have access to financial services through their mobile phone and there are no legacy systems, Fintech has a huge advantage over brick and mortar locations. Fintech has also grown faster in China relative to the West. For example, it took four years for P2P transaction volume to exceed USD 5 billion in the US, whereas it only took two years in China (Wyman, 2017). The Chinese P2P sector grew from one platform in 2007 to 2,136 platforms by July 2015, making it the largest P2P market in the world. Digital banking customers are expected to triple by 2020 and reach 900 million customers. Approximately 432 million Chinese citizens are currently "not banked", meaning they also have no formal credit history by which banks can make risk assessments. The country also has the largest e-commerce system in the world, with over half of the population active on social media. In terms of payment processing, Alipay now handles over one million transactions per day.

Yu'E Bao has attracted approximately USD 94 billion of deposits as a substitute for current accounts and AliFinance has provided SME loans (where a huge funding gap exists) to over 409,000 borrowers.

There are numerous factors contributing to the growth of the Chinese Fintech market. These factors include the scale of unmet needs being addressed by dominant technology leaders; ubiquitous internet and mobile penetration[7]; easy access to capital and accommodative regulations. Underserved by the incumbent banking system, Chinese consumers and SMEs have turned to Fintech for access to payments, credit, investments, insurance, and wealth management products. 40% of consumers in China use new payment methods and 35% of consumers use Fintech to access insurance, or InsurTech. Zhong An Insurance is China's first online insurance company and is located in Shanghai. Tencent and Ant Financial are major shareholders. Zhong An Insurance's most successful product is a low-cost insurance covering the cost of return shipping for unwanted online purchases. Ping An is an insurance, banking and investment group, with a 43% stake in Lufax, the largest P2P lender in China. Rong 360 has 12 million users in 300 cities and provides a 360-degree financial information platform. Financial products can be found from 10,000 banks and users can search for recommendations and application assistance.

New entrants into the Chinese Fintech sector have encountered relatively light banking licenses. The Chinese government has tried different regulations to allow Fintechs to offer more competitive interest rates on deposits compared with traditional banks.

Many Chinese Fintech providers have a well-resourced e-commerce parent company and the market is dominated by Baidu, Alibaba and Tencent (collectively known as the BATs). Unlike its Western rivals, the BATs can sustain more balance sheet intensive and larger scale businesses. The BATs have also expanded through acquisitions outside of China. Tencent was the first Chinese company to reach a USD 500 billion valuation[8], and in 2017 surpassed Facebook in value. Tencent spans gaming, social media and news content, and owns WeChat which has close to 1 billion users and handles over 60 million daily transactions. WeChat offers a range of applications including mobile payments (WeChat Pay). Tencent is gaining prominence in the wealth management area. In September 2017, Tencent acquired a 5% stake in CICC (China's own private investment bank) and launched the country's first online only bank. During the process Tencent collects a lot of data. Tencent has won over many individual investors and left the SOES to be served the banks.

Alibaba has a vast electronic trade platform that incorporates customer-to-customer (C2C), business-to-business (B2B) and business-to-customer (B2C) models. Alipay is an online payment platform that Alibaba developed in 2004. China's weak consumer protection laws, inefficient payment infrastructures helped boost Alipay's rise to the global stage. Alipay also has lower transaction fees (0.6%) compared with US vendors (3%).

Ant Financial is the financial arm of Alibaba and as of May 2018, was valued at USD 150 billion. Headquartered in Hangzhou, Ant Financial targets market segments that are underserved by the large SOE banks. Ant Financial's stated mission is to "*bring the world equal opportunities.*" MYBank was launched in 2015 as a bank "*not for the rich, but for the little guys*."[9] It operates on a "3-1-0" strategy with registration within 3 minutes, approval in 1 minute with zero human intervention. Ant Financial Services Group growth is extremely impressive. In 2016, the company announced a USD 4.5 billion Series B round of financing which makes it the largest private funding round for any Internet company in history. Ant Financial also makes frequent use of artificial intelligence (AI) and data analytics and uses these for scenario analyses to develop software and APPs. This has proved hugely successful for the 11.11 (Singles Day) Global Shopping Festival where Alipay set a global record in 2016. Zhima Credit is part of Ant Financial and aims at developing a complete credit system in China. Ant Credit Pay (which is Ant Financial's credit portal) provides credit lines based on user data on consumption frequency and payment habits. Ant Fortune was launched in 2015 and is aimed at providing a comprehensive wealth management platform that caters to individual consumers with little financial management expertise. Yu'e Bao integrated with Ant Fortune by providing thousands of third-party financial products available through Zhao Cai Bao.

Ant Financial is able to tap huge institutional voids in the Chinese marketplace. For example, gaps where there are no credit scores, large underserved market segments, and areas of grey regulatory control. Ant Financial's competitive advantages have proven to be a massive user base with great potential as well as serving as an incubator for innovative and important financial products. The company also provides a financial cloud technology platform and is a pioneer in digital transformation.

Baidu is the largest search engine provider in China and offers advertising services similar to Google Adword. Baidu is heavily dependent on AI and has a financial services

group which covers consumer finance, wealth management, online banking and insurance. Baidu Wallet is a direct competitor with Alipay.

The credit scoring market is markedly different in China compared with the US and UK. The People's Bank of China (PBOC) maintains credit histories for around 350 million citizens – less than one-third of the adult population. In America, 90% of adults have credit scores. Ant Financial has tried to close this gap by having Alipay users sign up to Sesame Credit which is a credit scoring service that enables those with high credit scores to use hotel, bike and rental services. More than 60% of Ant Credit Pay customers do not own a traditional credit card.

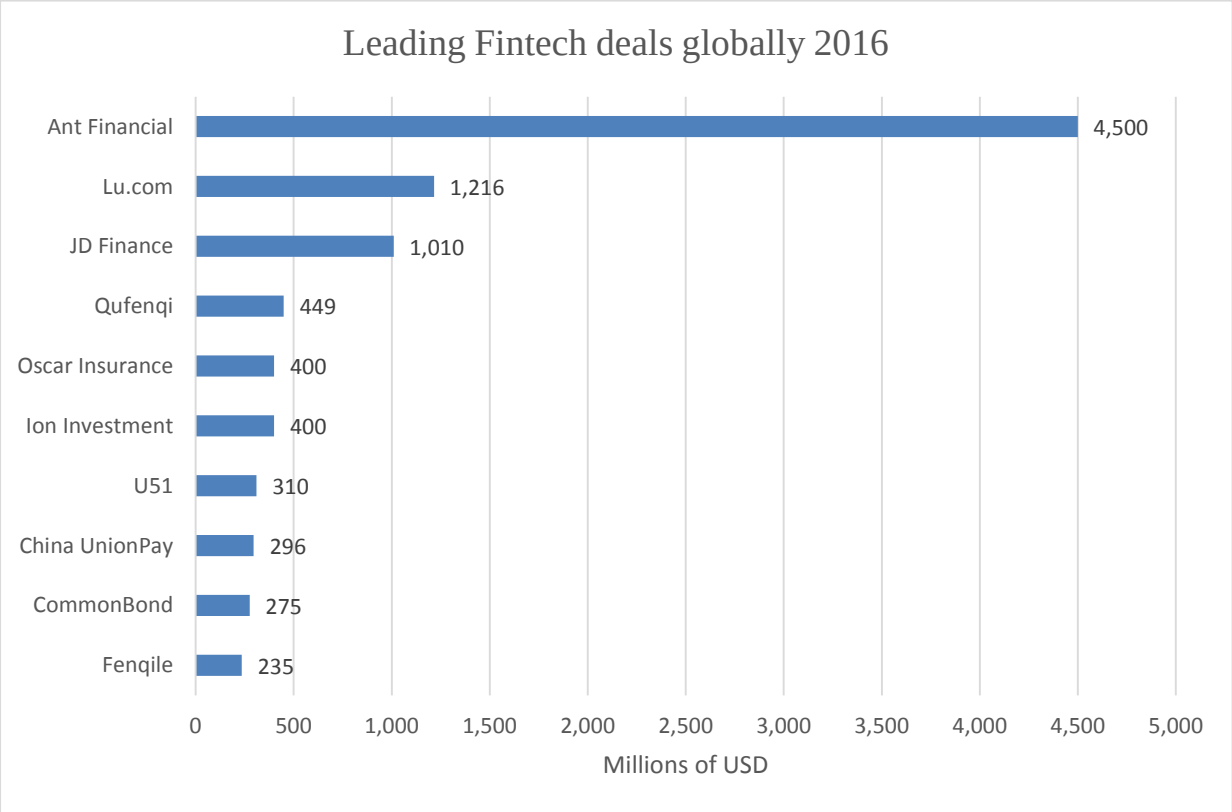
Chinese Fintech companies have applied aggressive marketing, and for retail investors the high visibility implies safety and trustworthiness. The big hurdle that China (and Sweden) had to overcome is how to deal with the matter of trust. In particular, in the C2C e-marketplace, there was a lack of trust between the merchants and customers to facilitate transactional exchanges. Alipay was founded to address the trust issue because it functions as an escrow account. Buyers send money to the escrow accounts and once Alipay receives the money, it notifies the merchants who then make the deliveries. When the customers receive the products, Ailpay then releases the money to the merchants.

Alibaba and Tencent are each valued at over USD 500 billion and have expanded their markets beyond payments into loans, credit scoring and wealth management. Alibaba has the world's largest money market fund (Yu'E Bao, or "leftover treasure"). Before Yu'e Bao, such money market fund companies were already available., but had a minimum investment amount (usually RMB50,000) and were on fixed terms (one month to three years), with a two day withdrawal period. Yu'e Bao addressed this downside and innovated the process through technology, thereby increasing efficiency. For example, instead of leaving money idling in an Alipay account without interest, Alipay users can put their money into Yu'e Bao and earn interest with just a few clicks. There is no minimum investment threshold and customers can withdraw their money anytime.

Figure 2 displays the leading Fintech global deals in 2016. Clearly Chinese Fintech companies dominate. Lufax is a Shanghai P2P lending platform with over 29 million users. It is associated with PingAn Insurance. JD Finance is backed by JD.com and Tencent and is located in Chaoyang. Qufenqi is a Beijing microlender backed by Ant Financial. China

UnionPay deals with bankcard and card payments and Fenquile is an online platform that targets young college educated persons.

Figure 2



In turn, there has been a bank backlash as SOEs look less attractive to clients. Chinese regulators have taken steps in recent years to level the playing field between parties. Appendix One presents a timeline of Fintech milestones in the Chinese marketplace.

4. P2P Lending

In a short period of time P2P lending has become one of the biggest Fintech challengers to the traditional banking and consumer credit markets. In 2005 the public launch of Zopa in the UK established the world's first P2P lending platform. This was followed in 2006 by US P2P platform Lending Club. In 2007, Prosper.com (in the US), Smava (a German P2P lending company) and the first Chinese P2P lender, PPdai.com all launched. RateSetter launched in 2010 as did Funding Circle, which was the world's first P2P platform to fund business loans. Lending Club and Prosper.com now account for 98% of the US P2P

market (Balyuk, 2016). Applications of P2P platforms[10] include commercial mortgages, student debt, insurance and international money transfers. In 2015, 80% of US P2P lending activity was to the consumer sector, with a significant proportion based on student loans. China is now the dominant P2P lending market, accounting for three-quarters of the global market[11]. There is a general shortage of credit in China because banks prefer to lend to big SOEs. In China, P2P lending websites gather funds from the public and lend those funds to individuals or SMEs. There are many companies in China that have switched their core business (such as Panda Fireworks, Inc.) to become P2P lending platforms (Arner and Barberis, 2015). The Chinese P2P market is more diversified than Western P2P markets and is characterized as person to person. On the other hand, for the US and UK P2P wholesale banks tend to be more prevalent.

