Understanding how policy instruments dynamically affect the fintech industry: A case study of China

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# TABLE OF CONTENTS

TABLE OF CONTENTS ......................................................................................................................... 2
LIST OF TABLES ................................................................................................................................. 7
LIST OF FIGURES ............................................................................................................................... 8
ABSTRACT .............................................................................................................................................. 9
DECLARATION ....................................................................................................................................... 10
COPYRIGHT STATEMENT ..................................................................................................................... 11
DEDICATION ......................................................................................................................................... 12
ACKNOWLEDGMENT ........................................................................................................................... 13

<table>
<thead>
<tr>
<th>CHAPTER 1</th>
<th>INTRODUCTION .......................................................................................................................... 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Financial technology ............................................................................................................... 14</td>
</tr>
<tr>
<td>1.2</td>
<td>Research aims and questions ............................................................................................... 22</td>
</tr>
<tr>
<td>1.3</td>
<td>Research design ..................................................................................................................... 24</td>
</tr>
<tr>
<td>1.4</td>
<td>Findings and contributions of this research ...................................................................... 26</td>
</tr>
<tr>
<td>1.5</td>
<td>Thesis structure .................................................................................................................... 27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 2</th>
<th>LITERATURE REVIEW ................................................................................................................ 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Definitions of fintech .......................................................................................................... 30</td>
</tr>
<tr>
<td>2.2</td>
<td>Key concepts in fintech innovation studies ......................................................................... 33</td>
</tr>
<tr>
<td>2.2.1</td>
<td>Online payments .................................................................................................................... 35</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Online lending platforms ..................................................................................................... 36</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Blockchains ......................................................................................................................... 37</td>
</tr>
<tr>
<td>2.3</td>
<td>Fintech industry studies ..................................................................................................... 39</td>
</tr>
<tr>
<td>2.3.1</td>
<td>Fintech actors ...................................................................................................................... 43</td>
</tr>
<tr>
<td>2.3.2</td>
<td>Fintech actors’ interactions ............................................................................................... 47</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Fintech institutions .............................................................................................................. 50</td>
</tr>
<tr>
<td>2.3.4</td>
<td>Fintech infrastructure ......................................................................................................... 51</td>
</tr>
<tr>
<td>2.4</td>
<td>Fintech regulation studies .................................................................................................. 53</td>
</tr>
</tbody>
</table>
2.4.1 The concepts of fintech regulation ................................................................. 53
2.4.2 The concept of policy instruments ................................................................. 58
2.4.3 Existent studies on policy instruments and fintech industry ......................... 62
  2.4.3.1 Policy instruments and fintech actors .......................................................... 63
  2.4.3.2 Policy instruments and fintech interactions ..................................................... 69
  2.4.3.3 Policy instruments and fintech institutions ..................................................... 74
  2.4.3.4 Policy instruments and fintech infrastructure ................................................ 79
2.5 Summary and resultant research gaps .............................................................. 81
2.6 Research questions .......................................................................................... 85

CHAPTER 3 ANALYTICAL FRAMEWORK .................................................................. 87
  3.1 Introduction ....................................................................................................... 87
  3.2 The three fintech development stages ................................................................. 87
  3.3 Fintech innovation system (FTIS) framework ..................................................... 91
    3.3.1 Theoretical background of the FTIS framework ............................................ 91
    3.3.2 The Components of FTIS .............................................................................. 96
  3.4 Analytical framework ..................................................................................... 99

CHAPTER 4 METHODOLOGY ................................................................................ 101
  4.1 Introduction .................................................................................................... 101
  4.2 Philosophical perspective ................................................................................ 101
    4.2.1 Research approach .................................................................................... 101
    4.2.2 Research strategy ....................................................................................... 105
  4.3 Research design .............................................................................................. 108
    4.3.1 Research method ....................................................................................... 108
    4.3.2 Case study setting and background .............................................................. 109
  4.4 Data collection ................................................................................................. 116
    4.4.1 First phase of data collection ...................................................................... 116
    4.4.2 Second phase of data collection ................................................................. 117
    4.4.3 Third phase of data collection .................................................................... 120
    4.4.4 The summary of data collection .................................................................. 120
4.5 Data analysis ................................................................. 124
4.5.1 Data preparation ............................................................. 124
4.5.2 Data familiarisation ......................................................... 124
4.5.3 Data categorising and coding ............................................. 125
4.5.4 Data comparison and identification .................................... 126
4.5.5 Data presentation ............................................................ 126
4.6 Validation assessment ....................................................... 127
4.7 Ethical considerations ....................................................... 128
4.8 Chapter Summary ............................................................ 129

CHAPTER 5  THE INITIATION STAGE ........................................... 130

5.1 Introduction ........................................................................ 130
5.2 Structural elements of China’s fintech industry at the initiation stage ....... 130
  5.2.1 Background of the China’s fintech industry at the initiation stage ......... 130
  5.2.2 China’s financial regulation at the initiation stage ............................ 134
  5.2.3 TFOs of China’s FTIS ....................................................... 137
  5.2.4 Fintech start-ups of China’s FTIS ........................................... 140
  5.2.5 Technology developers and fintech infrastructure of China’s FTIS ...... 141
5.3 The policy instruments’ roles on the China’s FTIS ............................. 143
  5.3.1 The roles on TFOs, fintech start-ups and actors’ interactions ............... 143
  5.3.2 The roles on the institutions of China’s FTIS ................................ 149
  5.3.3 The roles on technology developers and infrastructure of China’s FTIS ...... 152
5.4 Chapter Summary ................................................................ 155

CHAPTER 6  THE GROWTH AND PROBLEMATISATION STAGE .......... 157

6.1 Introduction ........................................................................ 157
6.2 Structural elements of China’s fintech industry ................................. 157
  6.2.1 Background of the China’s fintech industry .................................. 157
    6.2.1.1 The growth and problematisation of P2P online platforms ............ 158
    6.2.1.2 Growing China’s TPP ....................................................... 160
  6.2.2 Proliferation of fintech actors and interactions ................................. 161
6.2.3 The Infrastructure of China’s FTIS ......................................................... 163
6.2.4 The institutions of China’s FTIS ......................................................... 166
6.3 The roles of policy instruments on China’s FTIS ................................ 167
6.3.1 The roles on fintech actors and interactions of China’s FTIS .......... 167
6.3.2 The roles on the institutions of China’s FTIS ................................. 171
6.3.3 The roles on the infrastructure of China’s FTIS ............................. 174
6.4 Chapter Summary .................................................................................. 176