A P2P platform acts as a broker between borrower and lender[12]. In terms of the lending process, some platforms connect borrowers and lenders directly whilst others use a third party. The P2P platform can (1) broker loan reimbursements through interest free investments; (2) broker the sale of securities backed by their issuers and (3) facilitate the origination of loans which are sold as securities to P2P investors who behave like lenders. US platforms like Prosper require that borrowers hold a bank account. Some platforms may perform a "soft credit check" where a credit report is obtained from an agency like Experian. The credit report will contain information like borrower's credit score, debt level, and the number of accounts in borrower's name, mortgage accounts and payment instalments. Presently, China lacks an equivalent credit scoring market, although Sesame Credit is using big data to fill this gap.

Prosper.com initially implemented an auction model where borrowers posted a maximum interest rate, and lenders were able to make offers at lower rates. In 2010, Prosper.com replaced its auction model with one where interest rates are centrally based on the borrower's credit score (Einav et al. (2015)). Meyer (2015) finds the centralization greatly simplifies the pricing process.

In most Western countries borrower credit scores are usually provided by specialized and independent credit rating agencies. The granular pricing of P2P loans improves information processing. Platforms such as Lending Club and Prosper.Com make their data publicly available. Lending Club uses a proprietary algorithm that assesses the riskiness of each potential borrower and sets interest rates based on his score, adjusting for market

conditions and required risk premium. On the other hand, Chinese P2P lending platforms use their own credit rating system to assess borrowers' creditworthiness (Tao et al., 2017).

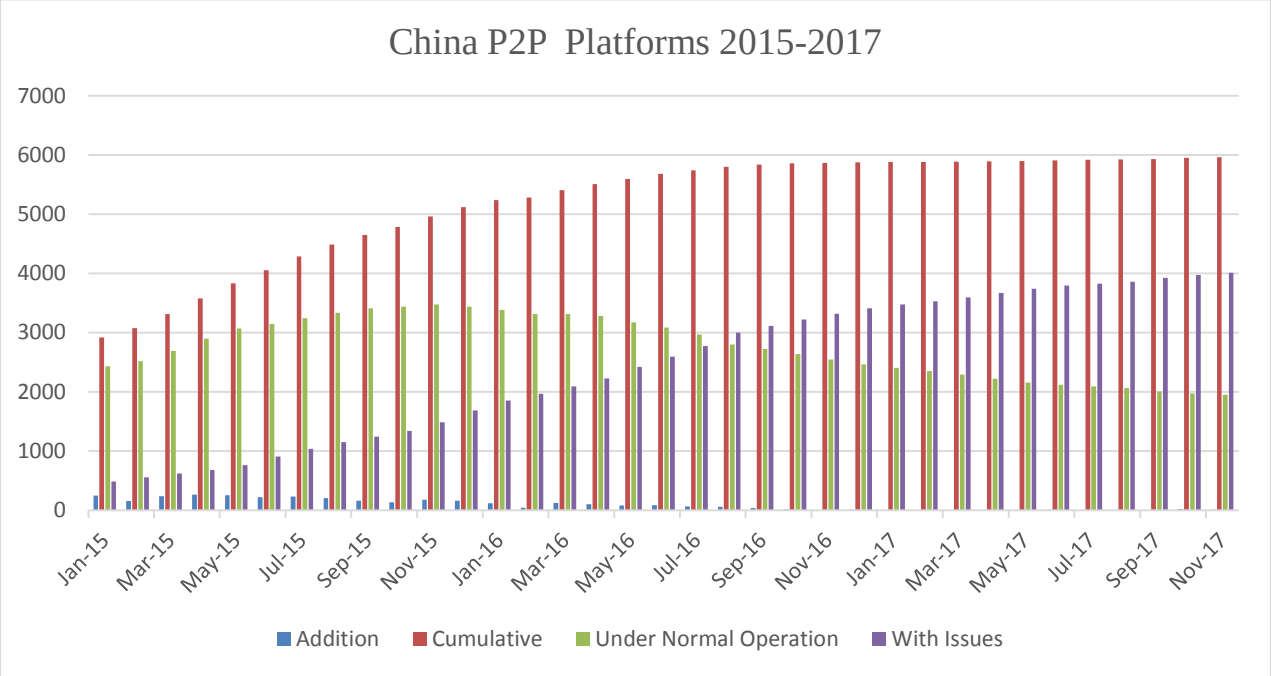
In China, P2P platforms focus on four industry segments: consumer lending, small business lending, auto loans and real estate lending. Products offered by Chinese P2P platforms can include anything from loans for weddings, guaranteed against the cash gifts that couples expect to receive, to high-yield lending for risky property or mining projects.

Many of China's P2P platforms also assume the role of both pledger and debt collector. When PPDai was founded, its business model was very similar to Prosper.com. Another P2P platform RenRenDai, introduced a priority auto bidding tool for investors' optimized wealth plan that would help lenders automatically place a bid. In a very short period, the Chinese P2P lending market has become increasingly more comprehensive. Consider Lufax that launched in 2011. Within two years Lufax had achieved a loan origination amount of RMB 9 billion, whereas it took US Lending Club five years to achieve a similar level of loan originations (Wyman, 2017). Even in 2016 Lending Club's loan volume was still less than 0.5% of the total loans in the US (Citi, 2016). Lufax[13] is considered to be most similar to Prosper.com and Lending Club, connecting individual (not institutional) borrowers and lenders for loans of around USD 10,000. The platform collects 4% in fees from borrowers and investors typically earn between 6 and 8 %[14]. First time Lufax borrowers are interviewed over the phone. Starting in 2012 as a fixed income platform, Lufax now has partnerships with over 520 platforms offering online lending, as well as fund and wealth management services. It operates approximately 100 storefronts in 80 cities in China. In 2015, Lufax announced further expansion and proposed to use new capital to include institutional investors to buy and sell financial assets such as asset backed securities.

Whilst China's P2P market has experienced a meteoric rise, the sector has been ripe for abuse. On a cumulative basis over the past decade there have been 5,962 P2P lending platforms formed and 4,008 platforms with problems such as halted operations, disputes, frozen withdrawals, executives who absconded, business transition, and criminal investigations. In 2012, the Chinese P2P lending market started to accelerate when the number of lending platforms increased to about 200 from about 50 platforms the previous year. In addition, the size of transactions in 2012 was 6.8 times of that in 2011. But events soured in late 2012 with the first P2P scandal. On December 21 2012, Youyi Net, which had operated for only four months, suddenly shut down its business. Its three partners

absconded with about sixty investors' money, leading to RMB 20 million in losses. The largest P2P collapse to date has been Ezubao which collapsed in 2015 where 900,000 investors were defrauded of USD 7.6 billion. In another case, P2P lender Chinatou.com announced it was no longer able to return cash to investors but had pledged to pay investors with baijiu[15] (an alcoholic drink) to "*minimize the loss to investors*". In 2014 Tenfei Wealth Management collapsed with losses of USD 400 million owed to 37,000 investors.[16] Tenfei was founded as a nonbank lender (but rebranded in 2011) and guaranteed loans for business finding it hard to access credit. Its lending rates were 33-40%, compared to 8% at commercial banks. When Tenfei collapsed it was under investigation for illegally soliciting funds form the public and exceeding its business remit.

Figure 3: Number of China P2P Platforms between Jan. 2015 and Nov. 2017



Data source: WDZJ.com

According to Wangdaizhijia (WDZJ) (as shown in Figure 3) the number of P2P lending platforms with normal operations grew slowly in 2015 and started to decrease in 2016 and 2017. As of January 2015, 248 new P2P platforms formed and 485 existing platforms experienced difficulties such as closures, executives who ran-away, business transitions, and criminal investigations. There were 2,433 platforms with normal operations. Between February and December 2015, 2,203 new P2P platforms formed and an additional 1,199

existing platforms experienced difficulties. By December 2015, 3,437 platforms were considered to be operating normally. In 2016, only 756 new P2P platforms formed and a cumulative 1,727 existing platforms experienced troubles. By December 2016, there were 2,466 platforms considered to have normal operations. Between January and November 2017, there were only 85 new P2P platforms established and an additional 597 existing platforms experienced troubles. By November 2017, there are only 1,954 platforms running with normal operations.

Since 2011, a total of 4,008 P2P lending platforms have experienced problems such as halted operations, executives who absconded, business transition, and criminal investigations. Based on 4,008 platforms, 49.2% of the troubled platforms closed their business, liquidated their assets, and partially repaid their outstanding debts; 19.6% of the problem platforms cannot afford interests and principal payments; 29.1% of troubled platforms ended up with managers running away and 0.6% of the platforms are involved with criminal investigations due to fraud, illegal fund-raising, etc. There are 1.5% platforms that experienced business transitions into areas such as off-line wealth management, private equity, consumption financing, etc. Table 2 provides more detail.

Table 2: Types of Operation Problems of China P2P Platforms (2011–2017)

Type of Platform Troubles	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Shut-down	5	2	6	36	418	1127	378	1972
Withdraw Difficulty			65	123	288	168	140	784
Under Criminal Investigation				4	13	5	3	25
Run-away	5	4	6	138	569	387	57	1166
Under Business Transition					2	29	30	61
Total	**10**	**6**	**77**	**301**	**1290**	**1716**	**608**	**4008**
Cumulative		**16**	**93**	**394**	**1684**	**3400**	**4008**	

Data source: WDZJ.com

The Chinese P2P lending market faces multiple challenges due its meteoric growth, the lack of regulations and risk management, as well as severe information asymmetry problems. In 2015, 44% of P2P platforms had managers running away with investors' money. Due to regulations initiated in 2016, Chinese regulators have changed the P2P

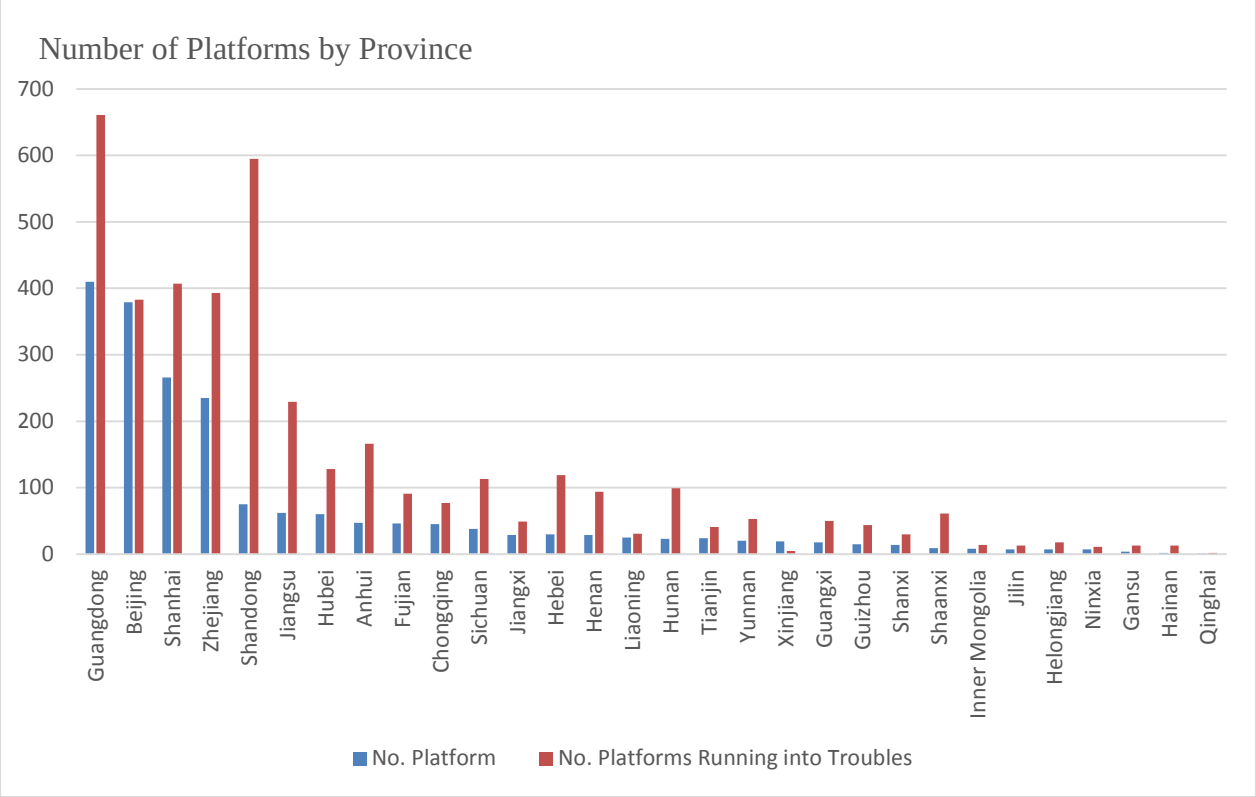
lending market by forcing online lending platforms into more of a matchmaking business, lining up investors with borrowers without providing protection against losses to lure customers. As Table 2 indicates, the number of problem platforms decreased from 1,716 in year 2016 to 608 in year 2017. In addition, in November 2017, China's central bank issued a notice asking provincial governments to stop licensing any new online micro-lenders. The tightened rules for the P2P market should decrease business risks in the P2P lending market, but an unintended consequence could be that it dries up the source of funds and hamper the growth of small business.

P2P platforms initially emerged in the first-tier cities such as Shanghai, Beijing and Shenzhen, followed by the second and third tier cities. The geographic distribution of the platforms is related with the regional economic status of Chinese 31 provinces. By November 2017, there are only 1,954 platforms running normally.

Most of these platforms displayed in Figure 4 are located in the provinces of national top ten GDP per capita. Specifically, nearly 70% of the P2P platforms are in Guangdong, Beijing, Shanghai, Zhejiang, and Shandong, with ten GDP per capita ranking of 8, 2, 3, 5, and 4 respectively. Interestingly, these five provinces also have more cases of problem platforms than other provinces. In fact, over 60% of the platforms running into difficulties are located in these five provinces.

In contrast, the provinces in with bottom GDP per capita ranking have far fewer platforms with normal operations. In Nov. 2017, the number of normal platforms running in Qinghai, Hainan, Gansu, Ningxia, Helongjiang, and Jilin are 1, 2, 4, 7, 7, and 7, respectively; the 2016 total GDP ranking for these provinces is bottom 2, 4, 5, 3, 11, and 10. Moreover, there is about 1.7% of the platforms experiencing trouble are from these six provinces.

Figure 4: Geographic Distribution of Chinese P2P Platforms



Data source: WDZJ.com

Table 3 lists the top ten Chinese provinces experiencing difficulties based on various problems such as closures, withdrawal difficulties, run-away managers, criminal investigations, and business transition, respectively. As indicated in Table 3, provinces with either a top or bottom 2016 GDP per capita ranking tend to be more likely to experience difficulties. For example, among the top ten provinces in terms of the number of withdrawal difficulty platforms, there are Beijing, Shanghai, Jiangsu, and Zhejiang that have the top 2016 GDP per capita rankings (2, 3, 4, and 5, respectively). In addition, on the same list, there are Sichuan and Anhui that have 2016 GDP per capita ranking of 24 and 25 respectively.

P2P trading volume increased dramatically between 2014 and 2017. In January 2014, total P2P lending transactions were approximately RMB 11.8 billion. By the end of July 2017, the P2P lending transactions climbed to RMB 253.7 billion, which is about 21.5 times the January 2014 figure. By the end of November 2017, the P2P lending transactions increased to RMB 227.8 billion (Source: WDZJ.com).

Table 3: Top Ten Provinces with the Most Cases of Problem Platforms Categorized by the Types of Operational Problems

Shut-down			Withdrawal Difficulty			Run-away			Criminal Investigation			Business Transition		
Top 10	**No. of Cases**	**GDP Rank**	**Top 10**	**No. of Cases**	**GDP Rank**	**Top 10**	**No. of Cases**	**GDP Rank**	**Top 10**	**No. of Cases**	**GDP Rank**	**Top 10**	**No. of Cases**	**GDP Rank**
Guangdong	333	8	Shandong	138	9	Shandong	211	9	Guangdong	12	8	Guangdong	12	8
Shandong	242	9	Guangdong	117	8	Guangdong	187	8	Zhejiang	5	5	Beijing	11	2
Beijing	209	2	Zhejiang	117	5	Shanghai	124	3	Beijing	3	2	Shanghai	8	3
Shanghai	207	3	Beijing	67	2	Beijing	93	2	Shanghai	2	3	Zhejiang	4	5
Zhejiang	180	5	Shanghai	66	3	Zhejiang	87	5	Anhui	1	25	Shandong	4	9
Jiangsu	110	4	Jiangsu	60	4	Jiangsu	59	4	Sichuan	1	24	Fujian	4	6
Anhui	73	25	Anhui	47	25	Hebei	45	19	Shanxi	1	28	Hubei	3	11
Hubei	71	11	Hunan	28	16	Anhui	44	25	Others	0	--	Sichuan	2	24
Hebei	63	19	Hubei	22	11	Sichuan	37	24				Hebei	2	19
Henan	54	20	Sichuan	22	24	Hubei	32	11				Hunan	2	16

P2P lending debt outstanding has also increased. In January 2014, the total debt outstanding of P2P lending was approximately RMB 30.8 billion. By the end of November 2017, debt outstanding increased to RMB 1.2 trillion. This is about 39 times more than in January 2014. However, the debt outstanding of P2P lending slowed after 2015 when tighter regulations were implemented. The average monthly growth rate of P2P debt outstanding is 11.7%, 12.1%, 6%, and 3.6% for 2014, 2015, 2016, and 2017 (Source: WDZJ.com). The decrease in P2P lending transactions is partly due to the increasingly tight oversight of the Chinese P2P lending market by Chinese regulatory authorities.

The numbers of the total active P2P lenders and borrowers grew between 2014 and 2017. Up to November 2017, the total active P2P lenders are 4.54 million, which is 26.4 times that in January 2014. Similarly, the total number of P2P borrowers in November 2017 is 5.21 million, whereas there were only 37.7 thousand of P2P borrowers in January 2014. However, the growth in number of P2P borrowers is different from that of P2P lenders. The number of P2P borrowers increased after February 2017 whilst the number of P2P lenders has declined more recently. For example, in 2016 and 2017 the average monthly growth rates of the number of P2P borrowers were 9% and 9.5% respectively. In contrast, the average monthly growth rates of the number of P2P lenders were 3% and 1% for year 2016 and 2017, respectively.

The average debt per P2P borrower has decreased dramatically over time. In 2017, on average individuals borrowed 0.26 million RMB each month; while in November 2017, the average debt amount per borrower in each month dropped to 75 thousand RMB. This most likely reflects the stricter regulations of the Chinese P2P lending market. After 2016, individuals can only borrow up to 200,000 yuan, about USD 30,000, from a single P2P platform and 1 million yuan in total from different P2P lenders.

Lending yield in the Chinese P2P market has decreased over time. The average lending yields were 18.5%, 13.81%, 10.62%, and 9.44% in 2014, 2015, 2016, and 2017, respectively. This suggests that investors have become more cautious when choosing a P2P platform.

Yields, trading volume and maturity data for Chinese P2P platforms are presented in more detail in Appendices to this report. Appendix Two presents the distribution of trading volume by various yields over time. Appendix Three presents the distribution of the number of platforms by various yields over time. Appendix Four describes the distribution of trading

volume by various maturities over time. Appendix Five describes the distribution of the number of platforms by various maturities over time.

Table 4 profiles the Chinese P2P lending market as of November 2017. In November 2017, total P2P lending transactions reached 227.843 billion RMB, with a growth rate of 4.33% relative to the previous month. The growth in trading volume in November 2017 is due to the promotion events such as offering higher lending yields and providing investment bonuses in many platforms in response to Chinese Singles' Day (November 11). By the end of November 2017, cumulative P2P lending transactions achieved 60.09 trillion RMB, an increase of 88.68% relative to November 2016.

Across the 30 provinces/municipalities, P2P platforms in 18 provinces/municipalities experience an increase in trading volumes. The top three provinces/municipalities in terms of P2P lending transaction in November 2017 are Beijing, Guangdong, and Shanghai. However, the Shanghai P2P trading volume in November 2017 decreases by 6.37% relative to the previous month. In contrast, Beijing P2P trading volume increases by 12.83% while Guangdong P2P trading volume remains stable. The trading volume of P2P platforms in 12 provinces/municipalities decreased in November 2017. Among these negative growth regions, P2P platforms in Heilongjiang and Ningxia incurred a dramatic decrease in their trading volume of more than 10%.

By the end of November 2017, the total P2P debt outstanding increases by 2.95% relative to the previous month, reaching about 1.2 trillion RMB. Among the 30 provinces/ municipalities, the P2P debt outstanding in Beijing, Shanghai, and Guangdong exceeds 80% of total national P2P debt outstanding. In Beijing P2P debt outstanding has increased at a faster rate (4.67%) than other regions.

In November 2017, there were 13 new P2P platforms, with eight in Zhejiang and two in Shanghai. The number of platforms operating normally in Guangdong, Beijing, Shanghai, and Zhejiang is 1,290, about 66% of P2P platforms in China. In November 2017, platforms in 23 provinces/ municipalities have no operational problems. The recent problem platforms are mainly located in Shanghai, Guangdong, Zhejiang, Jiangsu and Beijing.

Table 4: Platform Information by Provinces as of November 2017

Province	Transaction		Platforms		Number of Platforms with Troubles	Cumulative Number of Platforms with Troubles	Debt Outstanding (100M)	Lending Yield	Average Maturity (Months)	Number of Lenders (10,000)	Number of Borrowers (10,000)
	Amount (100M RMB)	Monthly Growth Rate	Number	Monthly Growth Rate							
Overall China	2278.43	4%	1954	-1%	42	4008	12007.45	9.49%	9.27	454.1	520.77
Guangdong	532.1	0%	410	-1%	6	660	2196.45	9.47%	5.92	112.08	93.46
Beijing	720.5	13%	379	0%	2	386	4302.52	9.64%	12.92	173.07	159.53
Zhejiang	353.93	4%	235	3%	5	394	1020.13	8.79%	3.12	64.93	51.39
Shanghai	386.68	-6%	266	-3%	9	407	3193.84	9.20%	15.6	66.6	189.36
Jiangsu	38.25	10%	62	-5%	4	229	373.98	8.92%	5.74	5.22	3.13
Shandong	20.02	-4%	75	0%	1	596	110.91	10.02%	5.16	2.75	0.55
Hubei	19.91	11%	60	0%	0	128	109.29	11.87%	7.44	4.72	14.17
Sichuan	88.44	16%	38	0%	0	113	128.52	10.90%	5.39	4.11	3.08
Others	118.6	5%	429	-3%	15	1093	571.81	10.37%	4.77	20.62	6.1

The numbers of active investors and borrowers increased by 5.29% and 16.77% relative to October, reaching 4.541 million and 5.2077 million, respectively. Beijing has the largest number of P2P investors while Shanghai has the highest number of P2P borrowers.