CHAPTER 7 THE IMPROVEMENT STAGE ......................................................... 178
7.1 Introduction ............................................................................................ 178
7.2 The structural elements of China’s FTIS ............................................ 179
7.2.1 Background information of the China’s fintech industry .............. 179
7.2.2 Actors and interactions of China’s FTIS ........................................... 181
7.2.3 The Infrastructure of China’s FTIS ................................................... 185
7.2.4 The Institutions of China’s FTIS ...................................................... 187
7.3 The roles of policy instruments on China’s FTIS ......................... 190
7.3.1 The roles on actors and interactions of China’s FTIS .............. 190
7.3.1.1 The roles on the protection of financial customers ............ 190
7.3.1.2 The roles on the fintech start-ups and technology developers 194
7.3.2 The roles on institutions of China’s FTIS ..................................... 196
7.3.3 The roles on infrastructure of China’s FTIS ................................. 199
7.4 Chapter Summary .................................................................................. 202

CHAPTER 8 DISCUSSION ............................................................................. 203
8.1 Introduction ............................................................................................ 203
8.2 The timeline of each structural element of FTIS .............................. 203
8.2.1 Actors of China’s FTIS ................................................................... 203
8.2.2 Interactions of China’s FTIS ............................................................. 206
8.2.3 The Institution of FTIS ................................................................... 209
8.2.4 The Infrastructure of FTIS ............................................................... 211
8.3 The role of regulatory instruments in FTIS ...................................... 215
8.3.1 Establishing and developing the fintech regulatory institution .......... 215
8.3.2 Standardising fintech infrastructure ........................................ 217
8.4 The role of economic and financing instruments on FTIS .................. 218
  8.4.1 Providing financial and technical support .................................. 218
  8.4.2 Increasing public procurement .............................................. 219
8.5 The role of soft instruments on FTIS .......................................... 221
  8.5.1 Promoting and sharing industrial information.......................... 221
  8.5.2 Strengthening the self-regulation .......................................... 222
8.6 How policy instruments dynamically affect the fintech industry ........... 223
8.7 Comparing the findings with existing fintech studies ....................... 226
  8.7.1 The policy instruments’ role in fintech deregulation ...................... 227
  8.7.2 The role of policy instruments in adjusting fintech actors’ interactions... 231
  8.7.3 The role of policy instruments in centralising and decentralising fintech regulatory institutions ................................................................. 233
8.8 Chapter Summary ........................................................................... 235

CHAPTER 9  CONCLUSION ........................................................................ 238
  9.1 Research Review ........................................................................... 238
  9.2 Summary of research findings ..................................................... 241
  9.3 Theoretical contributions of this study .......................................... 246
  9.4 Practical implications of the findings of this study ......................... 250
  9.5 Limitations and future research ................................................... 253

REFERENCE ......................................................................................... 255

APPENDIX 1 GUIDELINE FOR SEMI-STRUCTURED INTERVIEWS .............. 279
APPENDIX 2 EXAMPLE OF DATA CATEGORISING AND CODING .......... 282
APPENDIX 3. PARTICIPANT INFORMATION SHEET .................................. 284
APPENDIX 4. CONSENT FORM ................................................................. 288

Word Count: 60395
LIST OF TABLES

Table 2.1 Summary of the policy instruments roles in each fintech element..............................................84
Table 3.1 Representative studies using the innovation system approach.....................................................92
Table 4.1 Examples of fintech policies for exploration and development in China........................................111
Table 4.2 Examples of national fintech supervision policies in 2016..........................................................114
Table 4.3 Interview timeline and arrangement............................................................................................122
Table 4.4 List of Interview and codes of interviewees..................................................................................122
Table 5.1 The responsibilities of CBRC in 2012.........................................................................................136
Table 5.2 The details of the banking industry in China.................................................................................139
Table 5.3 Examples of fiscal incentives of policies at the initial development stage in China.....146
Table 5.4 Examples of entrepreneurial policies at the initial development stage in China.................147
Table 5.5 Examples of policies on the institutions at the initial development stage in China............151
Table 5.6 Examples of technical support of policies on the infrastructure at the initial development stage in China .........................................................................................................................155
Table 6.1 Examples of economic and regulatory policy instruments on fintech actors and interactions at the growth and problematisation stage in China.........................................................169
Table 6.2 Examples of regulatory policy instruments on fintech institution at the growth and problematisation stage in China.................................................................................................................172
Table 7.1 Financial scale and market value of nine listed fintech companies.............................................180
Table 7.2 The investment on fintech services by the five largest banks in China in 2019.........................181
Table 7.4 New fintech subsidiaries of China’s FTIS at the improvement stage........................................182
Table 7.5 Details of fintech start-ups at the improvement stage of China’s FTIS....................................183
Table 7.6 Examples of policies for the financial customers’ protection and data privacy at the improvement stage in China ........................................................................................................................................192
Table 7.7 Examples of standardisation of policies on infrastructure at the improvement stage ...200
Table 7.8 An example of standardisation process in China’s securities industry ..................................201
Table 8.1 How policy instruments dynamically affect the China’s FTIS at each stage ......................225
Table 8.2 The policy instruments roles in the fintech industry .................................................................226
LIST OF FIGURES