Across the 30 provinces/municipalities, P2P platforms in 10 regions such as Gansu, Qinghai, and Chongqing, provides lending yields lower than the national average of 9.49%. The platforms in Gansu offer the lowest yield of 7.09%. In contrast, platforms in Ningxia, Henan, and Guangxi provide top lending yields of 14.6%, 12.24%, and 12.12%, respectively. Overall, platforms in 19 provinces/municipalities decrease their lending yields. The platforms Hainan, Heilongjiang, and Shanxi decreased their lending yields the most by 119, 33, and 27 basis points, respectively. Relative to October 2017, the average P2P lending maturity the following month 17 increased by 0.42 months to 9.26 months. Platforms in Shanghai and Beijing have longer lending maturities than the national average P2P lending maturity. In contrast, platforms in Xinjiang, Heilongjiang, and Henan have the shortest maturity - less than three months.

By 2015, real estate loans handled by P2P platforms grew much faster than outstanding mortgages held by the country's banks[17]. In 2016, Shanghai Kuailu Investments halted redemptions on wealth management products for 250,000 clients.[18] Most cash was tied up in investments that could not be quickly converted to cash. P2P was one segment of its operations.

In the next subsections, we present mini-cases on problematic P2P platforms.

4.1 Mini-Case: Ezubao (China)

A major casualty of the Chinese P2P market was Ezubao. Ezubao was established in 2014 by Ding Ning to woo investors away from Yucheng International (part of the shadow banking market). Ezubao was a 50 billion yuan (USD 7.6 billion) pyramid scheme that eventually impacted 900,000 investors in less than a two year period[19]. "*Multi-level marketing*" (MLM) is a common practice used by Chinese pyramid schemes whereby a salesperson earns money not just by selling a company's goods but also from commissions on sales made by others, whom the first salesperson has recruited. The company quickly grew to be one of the highest profile P2P lending sites promising investors annual returns of 9% to 15% on products and maturities ranging from 3 months to one year. Ezubao expanded rapidly across China due to sports sponsorship and an aggressive advertising campaign on

Chinese Central Television and high speed rail cars[20]. Even though the Chinese economy slowed, Ezubao continued to pitch its high yield investments. As Chinese investors sought alternatives to the volatile Chinese stock market and slowing real estate market, Ezubao continue to accelerate its growth[21]. However, as a Ponzi scheme, Ning used investor money to pay off previous investors, fund company real estate projects and to fund his lavish lifestyle. Ezubao's risk controller admitted 95% of the P2P lenders projects were falsified schemes. Twenty-one officials were subsequently arrested and the scandal triggered a call for a nationwide "rights protection" movement. The Beijing government also expressed concern that protests could spill over to social unrest.

4.2 Mini-Case: Hongling Capital (China)

Founded in 2009, Hongling Capital experienced a rapid rise due to its many innovative P2P lending practices. Apart from the large loans model, Hongling Capital initiated a tradition of guaranteeing principal and interest on the loans that it made. This practice became more commonplace in the Chinese P2P lending market, but in 2015 the practice was banned by regulators. Due to the implicit bailout Hongling Capital guaranteed its investors (who earned 6.4 billion yuan in investment gains) the platform itself could barely generate any profit.

After 2009, there were few explicit regulatory rules for the Chinese P2P market. In August 2016, China's P2P lending market faced more unified regulation from the China Banking Regulatory Commission (CBRC) and three other government bodies. This was in response to a series of Ponzi schemes and other scams that had plagued the Chinese P2P market. P2P lenders were given 12 months to comply with new regulations, which included capping loan size - a maximum loan size of 1 million yuan (USD 149,000) for individuals and 5 million yuan (USD 743,000) for companies through a single P2P website.

In July 2017, Hongling Capital, formerly the largest P2P platform, announced it would be leaving the online lending business and moving into the mainstream wealth management sector. This announcement essentially ended the "very large loans" model for the Chinese P2P lending market. Hongling Capital's decision was influenced by other factors. As of July 2017, 800 million yuan (USD 118.4 million) had not been repaid by borrowers; handling toxic loans; and a major loan default (50 million yuan) by China Huishan Dairy Holding Company. In addition, switching to smaller transactions raised costs for Hongling since it required

more credit checks. Hongling Capital also had to limit the maturity of loan maturity to less than three years. Hongling Capital's founder, Zhou Shipping was not optimistic about a smaller loan model because the interest rate would be too high for retail borrowers and many P2P lenders had inadequate anti-fraud technologies to maintain their businesses. Its founder and chairman Zhou Shipping acknowledged that "*P2P lending is not what we are good at, neither is it something we see potential in*." It is worth noting that in markets like the US, UK and Sweden, the P2P markets have not been without their own problems.

4.3 Mini-Case: TrustBuddy (Sweden)

In Sweden in 2015, news circulated that TrustBuddy, a prominent P2P lending platform, had commissioned unlawful loans on its platform by transferring existing loans on the platform to new borrowers without informing the initial lenders. Launched in 2009, the TrustBuddy P2P platform originally specialized in payday loans, and expanded into more conventional consumer loans. However, in August 2015 after this transition to a broader focus in consumer lending, TrustBuddy reported significant losses. A newly hired management team uncovered evidence of misconduct. A subsequent internal investigation revealed that the platform owed significantly more to investors than it held in assets. The investigation found that TrustBuddy had been allocating new lender capital to cover bad debts, as well as using capital to make loans to borrowers without assigning the loans to a lender. After the new team at TrustBuddy reported the situation to the Swedish Financial Services Authority TrustBuddy was ordered to cease its operations in October 2015. This left SEK 44 million of the platform users' money traceless.[22] TrustBuddy shares were suspended from trading, and the platform quickly filed for bankruptcy. The direct market reaction to this platform failure was somewhat muted. However, the incident raised further questions about the safety of Fintech lending, and prompted regulatory scrutiny. Since the failure of TrustBuddy, P2P activity has declined in Sweden (FSB, 2017).

4.4 Mini-Case: Lending Club (United States)

Lending Club is the largest US marketplace lending platform. In May 2016, it was announced that Lending Club had repurchased USD USD 22 million of near-prime personal loans previously sold to a single investor. The company stated that the repurchased loans did not conform to the buyer's requirements. An internal review later revealed evidence of

data manipulation on certain noncredit field items. At the same time, Lending Club announced discovery of a previously undisclosed ownership interest of senior executives in a fund designed to invest in marketplace loans. Lending Club's CEO and several executives subsequently resigned after these disclosures. The Lending Club incident prompted increased regulatory and investor scrutiny. This included investors demanding greater transparency in deals and underwriting practices. However, spillover effects to other platforms remained relatively limited.

In 2018, Lending Club faced accusation about fees charged to borrowers. The Federal Trade Commission (FTC) charged Lending Club was falsely promising customers that there would be "no hidden fees" in their loans and glossing over a 5% origination fee that is regularly deducted from lending proceeds. Lending Club was also accused of "stringing consumers along" by telling investors that investors had already backed their loan, when in fact many loans were eventually rejected. The FTC also accused Lending Club of charging consumers who had already cancelled automatic payments or had even paid off their loan entirely. Lending Club shares subsequently dropped 15% to below USD 3 per share for the first time since its IPO.

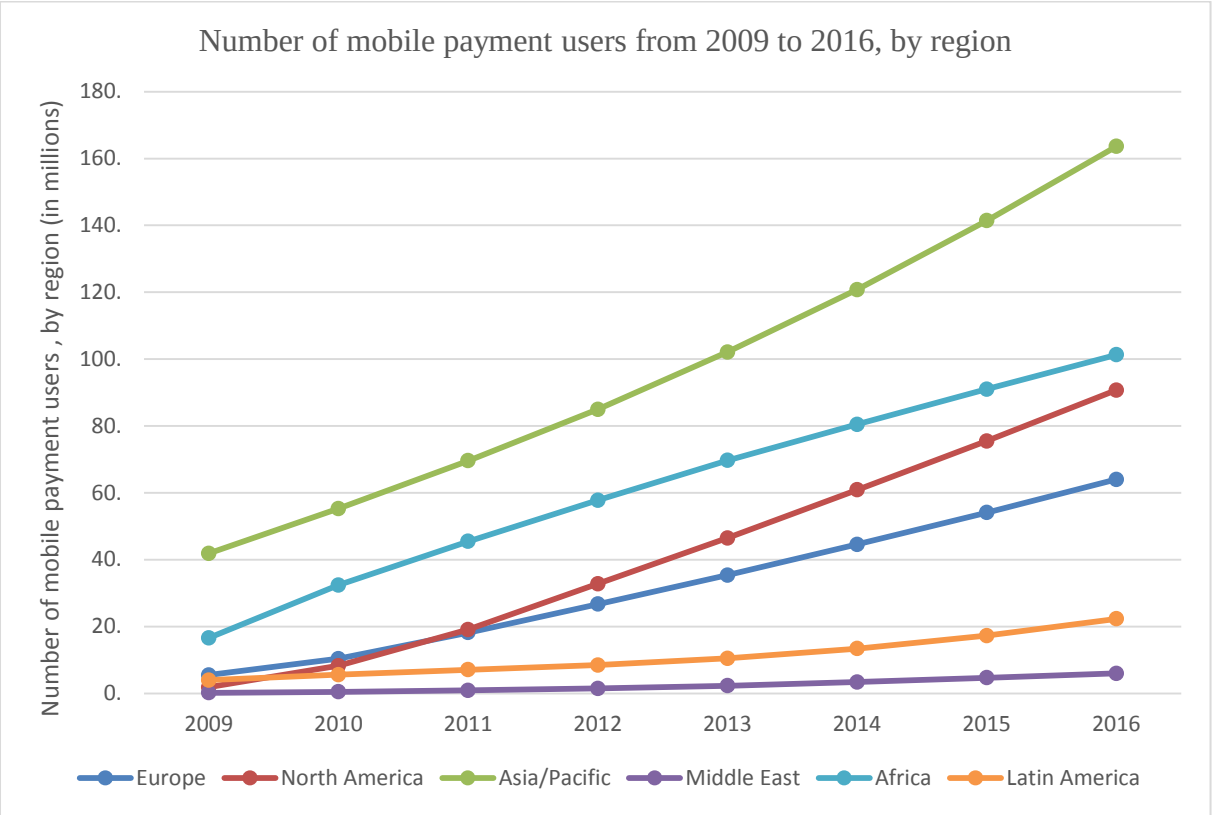
4.5 Mini-Case: Collateral (UK)

A UK P2P lending platform, Collateral launched in 2016. Collateral offered pawnbroker style and property-backed loans to consumers, with returns averaging 15% (Beioley, 2018). The loans were usually backed by assets such as jewelry and watches. It emerged within the last year that some of the loans were too big for the platform given the small investor base. For example, one loan that struggled to sell was a GBP 8.5 million property loan that was divided into 30 tranches. In 2017, the UK FCA demanded more detailed information about the nature of Collateral's defaults. In February 2018, Collateral inserted a clause stating that in the case of insolvency, customers would be ranked as unsecured creditors and would be unlikely to recover their investment. Collateral entered bankruptcy administration in March 2018, after it was disclosed that the P2P lender had been trading without a license, putting GBP 21 million of investor money at risk.

5. Mobile Payments

According to Figure 5, the greatest growth in the number of mobile payment users has been in Asia, followed by Africa then North America. Mobile payments offer a more cost-efficient alternative to traditional bank alternatives. China dominates the global third-party mobile payments market. In 2016, its mobile payments market was worth USD 8.8 trillion compared with the US market of USD 112 billion. This figure reflects the absence of legacy payments like cheque book, credit cards and the arrival of the mobile phone in China.

Figure 5



Source: Statista

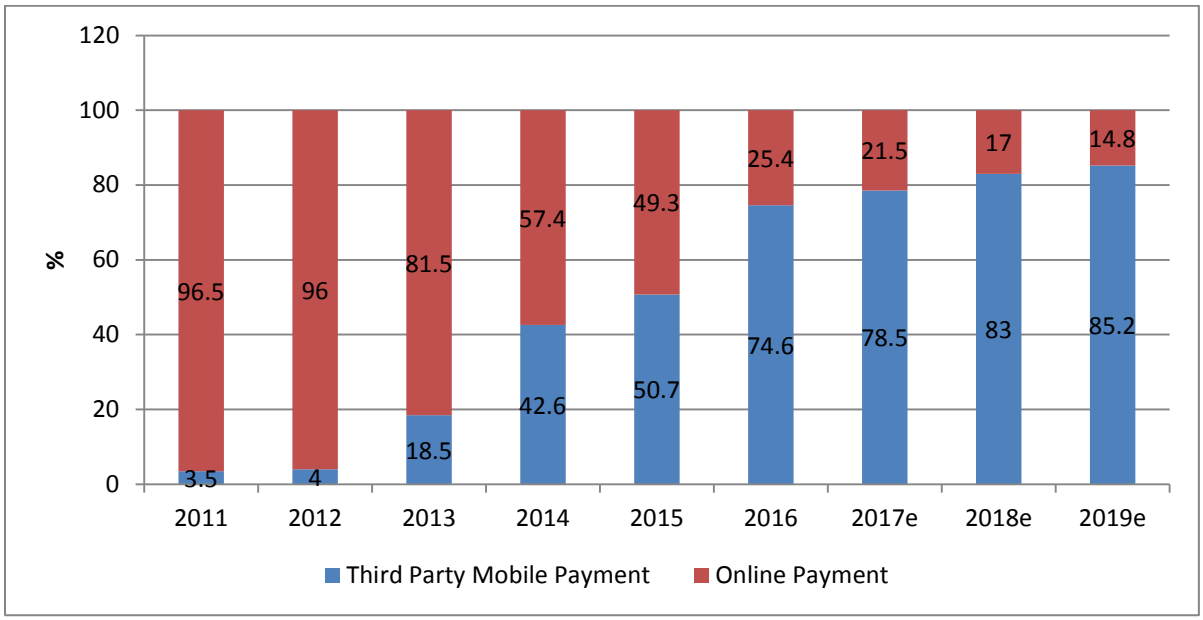
Sweden is experiencing a decrease in the use of cash. Sweden is moving rapidly to becoming the first cashless society with approximately 1% of all payments in 2016 made using coins or notes. More common are digital payments via cards (80% of all transactions are made with cards) and apps[23]. Currently, Swish[24] is the favorite mobile application in Sweden and along with iZettle makes it easier for small business owners to operate cash-

free. The Sveriges Riksbank is investigating the possibility of issuing an electronic payment format – “e-SEK” as an alternative to the use of cash.

In early 2018 the People’s Bank of China announced it was considering a central bank digital currency (CBDC). This move is intended to strengthen the role of the sovereign currency and curb public demand in private cryptocurrencies. Many Chinese cities have become cardless and cashless due to the ubiquity of mobile payment facilities. In a 2017 survey, 26% of respondents carry less than 100 yuan (USD 15); 14% no longer carry cash and 74% admit than can survive for over a month with only 100 yuan in their pockets[25]. The Chinese mobile payments market is the largest in the world. In 2016, China’s mobile payment sector was worth CNY 38 trillion (USD 5.7trillion), which is 50 times larger than the US market (USD 112 billion)[26].

Figure 6 illustrates the shift from online payments to mobile payments in China over the last decade. It is estimated that by 2019 mobile payments in China will account for 85.2% of market share compared with 14.8% for online payments. The growth in mobile payment transaction size has been aggressive over the last decade. The growth was particularly swift after 2012, because the previous year the People’s Bank of China granted third party online payment licenses to Alipay along with 26 other internet finance companies[27]. In 2009 Alipay announced the formal launch of its mobile payment service. Alipay was the first to receive “The Payment Business License” from the People’s Bank of China. 2011 marked a turning point for the company because Alibaba spun the company off into a separate entity.

Figure 6 Market Share of Third-party Mobile Payment vs. Online Payment in China 2011-2019



Alipay dominates the Chinese mobile payments market with a 68.4% market share, followed by WeChatPay (which belongs to Tencent) with 20.6%. Alipay (part of Ant Financial) has become the world's largest mobile payment system and has expanded into 70 countries including the US, UK, Australia and Japan. It processes more transactions than PayPal and is a fierce competitor with ApplePay. Alipay is also recognized at Harrods and Selfridges in the UK.

Prior to the widespread adoption of mobile payment services, UnionPay held the monopoly for payment and clearing in China. The rapid growth of China's third party mobile payment system is attributable to a number of factors. In China mobile cellular phone subscriptions have been growing at a faster rate than the US, UK and Sweden. Second, in China 95% of internet users now go online through mobile equipment. Mobile payments have the advantage of convenience, portability and ease of use. As part of its online to offline (O2O) strategy, Alipay teamed up with over 130,000 offline merchants including taxis, supermarkets, restaurants and bike-sharing to accept mobile payments, resulting in a brisk growth.

Another reason 2011 was a turning point for Alipay was that it launched its smartphone App on both Apple IOS and Google Android platforms. This enriched purchases to be made at restaurants, etc. to promote their platforms. Both Alipay and WeChatPay spend billions of renminbi on subsidies to merchants and customers. Alipay's technology is

also very different to its competitors like SamsungPay and ApplePay who use Near Field Communication (NFC)[28] to carry out mobile payment functions. In contrast, Chinese Fintech companies utilize the Quick Response code (QR) technology. QR codes were first designed in Japan and are a two-dimensional matrix barcode. Transactions can be executed scanning a QR code by using a POS terminal, or between mobile phones or when the customer scans a QR code decal near the counter. The QR code technology is cheaper to use and Alipay APP QR codes are one-off uses. Transfers can be completed immediately. For security, before initiating payment consumers set up a passcode or use biometric information for identity verification. In 2015 during the 11-11 (Singles Days) Global Shopping Festival Alipay had 85,900 transactions per second, breaking the record of 56,000 transactions per second set by VISA.

Finally, mobile payment platforms like Alipay and WeChatPay were able to thrive due to the fact that Chinese banks originally did not take e-payment seriously enough. For a long time Chinese banks have relied mostly on margin interests for revenue, with payment accounting for less than 5% of the revenue[29].

In the next subsection we detail the success of Klarna, Sweden's most successful payments system to date.

5.2 Mini-Case: Klarna (Sweden)

Valued at approximately USD 2 billion, Klarna is a Swedish Fintech unicorn that now operates in 18 countries. Founded in 2005, Klarna disrupted the online payments space by allowing customers to buy and receive goods before paying for them. Prior research had shown the Klarna founders that only one-third of online shoppers finalized their transactions. The number was even lower for mobile users – only 5%. A combination of forgotten card details, password/user name issues and insufficient credit often prevented consumers finalizing their online transactions. At the time Swedish consumers were also reluctant to use their credit card online due to safety concerns. At the heart of the matter was trust. Klarna's value propositions originated around the idea of making consumers feel safer shopping online. Klarna achieved this by acting as a middleman and taking on the full risk for the merchant as well as the consumer of paying and delivering online goods. Klarna pays the merchant, regardless of what happens, and once the consumer receives the goods and is happy with them, the consumer can pay up to 14 days later (Skinner, 2016). Klarna

users do not have to create an account or type in credit card details when checking out in an online store. Instead, consumers only need to enter an email address and zip code to settle the bill while having the option of paying Klarna later, as with a normal credit card. Klarna's success derives from the fact that with each customer, Klarna runs a quick check using its algorithms and data it has built up since 2005 to model customer risk. If the customer is approved, Klarna pays the merchants instantly and bills customers for settlement later. In a typical credit card transaction, there are at least four players involved (Visa/Mastercard technical standards; issuing bank; the acquirer (or online shop) and the gateway). Klarna controls the whole transaction, not just one quarter. What makes the risk modelling easier to accomplish is that with Sweden being a very transparent society, income based upon earnings and income from capital is relatively accessible. Also behavioral data is very important to model consumer risk. Most of the company's revenue comes from its consumer lending business. At the checkout point, Klarna extends credit to selected customers and the company has a low fraud rate of 3.7 basis points (Citi, 2016).

Currently, Klarna has 60 million customers and 70,000 merchants. In 2015, Klarna generated USD 331 million in revenue and now processes 50% of all online purchases (Skinner, 2016). In 2014, the company joined forces with SOFORT to form the Klarna Group, becoming the leading European online payment provider. Klarna Checkout has launched in the UK and is now making inroads into the US.

6. Artificial Intelligence

In the last 60 years the AI field has experienced its share of rises and falls, with a series of two "AI winters". However, the recent trend has been one of rapid growth. In China, Baidu, Didi and Tencent dominate the AI market. According to a Wushen Institute Report (2017), 5,154 AI startups have been established globally during the past five years, representing a 175% increase relative to the previous 12 years. There are two explanations for this impressive growth. First, exponential advances in computing power have led to declining processing and data storage costs and secondly, the immense data availability has increased.

Historically, the US has dominated the AI field. Between 2000 and 2016 there were 3,033 AI startups in US, accounting for 37.41% of the worldwide total (Wushen Institute Report, 2017). However, the proportion has been decreasing, and in 2016 dropped to under

30% for the first time. During the same period, the US received USD 20.7 billion in funding, accounted for 71.78% of the world's total funding (Wushen Institute Report, 2017).

In 2017 China surpassed the US for the first time in terms of AI startup funding (CBInsights, 2018). Last year China accounted for 49% of total global AI funding of USD 15.2 billion, AI equity deals increased 141% relative to the previous year and since 2016 more than 1,100 new AI companies have raised their first round of equity financing. However, the US is losing its global AI equity deal share, decreasing from 77% to 50% of equity deal share during the last five years (CBInsights).

In terms of AI growth, China is leading the Asian market. Many Chinese cities and provinces dominate other Asian market share. In terms of the number of AI companies, there are 1,387 in Beijing, 792 in Guangdong and Shanghai in 154 compared with 57 in Singapore and 283 in India (Wushen Institute, 2017). Beijing has attracted USD 1.387 billion in AI funding, followed by Guangdong (USD 792 million) and Shanghai (USD 154 million), the total exceeding that of Japan (USD 436.81 million). Beijing's AI current funding is also higher than the UK (USD 1.25 billion) (Wushen Institute Report, 2017). Within China growth has been swift in the last three years and Beijing accounts for the majority of AI funding (50.23%), followed by Guangdong (28.68%) and Shanghai (5.57%) respectively.

China has overtaken the US for the number of AI patents over the last five years. Between 2012 and 2016 the compound growth rate of AI patents was 33.2% p.a. Currently the US and China hold over 50% of all AI patents (35,508 in US and 34,345 in China) but they are being filed at a faster pace in China. The US owns 32% of ML patents and 26% of natural language processing patents around the globe. In these same areas, China comes second with 23% and 14% of patents respectively[30]. Currently China dominates the machine vision patent category (55% of 150,000 patents globally). Machine vision refers to object and facial recognition and is useful in public security, healthcare, e-commerce and autonomous driving. Two Chinese companies – Face# and SenseTime are valued as "unicorns". For machine learning (ML) related patent publications the gap is closing between China and the US. Additionally, cross border investment is on the rise, but not in an equal manner. There are more Chinese investments in AI startups in the US, than vice-versa. In fact, the gap between the two widened after 2015.

So what explains the increasing dominance of China in the AI area? First, there is the matter of scale. Many ML techniques require vast amounts of data. There is a huge supply

of data. For example, China's online population (730 million) is almost twice the size of the US. For example, WeChat has over a billion users. Secondly, there are two prominent technologies fueling the drive, namely facial recognition and AI chips."[31] Both the US and China compete heavily in AI chip technology. Baidu and JD.com invest heavily in AI both domestically and abroad.