Fig 3.1 FTIS framework................................................................. 99
Fig 3.2 Analytical framework of policy instruments’ roles analysis in FTIS.................. 100
Fig 4.1 The reality domains of critical realism ................................................. 104
Fig 5.1 How TPP works compared to traditional payment chain............................. 132
Fig 5.2 China’s financial regulation and supervision system in 2012.......................... 135
Fig 5.3 Changes in the number of registered fintech start-ups in China.................... 141
Fig 5.4 Changes in the number of investments in the fintech industry in China............. 141
Fig 6.1 China’s main fintech start-ups at the second stage ..................................... 158
Fig 7.1 Fintech Market Size in China from 2016 to 2020 (Billion yuan)...................... 179
Fig 8.1 How technology developers, fintech start-ups and TFOs received the different levels of deregulation in China’s FTIS in each stage......................................................... 230
ABSTRACT

Policy instruments have significant impacts on the fintech (financial technology) industry, and many studies have been concentrating on the policy instruments’ roles in the fintech industry and fintech regulation studies. Existent literature has identified four crucial structural elements of the fintech industry: actors, interactions, institutions, and infrastructure, and the significant impacts of the policy instruments on each element. Most analysis in the field is, however, with regard to policy instruments’ roles in the structural elements; it tends to be static and limited to focus on only one or two elements. This thesis aims to understand how all four structural elements of the fintech industry are affected by policy instruments dynamically. Through a case study of the fintech industry in China, this research reveals the six policy instruments’ roles in the fintech industry through the four structural elements. The research findings further existent knowledge with regard to both the fintech industry and regulation studies, and this research also provide an analytical framework for further fintech industry research. The practical implications of the roles of the policy instruments for policy-makers and other practitioners in the fintech industry are given. Finally, research limitations and future research directions are illustrated.
DECLARATION

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DEDICATION

To my family!
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CHAPTER 1 INTRODUCTION

This chapter introduces the research. There are five sections to this chapter. Section 1.1 introduces the financial technology (fintech) and summarises the research gaps in existent fintech studies. Thereafter, Section 1.2 presents the research aims and the research question based on the research gaps identified by the literature review. This is followed by Section 1.3 which illustrates the research design, whilst Section 1.4 summarises the findings and contributions of this research. The chapter concludes with Section 1.5 which illustrates the structure of the thesis.

1.1 Financial technology

Financial technology (fintech) refers to technology that improves the automation of the distribution and implementation of financial services (Magnuson, 2018). The global fintech market expanded rapidly by 20% p.a. between 2015 and 2019 (CAICT1, 2020). In 2020, the Coronavirus pandemic that swept the world brought great shocks to capital markets. This once-in-a-century public health crisis has changed many industries. Despite the ongoing turbulence caused by the pandemic, the fintech industry still received over 36.2 billion dollars from venture capital worldwide in 2020 (McKinsey, 2021). This level of investment illustrates the extent to which fintech has been one of the most popular investment areas of recent years.

Bettinger (1972) firstly introduced the term fintech into academia. Since then, scholars have increasingly focused on fintech studies. Through reviewing existent literature, fintech studies can be categorised as three fields of research: fintech innovation studies, fintech industry studies, and fintech regulation studies. The first

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1 The China Academy of Information and Communications Technology
research field (fintech innovation studies) focuses on the efficiency and effectiveness of technological innovation improving financial services. For example, Langley and Leyshon (2017) focused on crowdfunding, which is a new financial service that uses online platforms to raise fund from the public, and analysed how crowdfunding has influenced and impacted traditional financial services. Other innovations have also been studied within existent research including: P2P lending platform (Ahern, 2018), AI learning and big data (Odinet, 2017), blockchain technology (Chen et al., 2019; Panisi, 2017), and so on. Cumulatively, research in this field has identified different types of fintech innovation and their different natures and impacts.

However, studies which concentrate on specific fintech innovations and identifying the natures and impacts still have limitations in terms of their understanding of both the entire fintech industry and fintech regulations from a holistic perspective. Gai et al., (2016) stated that there is a consensus between most scholars and practitioners that emerging fintech innovations will involve many uncertainties and risks that will need to be regulated; an appreciation that underlines and highlights the importance of understanding fintech industry and fintech regulation – the primary focus of this thesis.

The second research field within existent literature is, as mentioned, fintech industry studies. Work within this field has focused on how different components of the fintech industry are influenced by fintech innovations and how they interact in the fintech sector. From the review of literature, four structural elements of the fintech industry were identified: actors, interactions, institutions, and infrastructure. This section briefly introduces the background of these elements as below, and the chapter of

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2 Peer-to-peer
3 Artificial Intelligence
literature review will specifically focus on what those structural elements are studied in literature and defined in this thesis.

Turning first to actors, it was found that there are five actors in existent fintech industry literature. The first actor is traditional financial organisations (abbreviated as TFOs in this research) which implement traditional financial services such as banking, securities, insurance, and so on. There is a wealth of studies focused on different aspects of TFOs. For example, Jagtiani and Lemieux (2018) analysed the disruptive roles that fintech innovations have brought to the banking sector. Raikwar et al., (2018) focused on the application of blockchain in the insurance sector, whilst Gulamhuseinwala et al., (2015) studied the adoption of fintech in traditional banking and insurance sectors. Cao (2020) concentrated on the application of fintech on securities, which is called as smart insurance.

The second actor is fintech start-ups. These deliver financial products or services, to financial customers by using fintech innovations. Fintech start-ups, such as SoFi, Ant Financial, and PayPal, are newcomers to the fintech sector and have had considerable market shares within the same. Shim and Shin (2019) analysed fintech actor network in China and elaborated on the interactions among Alipay, (as one of the most prominent fintech start-ups in China), TFOs, and governments.

The third fintech actor is financial consumers. Financial consumers are, viewed as a whole, the largest actor of fintech industry, and their financial consumption has also attracted much scholarly attention. For example, Anand and Mantrala (2019), Lee and Shin (2018), Zalan and Toufaily’s (2017) research all support the notion that tech-
savvy, young, urban, and high-income groups were the earliest adopters of fintech services. Financial consumers are highly involved in the interactions between other fintech actors. For example, they are consumers of fintech start-ups, and TFOs; therefore, financial customer acquisition is important for the development of fintech start-ups and traditional financial organisations (Riemer et al., 2017). The feedback from financial customers is important in minimising the potential systemic risks in regulation and protecting their benefits (Tsai and Peng, 2017).

Government is the fourth important actor who is identified in the fintech industry studies. Edler and Fagerberg (2017) indicate that one role of government in innovation is to prevent market and/or system failure. Within existent fintech studies, many methods of how government intervention has evolved in the development of fintech have been considered including: standardisation (Romānova and Kudinska, 2016), legislation (Treleaven, 2015; Ivashchenko, 2018), making a strategic plan (Xu, and Xu, 2019), and issuing policies (Edler and Fagerberg, 2017). Government plays an important role in protecting the right of individual financial customers in the fintech industry; especially given the large numbers of financial customers involved in the financial sector. If government intervention to protect financial consumers is not sufficient, financial customers may suffer considerable financial losses. For instance, Ezubao, one of China’s most prominent P2P fintech start-ups, committed financial fraud in 2016. At that time, there were almost no specific regulations on P2P online lending platforms. The total number of defrauded investors was 909,500, and the total amount of money being illegally collected was around 60 billion RMB (Albrecht et al., 2017). Gai et al., (2016) have also focused on the close relationship between government and financial customers, such as privacy and securities issues.
They highlighted the significance of the financial customers’ protection by government.

Technology developer is the fifth fintech actor identified within existent fintech industry studies. Technology developers in the fintech industry provide technical services to fintech actors — for example, FNZ\(^4\) whose assets under management stand at over €700 billion, and which provides investment platforms as fintech services to TFOs, fintech start-ups, and individual financial customers. Onfido\(^5\) provides biometric identification technology to over 1500 customers and is vital in payment processes. Kavis (2014) designed the decision-process algorithm and categorised different types of cloud computing service models, including PaaS (Platform as a service), IaaS (Infrastructure as a service), and SaaS (Service as a service). In this context, FNZ belongs to PaaS, and Onfido is IaaS. The difference between fintech start-ups and technology developers is that the former mainly concentrates on financial services to financial consumers whereas the latter concentrates on improving technical infrastructure to all fintech actors.

The interactions among these actors that were introduced above were identified as the second important structural element and were attracted many scholars’ attention in the fintech industry studies. For example, Shim and Shin (2016) used actor-network theory to analyse the case of the fintech industry in China and disclosed the interactions among government, TFOs, and fintech start-ups. Furthermore, the interactions between TFOs and fintech start-ups have become more frequent due to the significant, even disruptive, impact of fintech innovation in the fintech sector.

\(^4\) https://www.fnz.com/about/
\(^5\) from https://onfido.com/company/about/
(Jagtiani and Lemieux, 2018; Chiu, 2016; Li et al., 2020). Moreover, Gimpel et al., (2018) and Setia et al., (2013) studied the interactions between customer-oriented fintech start-ups and financial consumers. By reviewing the literature, the research concentrating on the interactions between two or three actors is common in the fintech industry studies. However, it is relatively rare to see any research that has concurrently considered all five fintech actors and their interactions. This will probably cause lack of holistic understanding the fintech industry, especially on actors’ interactions.

The third structural element is the institution of the fintech industry. Fintech actors follow the rules of the financial market. The rules could be specific laws, regulations, standards, invisible norms, culture, or traditions. In this research, the rules which are related to the fintech sector are termed as fintech institutions. This study investigated the different types of fintech institutions in existent fintech studies. It was found, for example, that Hamdan and Anshari, (2020) and Daqar et al., (2020) had analysed the new norms of young financial consumers behaviours on adapting to fintech products and services using fintech innovation, and how new issued laws and standards can affect the behaviours of the young financial consumers. Fintech institutions can influence the regulatory arbitrage, the emergence of shadow banks, the development of technology-enabling regulation, and forming of self-regulation in the fintech industry (Xiang et al., 2017).

Fintech institution is important for the development of the fintech industry. The fintech infrastructure, which is the fourth structural element of the fintech industry, is highly related to the fintech institution and important in the fintech industry studies as
well. For example, in 2014, the Singapore government planned to promote the fast payment infrastructure to realise instant payment services through the fast system application. Singapore started to build a public payment infrastructure — Paynow. Based on mobile phone I.Ds and I.D. card numbers, users can pay a bank account with their mobile phone number and I.D. numbers and only need a cell phone to do the payment and transfer. Singapore government developed fintech institutions by further technical standardising for infrastructure construction (Iwasaki, 2018).

At the end of 2017, the Monetary Authority of Singapore launched the technical standards of SQQR (Singapore QR code) to promote the unification of Q.R. code standards in the payment industry (Soon, 2008). Through this innovation, consumers would be able to use the same Q.R. code no matter which enterprises’ apps they were using. The infrastructure construction of public payment infrastructure related to merchants was developed by referring to the new standards of unified Q.R. codes. Although the penetration rate of banks in Singapore is very high, some vendors are reluctant to accept credit card payments because of their high charges. Singapore currently adopts a new standard to provide almost free payment network infrastructure and reduce the cost of online payment. Besides, the Singapore government built a my-info public data platform under new technical standards. The government initiated this public infrastructure to integrate the data stored by various relevant government agencies, which broke the data barrier and provided detailed data support for banks and other financial organisations (Lin, 2019; Fan, 2018).

In addition to the example in Singapore, much research related to the fintech institution and fintech infrastructure has been undertaken. The Chinese government
issued the national fintech development plan and through so doing indicated the importance of standardisation and regulation in fintech infrastructure construction in the future (Kukreja, 2021). The Thai government has also actively promoted the construction of relevant infrastructure. The Thai government implemented the national master plan for electronic payment in 2016, which involved new regulations and standards in fintech infrastructure constructions (Kijkasiwat, 2021).

The regulation of the structural elements of the fintech industry mentioned above is concentrated in this thesis. Fintech regulation studies is the third field of existent fintech studies. Within that literature, the importance of fintech regulation on the development and improvement of fintech is highlighted by many scholars including Gai et al., (2016), Ng and Kwok (2017), and Arner (2015). There are practical examples of fintech regulation in different countries. For instance, the governments of the US implemented the regulatory framework of double-layer (state, federal) and multipolar (many regulatory institutions), which is designed for risk controlling (Gerlach et al., 2016), whilst the governments of the U.K. and the Singapore governments attempted to use technological innovation such as regtech, regulatory sandbox, and innovation centre, (discussed in Chapter Two) to regulate fintech (Goo and Heo, 2020; Chen, 2020).