Chinese companies like Tencent, Baidu and JD.com are Fintech leaders in the Chinese market in terms of market capitalization and number of users. All three companies are investing heavily in AI. Last year, Alibaba heavily used AI to generate 400 million customized banner advertisements in the month leading up to Singles Day (November 11). During the presale period it used chatbots to answer 3.5 million simple queries a day over the presale period, such as "*Where's my package*?" [32]

Chinese and American big tech firms differ in terms of their AI focus. Microsoft, Google and IBM focus on ML, speech recognition and speech synthesis whereas Tencent, Alibaba and Baidu focus on image recognition and AI searching[33]. Chinese company Cambricon is developing chips for deep learning. Ant Financial uses facial recognition for payments at Alibaba owned retail stores. In 2016, Ant Financial, Foxconn and the city of Hangzhou partnered for the "*City Brain*" project using AI data from social feeds and surveillance cameras. Additionally, 55 cities participate in the "sharp eyes" project whose surveillance data may end up powering the nation's Social Credit System, a measure to gauge "trustworthiness" (CBInsights, 2018). One of the poorest provinces in the country, Guizhou is known as China's "big data hub".

Chinese local governments are offering financial incentives to encourage AI related innovations. Baidu, Alibaba and Tencent are also privy to what consumers buy, where they travel, and who they chat to online. In fact, Baidu has shifted its business strategy from "mobile first" to "AI first". Baidu's IPO float of iQyi is anticipated to provide more additional resources to invest in AI ventures.

In July 2017 the China State Council announced a development plan with the goal of being the world leader in AI by 2030. The council presented a timeline where it expects companies and research facilities to be at parity with the US by 2020[34]. In June 2017 the Chinese government announced plans to set up an "intelligence industry zone" near Tianjin along with a USD 5 billion fund to support the AI industry.

A 2017 UK government report estimates that AI could add an additional GBP 630 billion (USD 814 billion) to the UK economy by 2035 (Hill and Pesenti, 2017). In the UK a new AI startup has been established on roughly a weekly basis since 2014[35]. Swiftkey, DeepMind and Ravn are among the more prominent AI companies with London being the main hub of AI startups. In 2015 Blackrock acquired automated investment platform FutureAdvisor and invested GBP 60 million into early-stage UK venture capital fund Forward Partners, which targeted AI investment[36]. In a UK government report, Hill and Presenti (2017) identify three areas of finance in the UK where AI has great potential: personalized financial planning; fraud detection and anti-money laundering and process automation.

Sweden is embracing AI in the financial services industry. One of Sweden's biggest banks, SEB AB uses a virtual customer representative called Aida, so that humans can engage in more complex tasks. Nordea has rolled out Nova, a chatbot in its Norwegian pension unit. It is envisaged that Nova will eventually help customers who want to cancel lost cards, open accounts and with investment advice. Swedbank uses a virtual assistant called Nina[37]. It is estimated that by 2035 AI will double the annual economic growth in Finland and Sweden, as well as boosting labor productivity by 36%[38].

7. Fintech Regulatory Framework.

The Fintech ecosystem is rapidly changing, especially in terms of institutional and market complexity both of which provide numerous challenges to regulators and policymakers. In fact Fintech is framed by a policy trilemma (Brummer and Yadav, 2017). The trilemma consists of maintaining market integrity, providing clear rules and encouraging financial innovation.

China, Sweden, UK and the US have approached regulation of the Fintech industry in quite different ways. Broadly speaking, the UK has encouraged Fintech innovation, favoring a principles based "light-touch" approach. UK regulatory authorities have a relatively coordinated approach to Fintech oversight. In the UK, the Financial Conduct Authority (FCA), Prudential Regulation Authority and HM Treasury have acted together regarding Fintech regulation. However, Fintech regulation has been more fragmented in the USA compared with Europe and Asia where jurisdictions usually have one regulator. US regulators are seeking how to best regulate the Fintech sector. In March 2016, the Office of the Comptroller of the Currency published a white paper on responsible innovation, following

the Consumer Financial Protection Bureau the previous November with Project Catalyst. Additionally, US regulators have been extremely cautious about opening up the Fintech sector too quickly, because it could increase systemic risk. Generally, the Swedish government has been very receptive to Fintech innovation. However, one of the biggest obstacles to Sweden becoming a dominant Fintech hub is the cumbersome regulation. During 2015 in China, the PBOC, the China Banking Regulatory Commission, China Insurance Regulatory Commission (CIRC), China Securities Regulatory Commission, Ministry of Industry and Information Technology (MIIT) along with five other government regulators jointly released the Guiding Opinions on Promotion of Healthy Development of Internet Finance ("Guiding Opinions").

Perhaps the Fintech area that has received the most coverage in terms of regulatory responses has been cryptocurrencies. Despite a rollercoaster rise during 2017, as of March 2018, cryptocurrencies have a combined value of USD 354 billion[39]. In China, the early days of the bitcoin market were characterized as "the wild west" due to both entrepreneurism and Ponzi like hawkers operating side by side. In 2013, the People's Bank of China banned banks from handling bitcoin transactions. In 2017, Chinese regulatory authorities repeatedly sought to limit cryptocurrency speculation and warned banks from working with virtual currency-related businesses.

Initial coin offerings (ICOs) have attracted the attention of international regulators. ICOs have emerged over the past few years as an alternative way for ventures to raise capital. There are mixed opinions as to whether they are deemed to be an investment product. An ICO is defined as a process that sells a contractually defined right (token) to investors, and the right is subsequently sold to another investor. In the future the right can be realized by the company in accordance with the contract. In September 2017, China's central bank declared ICOs illegal and called a halt to fundraising virtual ones[40]. The central bank continued to reiterate that ICOs were considered illegal activity throughout the nation. Cryptocurrency exchanges were shut down in order to deter domestic investors from evading the country's tight capital controls and market speculation. In addition, third-party payment providers and financial institutions were banned from accepting, using, or selling virtual currencies.

Sweden is to go cashless in 2023. The Swedish Riksbank is investigating the possibility of issuing an electronic payment means, "*e-SEK*" as an alternative to cash.

Cryptocurrency mining is an established activity in the Swedish Fintech sector. The Swedish Tax Office provided an informal statement that virtual currencies are not currencies domestically but would instead be treated as assets. At the time of the Finansinspektionen (2017) report the risks associated with ICOs as an investment product were disclosed and currently no Swedish company raises capital via ICOs.

Like Sweden, the US has allowed the cryptocurrency market to expand. The US Internal Revenue Service (IRS) has also announced how bitcoin will be treated for tax purposes. For tax purposes bitcoin must be treated as property, meaning a capital gain or loss should be recorded. If bitcoin is held for resale then under IRS rules bitcoin should be treated like inventory. If bitcoin is used as payment, then it should be treated like currency, but the bitcoin must be converted, and its fair market value checked on an exchange. In July 2017, the National Conference of Commissioners on Uniform State Laws approved state regulation of digital currency businesses[41]. Several US states have already approved the use and promotion of blockchain technology and bitcoin. For example, Arizona recognizes the use of smart contracts, Vermont approves the use of blockchain as evidence and Delaware is considering the blockchain to authorize share registration of Delaware companies.

In 2017, the Commodity Futures Trading Commission (CFTC) allowed the Chicago Mercantile Exchange and the Chicago Board Options Exchange (CBOE) to launch a bitcoin futures market. The CFTC deems bitcoin a commodity and regulates bitcoin futures as well as interstate fraud and manipulation involving bitcoin. LedgerX, LLC, a swap execution facility and derivatives clearing organization was also approved by the CFTC as a platform for the trading and clearing of virtual currency derivatives.

In late July 2017, the US Securities and Exchange Commission (SEC) warned that ICO sponsors were shorting securities and issued another notice about potential scams in the industry. The SEC subsequently issued three enforcement actions against ICO sponsors, including one halt and exposure of two alleged frauds. In the same month, the Financial Stability Oversight Council (FSOC) annual report warned of Fintech and virtual currencies such as bitcoin threatening to disrupt the financial services industry[42] and the report proposed strengthening cybersecurity rules. In November 2017 the US Treasury announced it would review FinCEN's cryptocurrency practices in terms of risks associated with terrorism and money laundering. Under FIN-2013-G001, FinCEN declares "*virtual currency does not have legal tender status in any jurisdiction.*" The UK has been planning stricter regulations

on Bitcoin. In terms of tax treatment, virtual currencies are taxed under goods and services taxes based on profits from a sale. In November 2017 the FCA published a warning to consumers about the risks of investing in cryptocurrency.

P2P lending has received more regulatory scrutiny. Within the two years China has tightened monetary policy and directed more regulatory attention to off-balance sheet and interbank lending, including a crackdown on shadow banking. The China Banking Regulatory Commission (CBRC) issued a flood of orders including detailed work aimed at "regulatory arbitrage," or rule-dodging, and this is particularly evident in the case of P2P lending. In the early days of the Chinese P2P market Chinese regulators had taken a hands-off approach to regulating online consumer loans. Fast forward to late 2016 and it is a very different picture. China's P2P lending market started to face more unified regulation from the CBRC and three other government bodies. This was in response to a series of Ponzi schemes and other scams in the Chinese P2P market (detailed in Section 4). The focus of many P2P regulatory investigations had been the use of violence and intimidation against borrowers. P2P lenders were given 12 months to comply with new regulations, which included capping loan size - a maximum loan size of RMB 1 million (USD 149,000) for individuals and RMB 5 million (USD 743,000) for companies through a single P2P website. Additionally, lending to students and loans to finance mortgage down payments is now forbidden. A second regulatory crackdown in the Chinese P2P market was announced in April 2018, with a new record filing system starting the same month[43]. The new rules go into effect in June 2018 and bar P2P lenders from guaranteeing principal or interest on loans they facilitate. Uncertainty around these new rules has put a chill on IPOs by Chinese online lenders. Qudian and Ppdai are already listed and have experienced declining stock prices. Some players are exiting the P2P industry. Searches for more competitive yields and alternative financing have resulted in the growth of consumer loan securitization, allowing participants to obtain even cheaper funding. In the UK, the FCA now requires firms to have resolution plans in place in the case of P2P platform collapses.

So in a Fintech world of "*jurisdiction shopping*", how do regulators promote Fintech growth within a market? There have been four response styles across the countries we examine: informal guidance, pilot programs, licenses (or charters) and regulatory "sandboxes" (Brummer and Yadav, 2017). Informal guidance does not obligate regulators to permit any course of action, nor does it carry the force of law. In the case of robo-advising,

the US SEC has provided detailed guidance on how it must comply with the body of law governing investment advising[44]. This includes informing clients that their money is being managed by an algorithm.

In China open regulations have permitted Fintech innovators to decide how financial services are offered. Pilot programs are very common in China, where an innovation can be tested and outcomes observed. Regulators can then tailor rules to the most effective and efficient form. For example, even though the Chinese insurance market is smaller than the UK and US, its growth has doubled each year for the last six year (Sheng, 2016). The industry is being revolutionized by Insurtech[45] and the China Insurance Regulatory Commission (CIRC) is supporting this growth by providing a favorable regulatory environment for Insurtech. CIRC has introduced a two-year pilot program that allows Insurtech companies the regulatory space to offer products and services across cities and state lines. As of 2017, insurance companies based in Beijing, Hebei or Tianjin can conduct business across all three regions. The objective is to encourage Insurtech firms to establish in the lower cost Hebei or Tianjin and sell the services in Beijing. By comparison, pilot programs are rarer in the US (Brummer and Yadav, 2017).

In the US, the Office of the Comptroller of the Currency (OCC) has announced that "special purpose national bank charters" will be available for Fintech companies, allowing them to cut through a patchwork of state and federal laws. States banking regulators and customers have expressed concern that such a license charter could allow start-ups to circumvent state laws intended to protect consumers in areas like payday lending. In June 2017, Klarna became the largest European Fintech company to secure a banking license[46] from the Swedish Financial Supervisory Authority. The banking license will help Klarna Bank expand into markets such as the US.