However, policy instruments research is rare within existent fintech regulation studies. Regulation is seen as one of the policy instruments (Borras and Edquist, 2013). Edler and Fagerberg’s (2017) highlighted the importance of policy instruments’ research in innovation fields. To better understand fintech regulation from a policy instrument view, this study also introduces the concept of policy instruments, and concentrated
on the relations between policy instruments and fintech. To be specific, this study reviews the fintech regulation studies related to the policies instruments roles in the four structural elements (actors, interactions, institutions, and infrastructure) of the fintech industry respectively.

Three types of policy instruments can be identified from the fintech regulation studies: economic and financing policy instruments, regulatory policy instruments, and soft policy instruments. The roles of policy instruments on the fintech industry and fintech regulation were various. However, most research specified the policy instruments’ roles in only one or two structural elements and tends to be static. The research involving all four structural elements of the fintech industry is still rare and how policy instruments dynamically affect the fintech industry through the four structural elements still remains unexplored in the fintech research. To better understand the fintech industry and fintech regulation, this research aims to fill this knowledge gap. The following section will introduce the research aims and questions.

1.2 Research aims and questions

In making a unique contribution to the furtherance of existent academic knowledge, by revealing how different policy instruments affect the fintech industry through the four structural elements of the fintech industry (actors, interactions, institutions, and infrastructure). In addition, the research addresses gaps with regard to regulation and also broadens understanding of the role of policy instruments in the fintech industry.

The overall research objective of this research is:
To understand the mechanisms of how policy instruments dynamically affect the fintech industry through fintech actors, interactions, institutions, and infrastructure.

The resultant primary research question that is answered by this thesis is:

**RQ. How do policy instruments affect the fintech industry dynamically?**

In addressing this primary research question, two additional sub-questions are also answered. Namely:

**SQ1. What are the fintech actors, fintech interactions, fintech institutions, and fintech infrastructure?**

**SQ2. How do policy instruments dynamically affect fintech actors, fintech interactions, fintech institutions, and fintech infrastructure?**

In addressing these questions, an analytical framework was developed. First, and with regard to reviewing existent literature, the fintech development stages were divided to enable dynamical consideration of the structural elements of the fintech industry and the effects of policies by the policy instruments. The three stages are: the initiation stage, the growth and problematisation stage, and the improvement stage. Then, the FTIS (fintech innovation system) framework was developed based on the System of Innovation framework (SI) developed by Ho and O'Sullivan (2019). The FTIS framework guides this study to identify the questions above what the specific fintech actors, interactions, institutions, and infrastructure are in fintech innovation system in each development stage (SQ1), and assist to understand the how policy instruments
affect each structural element in each fintech development stage (SQ2). Integrating the answers of SQ1 and SQ2, the main research question will be answered.

1.3 Research design

This research adopts Critical realism as its research approach. Critical realism is one of the critical research approaches in Tsang’s (2014) classification. Critical realists believe that the flux of events is caused by the continual operation and interactions that occur between mechanisms. The reasons why critical realism was used are as follows. Critical realism enables the identification of causality through shaped structures and mechanisms (Mingers et al., 2013). The study focuses on the mechanisms that generate events, processes, and phenomena instead of the regularity of observable empirical events, which is positivism (Blaikie, 2007). Therefore, critical realism is a suitable approach for identifying and analysing the dynamic process and mechanisms of how policy instruments affect the fintech industry, which will be detailed in Chapter 4.

Retroduction is adopted as the research strategy. Induction, deduction, retroduction, and abduction are four reasoning methods relating to research strategy and suitable combinations of research strategies provide the well-designed implementing of research (Blaikie, 2007). Retroduction helps to generalise theories through observing and measuring events or even though it believes the reality and events exist objectively (Mingers et al., 2013). Therefore, critical realism and retroduction are suitable as for this research. Under the critical realism research approach and retroduction as research strategy, this thesis developed an analytical framework first and then apply it to actual fieldwork to identify and then analyse the mechanisms and
causal explanations of how policy instruments affect the fintech industry by actors, interactions, institutions, and infrastructure.

An in-depth qualitative case study was used as the research method in this thesis. Qualitative research methodology provides an actual view that can construct a framework which demonstrates basic assumptions and predictions (Patton, 1990). Compared to quantifying a policy instrument’s impact on the fintech industry, the main advantage of qualitative research to this study is that it enables realisation of the processes leading to results, while experimental research is usually challenging to obtain (Maxwell, 2012). Exploratory and explanatory qualitative research is suitable in this research because case study is the most suitable qualitative research method to the how type of research question, compared to others such as experiment, archival analysis, history, and the investigator has no control over behavioural events (Yin, 2012).

The case setting is China’s fintech industry in this research, which satisfies the requirement of the case setting criteria proposed by Yin (2012) as a critical, unique, extreme, and revelatory case. 79 official policies, 52 documents from the state council official website, 6 effective regulations and laws, and 180 reports related to fintech, financial technology, internet finance, and other technology-driven finance were collected. Fieldwork was conducted from 2019 to 2021, and 35 semi-structured online interviews were conducted. The interviewees were comprised of official staff from fintech start-ups, TFOs, governments, and technology developers, as well as individual financial consumers. The interview data was analysed in a triangulated matter alongside the data collected from the literature and documents.
1.4 Findings and contributions of this research

In this case study, the development stages of China’s fintech industry was divided as: the initiation stage from 2003 to 2012, the growth and problematisation stage from 2013 to 2017 and the improvement stage from 2018 to present. The year’s division is in line with the views of most interviewees and is consistent with the collected literature and documents. Each stage of China’s development will be analysed from chapter 5 to chapter 7 in this thesis. To answer the SQ1. “What are the fintech actors, fintech interactions, fintech institutions, and fintech infrastructure?”, this study first identified the structural elements of the China’s FTIS at each stage by following the analytical framework. Then it investigated how policy instruments affect fintech actors, fintech interactions, fintech institutions, and fintech infrastructure in each stage, which leads to the answer of SQ2. “How do policy instruments dynamically affect fintech actors, fintech interactions, fintech institutions, and fintech infrastructure?”. 

In discussion chapter, the case study will be reviewed and then summarised how each structural element was affected by fintech-related policy. Integrating this and the answers of SQ1, and SQ2, six roles of policy instruments dynamically affecting the fintech industry through the four structural elements is summarised, which leads to the answer of main research question how policy instruments affect the fintech industry dynamically. The six roles of policy instruments are the regulatory policy instruments’ role in (1) establishing and developing the fintech regulatory institution and (2) standardising the fintech infrastructure, economic and financing policy instruments’ role in (3) providing financial and technical support to fintech actors and (4) public procurement on fintech infrastructure, soft instruments’ role in (5) promoting and sharing industrial information, and (6) strengthening self-regulation.
The research findings contribute to the fintech industry and regulation studies. This research findings support, supplement, and argue the existing fintech research based on the clarified six policy instruments’ roles in the fintech industry through the four structural elements and provided a new lens to understand how different structural elements changes in the fintech industry. This thesis made unique contributions to the knowledge of controlling risks in the fintech industry, the position of fintech infrastructure in fintech regulation. Moreover, this research also suggests the use of FTIS framework in the fintech studies.

In terms of the practical implications from this research, there are three points to the policy-makers and practitioners in the fintech industry. The research identified the importance of the appropriate choice of policy instruments in different stages of fintech development, which could profoundly influence the risks in fintech industry on different stages. Second, the importance of in-time evaluating policy instruments roles is stressed for reducing the unexpected policy instruments’ roles and risks. Third, the research findings indicated that continuous economic and financing policy instruments support for fintech infrastructure is an essential factor in bringing huge benefits to the development of the fintech industry. At last of the thesis, the limitations of this thesis and the directions of the future research is given.

1.5 Thesis structure

Comprised of nine chapters, the structure of this thesis is as follows.

Chapter 1 is the Introduction. It provides a background to financial technology
(Fintech) and the focus of this research is introduced. The research aims and research questions are given, as is the research design. The study’s research findings and contributions are summarised, and the structure of the thesis noted.

Chapter 2 is the Literature Review. This chapter aims to identify the literature gap and develop the research questions by review the existing fintech studies. The studies of fintech innovation, fintech industry, and fintech regulation are reviewed. Basic concepts of fintech innovation is provided for better understanding fintech research. This research focuses on the fintech industry and fintech regulation studies, and this study introduces the concept of policy instruments for further understanding fintech regulation. This study reviews fintech regulation literature related to how policy instruments affect the four components of fintech industry; however, there are still remaining unexplored gaps in the existing studies. Based on this, this study develops a research question to fill the gaps. Two sub-research questions will be raised as well.

Chapter 3 is the analytical framework. First, by reviewing fintech literature, this study divides the development stage of the fintech industry as: the initiation stage, the growth and problematisation stage, and the improvement stage. Then, Fintech Innovation System framework (FTIS) is developed, which is adapted from the System of Innovation (SI) framework (Ho and O’Sullivan, 2019). FTIS framework consists of four fintech industry elements: fintech actors, fintech interactions, and fintech institutions and fintech infrastructure and help to guide this research. This study will investigate what structural elements existing at each development stage, and analyse how policy instruments affect each structural element respectively. This study tries to understand the mechanism of how policy instruments affect the fintech industry by
integrating the individual results.

Chapter 4 is the methodology. This chapter contains the research approach, research strategy, research methods, case setting, data collection, data analysis, validation assessment, and ethical consideration. This study adopted Critical realism as the research approach and the case study research method is applied in this research. The fintech industry in China is selected as the case.

Chapter 5 to Chapter 7 are the case study. Case study presents the data results of three development stages of China’s fintech industry respectively: the initiation stage, the growth and problematisation stage, and the improvement stage.

Chapter 8 is the discussion part of the research. Based on the case study, the research question is answered. In addition to the six roles of policy instruments on the fintech industry, three more roles will be additionally discussed by comparing the research findings and existing fintech studies. Each of policy instruments roles contributes to both studies of the fintech industry and fintech regulation and enlighten policy and fintech researchers.

Chapter 9 is the conclusion. There are a review of this research and a summary of research findings. Theoretical contributions and practical implications will be summarised based on the research findings. The last of this chapter is a summary of the limitation of this research and the expectations in the future research.
CHAPTER 2 LITERATURE REVIEW

This chapter is comprised of six sections. The overall objective of this literature review is to identify the knowledge gap in fintech research and develop the research question of this research. Section 2.1 provides a definition of fintech. Thereafter, section 2.2 introduces three basic concepts in fintech innovation studies. Section 2.3 concentrates on fintech industry studies and identifies the four important structural elements that are found within existent literature. Section 2.4 introduces the fintech regulation studies. Then, section 2.5 is a summary of the roles of various policy instruments and resultant research gaps. At the last of this chapter, section 2.6 develops research questions of this research.

2.1 Definitions of fintech

As early as the 1970s, the financial sector started to use computers in their financial services. The term fintech was first introduced by Bettinger in 1972, who defined fintech as a combination of the financial industry and information technology. In the 1990s, the development of the internet led to the development of e-finance which incorporates online banking, online insurance, online securities trading, and other financial services (Allen et al., 2002). The ways of delivering financial products and services started to change as a consequence of the expansion of internet technologies. The suppliers and users of financial products and services benefited from the use of the internet in terms of lower operating costs, shorter working hours, more timely information management, more transparent internal organisational communications, and more convenient interactions with customers and services (Nielsen, 2002; Sathye, 1999). In the 2000s, mobile banking emerged. Most financial organisations around the world started to distribute access to bank account information to financial markets.
Technology has dramatically reduced the barriers to entry into financial markets (Pollari, 2016). At the same time, many financial services companies have been established. In recent years, with e-finance and mobile technology developments, more fintech innovations have emerged; examples of the same include: crowdfunding, P2P online lending platforms, cloud-computing services, cryptocurrency, and blockchain technology. Complicated problems and various topics in fintech development have attracted much attention from scholars, but the definition of fintech is still ambiguous (Sangwan et al., 2019; Schueffel, 2016).