In terms of regulatory sandboxes, the UK FCA has set the benchmark with Project Innovate. Currently, it is an experimental program that waives some UK regulations for entrepreneurs and established businesses with new ideas. A regulatory sandbox can be defined as a free zone for a Fintech company to test innovations in the market with actual customers under strict conditions and monitoring of the supervisory authority. The regulatory sandbox reduces the time and cost of getting the Fintech product to market, making it easier for young companies to develop funding. Regulatory sandboxes remove unnecessary obstacles for financial innovators to enter the market, providing that the

innovation is considered to be of benefit for consumers. Nor should it pose risks to consumers or the stability of the financial system. The success of Project Innovate has spurred similar initiatives around the world. In May 2017, there were discussions of a regulatory sandbox in Sweden. However, Finansinspektionen (2017) proposes at this time not to introduce a regulatory sandbox.

In March 2018, the UK FCA called for the creation of a global alliance of regulators that would encourage growth in the Fintech sector. This would allow a Fintech to test new products without going through a full approval process[47]. Since "*jurisdiction shopping*" is becoming more popular amongst Fintech start-ups, a global alliance would make it easier for Fintech firms to expand internationally by testing their products in multiple jurisdictions. Another advantage is that it would help regulators tackle cross-border problems such as money laundering.

8. Conclusion:

All in all, the Fintech phenomenon is forcing financial institutions around the world to develop superior financial services. In terms of where it is going (or "quo vadis"), the future looks bright for Fintech. In the first half of 2018, nearly USD40 billion was spent on approximately 141 Fintech transactions worldwide, representing a 26% increase from the previous year[48]. This includes Paypal's all cash acquisition of iZettle. Increased consumer and enterprise acceptance of digital banking, payments and financial data services have driven the wave of Fintech transactions this year.

The Fintech revolution continues, but it does face numerous challenges. In Europe the Payment Services Directive (PSD) and PSD2 across the Eurozone has triggered "open banking" and will result in more competition. The new open banking regulations requires lenders to provide access to the accounts of clients who authorize it. It involves sharing customers' data with third parties who can then use it to build or recommend better suited financial products and services. Competitors can show a bank's customer how much they could save by switching lenders. This has the potential to provide Fintech companies with new opportunities such as offering smartphone apps and web sites that can use customers' information to enable bank charge comparisons. Open banking is aimed at boosting competition in retail banking[49]. In the UK, the Competition and Markets Authority (CMA)

have allowed Barclays, HSBC, RBS, Santander UK and Bank of Ireland extra time to comply with open banking plans.

One of many factors behind the development of Fintech was that of financial inclusion. As detailed in the discussion on P2P lending and mobile payments this has been achieved in the large Chinese cities. But a challenge remains for Chinese Fintechs like Ant Financial and that is how to maintain financial inclusion in China's rural areas, which is more technologically underdeveloped with a lack of infrastructure. Another challenge is the nation-wide Social Credit System (SCS) that is expected to be in place by 2020. The SCS will assign a credit score to every Chinese citizen and business based on financial and social behavior. Big data and AI techniques have made this possible. The launch of the Internet Financial Industry Information Sharing Platform has accelerated entry of credit scoring into the internet finance area. Although it has the potential to open China's Fintech market up even further, challenges remain regarding data security and individual privacy.

Financial inclusion is also important in considering a cashless society. What is the downside with moving to a cashless society? In Sweden there has been a backlash in early 2018[50]. A downside of Sweden going cashless has been the speed of adoption. Opponents believe it has been too quick and it is difficult to maintain the structure for handling cash. Many Swedish bank branches have stopped handling cash. Arguments have been put forward that a cashless society leads to financial exclusion, especially for the elderly and low income segment that are not as digitally savvy or connected. And if a business does not take cash, then these excluded residents cannot use the business. A special parliamentary committee has been established to look at the structure[51].

Despite rapid growth of the Chinese Fintech sector, there are concerns about how the slowing economy will impact its future. The Chinese economy has been growing at its slowest pace since 1990. China's money market experienced a series of credit crunches in 2013. In 2015 the Shanghai Composite Stock Index dropped 40 per cent for nine days[52] and foreign investors pulled cash out of Chinese markets. Margin lending has declined, and the Chinese housing market is sluggish. Various regulatory responses have included cutting benchmark interest rates; restricting initial public offerings; lowering housing down payments; suspending trades in some stocks and easing rules on loans.[53] China's debt mountain has soared from 130% to 200% of GDP between 2008 and 2013. NPL loans have increased. China is now more indebted than any other emerging market country.[54] The

sustainability of the NPL securitization market is of concern (Buchanan, 2015) and Chinese banks are under increasing pressure to curb balance sheet growth due to tougher capital adequacy requirements. The Chinese P2P sector in China has reached a critical size and that is reflected in the regulatory crackdowns. During the summer of 2018, there was another surge of P2P failures. However, P2P lending is unlikely to disappear because it performs an important allocation role, especially for SMEs that have limited credit access. The challenge that remains is how to stop it being too big to fail.

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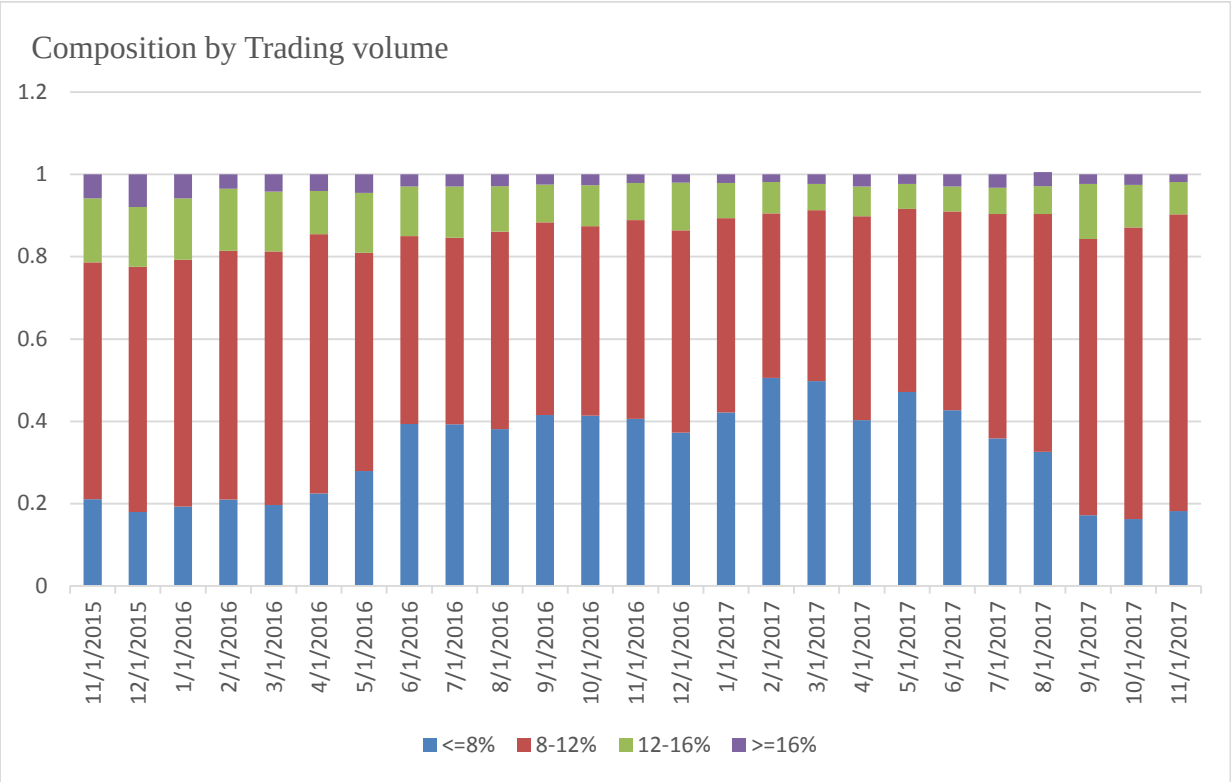
Appendix One: Timeline of Chinese Fintech Milestones

1949	Founding of People's Republic of China.
1978	Under Deng Xiaoping, the Chinese government institutes major economic reforms.
1988	Ping An founded.
1999	Jack Ma founds Alibaba.
2000	Baidu is established.
2001	China joins World Trade Organization (WTO).
2004	Alibaba develops Alipay (an online payments system).
2004	Tencent goes public in Hong Kong.
2005	Launch of TenPay in China.
2005	Launch of Zopa in the UK (first known P2P lending platform).
2006	CreditEase founded in China.
2007	PPDai goes live in China followed by Renrendai.
2009	Hongling Capital founded.
2010	PBOC requires non-bank payment companies to obtain a license so they can operate in China.
2011	WeChat is launched.
2012	Lufax launches (later becomes Ping An's largest P2P).
2012	200 P2P lending platforms are in China.
2012	First Chinese P2P scandal occurs when Youyi Net shuts down operations.
2013	800 P2P lending platforms are in China.
2013	PBOC explicitly supports tech companies to promote internet finance.
2014	1575 P2P lending platforms are in China.
2014	Ant Financial's MMMF, Yu'e Bao, becomes the fastest growing mutual fund of all time.
2014	Alibaba's New York IPO.

2014	Hongling Capital announces RMB100 million in bad debts. This is the largest amount of bad debt at the time. Hongling Capital then compensates investors' loss using its internal capital.
2014	P2P platform, Daibangwang revealed to have 12.8 million in bad debts. Different from Hongling Capital, it declines to use its own capital to repay the debts.
2015	China's banking regulator releases draft rules.
2015	PBOC allows Ant Financial's Sesame Credit, to provide consumer credit information services. CSRC issues directive tightening scrutiny on margin lending outside approved lenders.
2015	CBRC announces the enactment of capital requirements of P2P platforms.
2015	2,136 P2P lending platforms are in China.
2015	Yirendai goes public with a USD 585 million valuation.
2015	Ezubao, once among the top 10 largest P2P lending platforms in China, is being investigated for being a suspected illegal Ponzi scheme.
2015	Several Chinese government departments including the China Banking Regulatory Commission release a draft of new rules on Dec 28 that tighten regulation of peer-to-peer (P2P) lending.
2016	Public opinion on the P2Pdraft is solicited until January 27, 2016. Official rules are issued on August 24, 2016.
2016	Chinese regulators ban P2P platforms from securitizing assets or offering debt mechanisms that mimic securitization.
2016	The State Council, China's cabinet, issues details of rules aimed at reducing risks and supporting healthy development of the online finance market.
2017	Ezubao's founder and chairman, Anhui Yucheng, is sentenced to life in prison for fraud and other crimes. Civil fines equivalent to USD 290 million are applied.
2017	The Chinese government announces plans to set up an "intelligence industry zone" near Tianjin.
2017	Lufax shifts its P2P online lending business into China's booming retail-investing market. Later in the year, it puts its IPO launch date on hold. Also, LexinFintech scales back its US IPO fundraising goal.
2017	Alipay proposes to acquire US MoneyGram for USD 880 million, but the deal falls through because necessary US government approval is not received.