One definition is that fintech encompasses traditional financial service that are embedded with new IT applications. Dorfleitner et al., (2017) have alternatively suggested that fintech applications are essential for providing modern and innovative financial services and that they are a pre-requisite component of fintech start-ups. Lerner and Tufano (2011) further complicate definitional considerations by their suggestion that fintech as a financial instrument has been enabled by information technology. Namely, fintech encompasses traditional financial service that are embedded with new IT applications. The financial side of fintech is concentrated more in its definitions.

Some scholars refer to fintech as the application of information technology in the financial sector (Zavolokina et al., 2016). This view stresses the technology perspective of fintech and is different from other definitions that stress the financial perspective of the concept. Commenting further, Schueffel (2016), and Chishti and Barberis (2016) concluded that there are three types of fintech in payment services. These are: mobile payments, digital currency, and distributed ledger technology.
(DLT). However, DLT is a kind of technology, and its applications in financial services are recognised as fintech corresponding to Zavolokina et al's (2016) definition.

Furthermore, many new forms of technology have come to be used in the financial sector in recent years; examples include: big data used in financial analysis, lending platforms, cloud computing in financial services, AI insurance, and investment advisory (Lagarde, 2018). Maier (2016), Hawser (2017), and Sinha et al., (2018) studied how technology developers develop IT for fintech start-ups or financial organisations and how IT has improved the efficiency of financial services and promotes more inclusive finance.

This thesis suggests that defining fintech as the application of information technology in the financial sector is more helpful to garnering an understanding of new fintech innovations in recent fintech research than recognizing fintech as financial services which are embedded with IT. Accordingly, it is the former definition that is adopted for use throughout this thesis.

Further complicating considerations of definitional matters is the fact that the nature of fintech can be seen to be slightly different depending on the individual environments of different nations (Bromberg et al., 2018). For instance, the definition and meaning of fintech in the Chinese context are slightly different due to the progress and nature of the country’s development process. It follows, ceteris paribus, that it is essential to briefly explain the definition of fintech within the Chinese context in this research. In addition to the fintech in Chinese, which is the same
meaning as the previous definitions, there is also a widely used term in China that describes the boost to the financial industry that has occurred as a result of enhanced usage of the internet, internet finance. In the subsequent case study, the concepts of fintech are applied in such a manner so that it includes and incorporates the concept of internet finance as shown in existent Chinese literature.

2.2 **Key concepts in fintech innovation studies**

Fintech research is still embryonic (Gai *et al.*, 2018). Existent academic research papers on fintech can generally be divided into fintech innovations, fintech industry, and fintech regulation studies. This research focuses fintech industry studies and fintech regulation studies. Through reviewing fintech innovation literature, this section explains why fintech innovation studies are not focused in this research.

Most importantly, it was found, through the research undertaken for this project, that fintech innovation studies tend to stress the hardware side of fintech and have limitations when it comes to analysing the relatively integrated nature of the fintech industry and fintech regulation. For example, Gai *et al.*, (2018) collected and reviewed contemporary achievements of fintech for an accurate and up-to-date awareness of fintech for scholars and practitioners. They proposed a fintech framework and provided five technical aspects: security and privacy, data techniques, hardware and infrastructure, applications and management, and service models. Their framework explicitly demonstrates how fintech works as a technology and they also comprehensively analysed its mechanisms. However, the impacts of fintech as technology represents just a hardware aspect of fintech, and there is a limitation to understanding the fintech industry by just analysing the technological aspects of
fintech innovations. For another example, Chiu (2017) believes that fintech innovation is a kind of disruptive innovation that can render rapid changes. In such cases, the disadvantaged user group can be excluded entirely from sharing the benefits of a given innovation. Regarding payment innovations, Chiu identifies three potential areas of disruption: the replacing of traditional currencies with virtual currencies, the replacing of traditional cash and cards with fintech payment applications, and the replacing of traditional clearing and settlement systems with new ledger technologies. Chiu also analysed the potential risks that fintech could bring - as a disruptive innovation - to the industry from a technical point of view. He concluded that new disruptive fintech will significantly influence traditional financial services, and mentioned that the ways of disruptive fintech innovations influence specific fintech actors (except for traditional banks) and their interactions. However, how the disruptive fintech innovations influence other elements like institutions, or infrastructure is still missing in their current research.

In fintech innovation literature, the ways in which disruptive fintech innovation influence traditional banks are richly described. For example, Dhar and Stein (2017) view fintech as a combination of technologies and processes for potentially disruptive innovators. Loan and deposit services are at the core of retail banking and wholesale-level commercial banking; both can show the impact of fintech innovations. This is because fintech innovations such as online payment, and online platforms can significantly improve the efficiency of the loan and deposit services and lead to gain financial consumers. In addition to the banking service, the fintech innovation also improves the communication within the organisations, and the financial consumers. However, such shifts also pose a considerable challenge to bankers because fintech
start-ups provide new P2P loans services to many financial customers who lack a credit base, which form competitions between banks and fintech start-ups on lending services. Fintech actors include not only bankers but also fintech consumers, fintech start-ups, and so on. Therefore, further fintech industry research is needed to further consolidate and expand knowledge as to its implications in this specific arena.

There are different forms of fintech innovations and three of its forms are the primary focuses of this research: online payments, online lending platform, and blockchain. There are some reasons to mention these three concepts in this research. First, compared to other fintech, online payments, online lending platforms, and blockchain are fundamental in many financial services in different stages of fintech development. Commenting further, Arner et al., (2015) stressed the importance of online payments and online lending platforms in the early stages of fintech development. Understanding blockchain can also be used to reveal the potentials and uncertainties of fintech in the future. Rainer and Puschmann (2016) divided the evolution of the digitisation of financial services industry into five phases and the significance of online payments, online lending platform, and blockchain were each noted in their research. Therefore, elaborating on these three basic fintech innovations is crucial to understanding fintech development and this thesis.