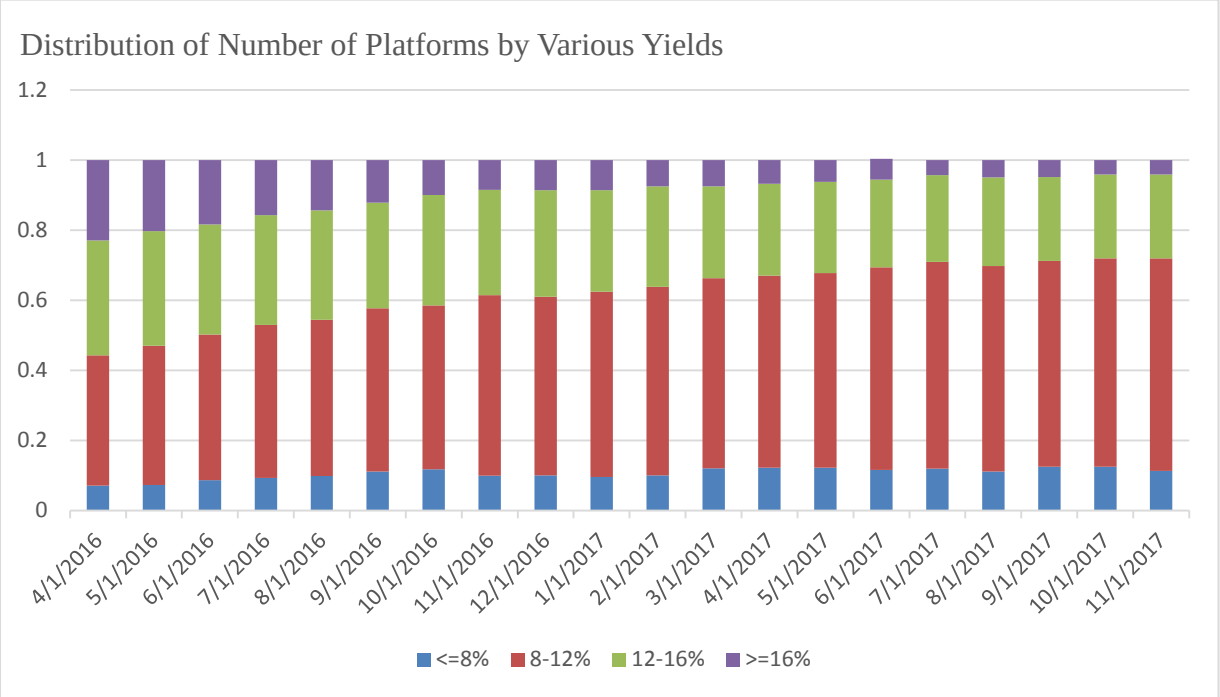
Appendix Two: Distribution of Trading Volume by Various Yields over Time



Data source: WDZJ.com

Appendix Two presents the distribution of trading volume by various yields over time. Between November 2015 and May 2016, over 50% of transactions flowed into P2P platforms offering lending yields in the range from 8% to 12%. Over the same period there were over 20% of transactions participating in P2P lending with yields lower than 8%. There are over 5% of lending transactions with yields of 16% and above. However, between June 2016 and June 2017, there was a shift of P2P trading volume from the platforms with yields ranging from 8% to 12% into platforms with yields less than 8%. Over this period, on average 46% of P2P transactions occur with yields ranging from 8% to 12%; 42% of transactions in the platforms with yields lower than 8%; and only 2.5% of transactions in the platforms with yields of 16% and above. Interestingly, between July 2017 and November 2017, P2P lending trading volume shifts from platforms with yields less than 8% back to P2P platforms with yields ranging from 8% to 12%. By November 2017, 72% of P2P lending transactions occurred on platforms with yields from 8% to 12%. The platforms with yields less than 8% generated 18.2% of P2P trading volume. In addition, only 1.86% of P2P transactions occurred on platforms with yields of greater than 16%.

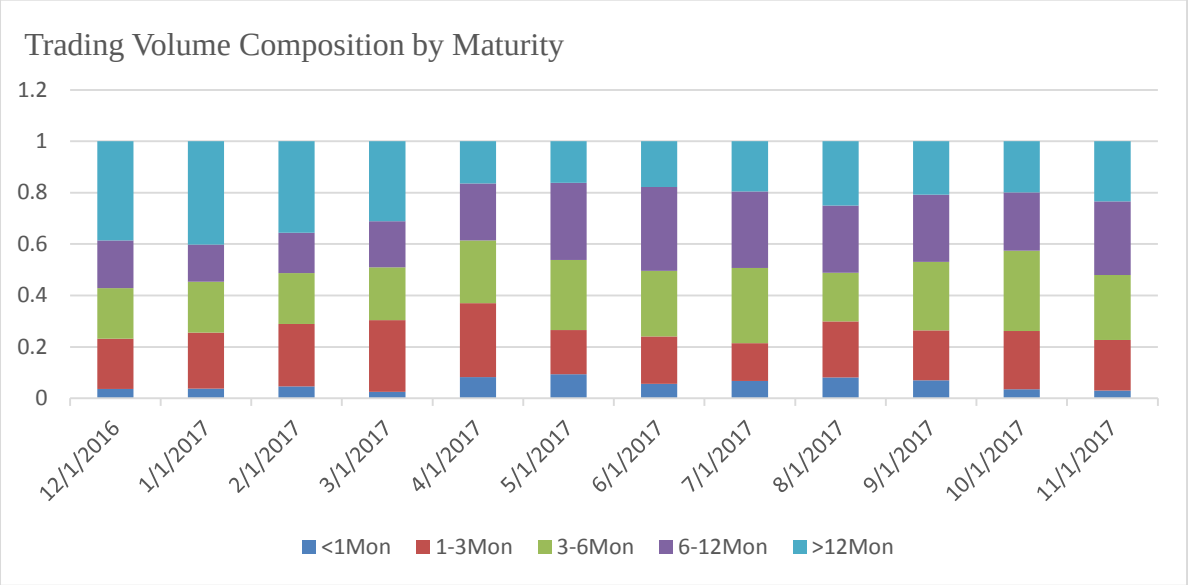
Appendix Three: Distribution of the Number of P2P Platforms by Various Yields



Data source: WDZJ.com

Appendix Three presents the distribution of the number of platforms by various yields over time. There are an increasing proportion of platforms offering a lending yield in the range from 8% to 12%. In April 2016, about 37% of platforms offered a lending yield in the range from 8% to 12%. In contrast, by November 2017, more than 60% of platforms offered a yield in the range 8% to 12%. By contrast, there is a sharp decrease in the proportion of platforms offering a lending yield of 16% and above. In April 2016, about 23% of platforms with a lending yield of 16% and above. However, by November 2017, only about 4% of platforms offered a yield of 16% or above. In terms of P2P loan maturity, the overall trend has gradually increased. In year 2014, 2015, 2016, and 2017, the average P2P lending maturity period was 5.85 months, 6.80 month, 7.78 months, and 9.08 months respectively. This is attributable to the following reasons. First, the risks of the P2P market decreased with the reduction of problematic platforms. Individuals become more confident in investing in long-term projects. Secondly, due to decreasing P2P lending interest rates, investors prefer long-term projects to lock in high yield and to avoid low re-investment rate. And lastly, the decrease in P2P lending interest rates makes it more affordable for individuals to borrow for a longer time and to finance longer-term projects.

Appendix Four: Distribution of Trading Volume by Maturity

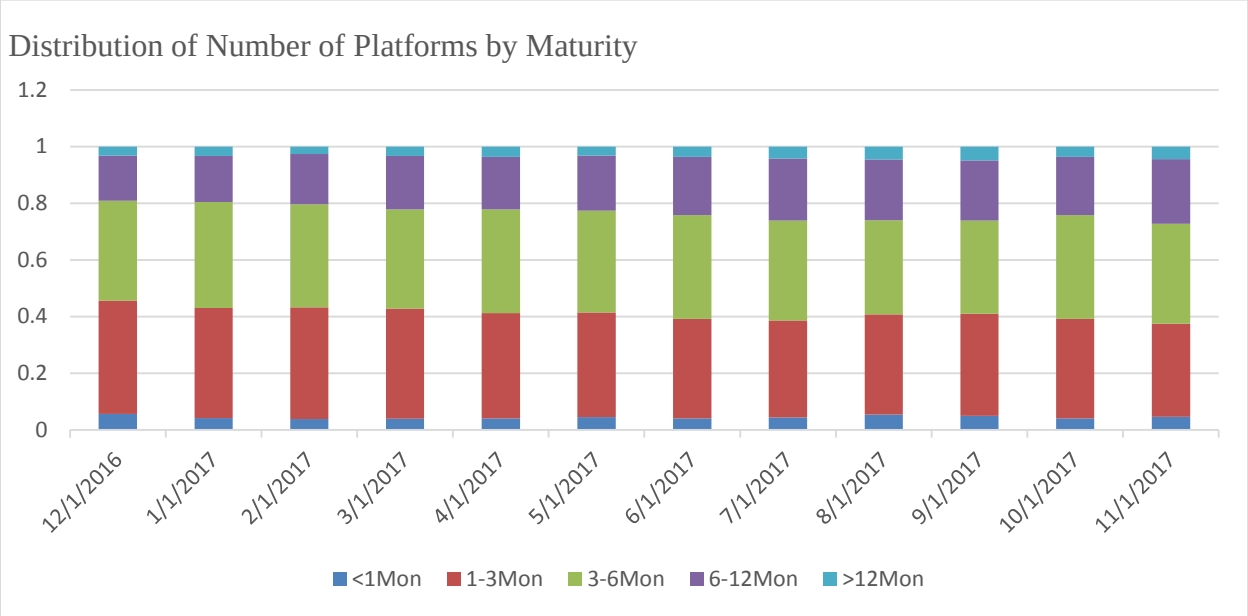


Data source: WDZJ.com

Appendix Four describes the distribution of trading volume by various maturities over time. The majority of lending transactions have a maturity greater than 1 month. Between December 2016 and November 2017, there are on average 21.4%, 24.0%, 23.7%, and 25.4% of P2P lending transactions with maturities ranging from 1 month to 3 months, from 3 months to 6 months, from 6 month to 12 months, and over a year, respectively. Moreover, there is a slight increase in the proportion of transactions with a maturity ranging from 3 months to 6 months. The percentage of transactions with a maturity from 3 months to 6 months increases from 19.6% in December 2016 to 25.3% in November 2017. There is a U shape in the proportion of transactions with a maturity over 12 months. In December 2016, 38.6% of P2P trading has a maturity over a year; whereas in May 2017, the proportion drops to 16.2%. However, in November 2017, the proportion of trading with a maturity more than a year increases to 25.4%.

The proportion of transactions with a maturity less than a month varies over time. The percentage of transactions with a maturity less than a month decreases from 3.6% in December 2016 to 2.5% in March 2017, which followed by an increase to 9.33% in May 2017. Since May 2017, the percentage of transactions with a maturity less than a month gradually decreases. By November 2017, there is 3% trading with a maturity less than a month.

Appendix Five: Distribution of Number of Platforms by Maturity



Data source: WDZJ.com

Appendix Five describes the distribution of the number of platforms by various maturities over time. The majority of P2P platforms provide lending with a maturity between 1 month and 6 months. Between December 2016 and November 2017, there are on average 36.6% and 35.5% P2P platforms with a maturity ranging from 1 month to 3 months and from 3 months to 6 months, respectively. Moreover, over the same period, there is a shift in the number of P2P platforms from maturity of less than 1 month to maturity of over a year. In December 2016, 5.7% of platforms offer lending maturity of less than a month and 3.3% of platforms provide a maturity more than a year. However, in November 2017, there are 4.7% of platforms with a maturity less than a month and 4.4% of platforms with a maturity more than a year.

[1] A “unicorn” is a company with at least a $1billion valuation.
[2] Blockchain is the technology which underpins financial technology.
[3] Interestingly, Uber is now the largest acquirer of small business bank accounts in the US.
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[12] Galloway (2007) observes that platforms differ and it is a misconception that the P2P platform actually funds the loan.
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[26] https://www.ft.com/content/00585722-ef42-11e6-930f-061b01e23655
[27] http://www.hoganlovells.com/en/publications/third-party-payment-licences-in-china-are-they-within-the-grasp-of-foreign-investors
[28] NFC enables communication between devices using magnetic induction. The communication occurs when two portable devices are touched together or brought within a few centimeters of each other.
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