2.2.1 Online payments

Online payment significantly increases the efficiency of financial transactions. Online Payments have been developed (and have also expanded in their scope) since the emergence of e-finance. The advantages of online payments, compared to traditional payments, are widely studied in fintech innovation studies, and one of the popular
topics worth understanding about online payment in fintech development is that online payments can help fintech start-ups and traditional financial organisations acquire financial customers more efficiently and effectively than before (Sadeh, 2003; Pousttchi et al., 2009; Zolnowski et al., 2014).

Online payments are also differentiated according to different financial customers. At the initial development stage of fintech, the online payment can be divided into two models, including the market-facing to individual financial consumers (B2C) (Gefen, and Straub, 2003, 2004; Devaraj, 2002; Dowling, 2002) and retailers and the market-facing to the wholesale or public procurement (B2B) (Timmer, 1998; Kaplan and Sawhney, 2000). Based on the different concentrations on the online payment market, initial fintech innovation is stimulated and created almost real-time payments system with mobile wallets and digital solutions related to currency exchange. Financial customer satisfaction to financial activities experience is increased with the improvement of easy access and payment approaches (Like NFC, QR, Face payment) (Li, 2016).

2.2.2 Online lending platforms

Customer-to-customer (C2C) and peer-to-peer (P2P) online payments emerged with the development of the online platform. Online lending platforms were established based on online payment technology, and enabled multiple payment services to be conducted in real-time. With the development of online lending platforms, the virtual communities were emerging (Timmer, 1998). The interactions between different fintech actors involved in the online lending platforms become more complicated than the single online payment transaction (Diniz et al., 2016). Almost all online lending
platforms are embedded with online payments. Of them, P2P financial services have developed rapidly in recent years. It provides a platform for individual fintech consumers to lend money to each other. In addition to currency, many other items can be lent through different kinds of online platforms such as crowdfunding platforms.

Online lending platform had a significant impact on the financial industry. First, during the early stage of fintech development, online lending platforms were less regulated than financial transactions that took place traditional financial organisations such as banks and securities, and the online lending platforms require a relatively lower qualification review process and lower platform cost to gain financial consumers and provide high lending process efficiency (Klaftt, 2008). This created competitive advantages for fintech start-ups who engaged in online lending platform-related business. Second, the high risk of increasing online transactions between individual fintech consumers is hidden behind online lending platforms (Bachmann et al., 2011; Yum et al., 2012; Ahern, 2018). The emergence of online lending platforms brought more uncertainty than traditional transactions to the financial service industry (Yan et al., 2015), and the problems of information asymmetry and credit risks are more significant than ever before (Ahelegbey et al., 2019). Understanding these basic concepts of online lending platform will promote understanding of fintech industry and fintech regulation.

2.2.3 Blockchains

Blockchain is distributed ledger technology (DLT) which is a shared database that can store data and information with traceable, open and transparent, immutable characteristics (Nofer et al., 2017). The composition which includes block, chain,
hash, algorithm, timestamp, determines the characteristics of a blockchain. A block is used to store the data created by users. Each block is generated every ten minutes and they are then attached to the chain, which is linking all blocks generated before. The function of the hash algorithm is to generate hash value from data (input), and the hash value is usually represented by a short string of random letters and numbers. The nature is that it is easy to calculate output but nearly impossible to induct input based on existing output. The Hash algorithm and timestamps guarantee that the data is immutable and traceable (Di Pierro, 2017).

The characteristics of blockchains can provide solid trust fundamental to the financial industry, and blockchain applications are utilised in many areas such as smart contracts, supply chain management in logistics, smart cities in urban construction, personal identification, cyber securities, and preventing crimes in governance. Bitcoin is one of the most famous uses of blockchains (Scharding, 2019). Swan (2015) highlighted the natures of blockchain uncertainty, especially for its innovative disruption to the financial industry. Zheng et al., (2018) commented on the potential challenges and future directions of blockchain research, and the uncertainty of blockchain was one of them. For example, the systems embedded with blockchain technology can possibly enhance or reduce the trust of users towards the economic or regulatory fintech systems (Lindman et al., 2017). Before reviewing the fintech industry studies, it is important to understand that the fintech innovation such as blockchain could significantly, or negatively in some cases, impact on the financial industry and its development. Regulation on fintech innovation is needed to control the potential risks from the fintech innovation.
2.3 Fintech industry studies

This section introduces fintech industry studies. Jagtiani and Lemieux (2018, 2019) strengthened the significance of analysing the fintech industry in fintech research. Four important topics were summarised to review the fintech industry studies: financial market scale, financial customer acquisitions, enhanced competition, and controlling risks.

This section stresses the importance of identifying the components of the fintech industry, and it found that four essential fintech elements exist in the fintech industry studies, including fintech actors, fintech interactions, fintech institutions, and fintech infrastructure. Before reviewing fintech regulation studies, introducing the four structural elements is necessary to understand the fintech industry and fintech regulation in detail. Otherwise, there will be a lack of specific perspective to summarise the fintech regulation studies.

The first field of the fintech industry studies is the financial market scale. Fintech influence the financial markets scale in different ways. Navaretti et al., (2018) believe that fintech has improved banking operations’ overall scale and efficiency from a technical perspective. Guild (2017) indicated that fintech promotes economic growth by meeting the needs of participants in financial business. Gomber et al., (2017) demonstrated that fintech helps to achieve inclusive finance. Jagtiani and Lemieux (2018) found that loans from fintech companies have covered areas that banks cannot. Fintech companies sometimes can provide financial services to SMEs which cannot satisfy the lending criteria of traditional banking (Lu, 2018). In addition, fintech is one of the crucial factors, like other traditional information technology, driving down loan
interest rates, and thereby further lowering industry access for financial consumers (Zetzsche and Dewi, 2018; Jagtiani and Lemieux, 2019). Fintech significantly cuts loan processing times and improves credit reputation analysis efficiency, thereby enabling loans to be acquired more quickly (Odinet, 2017). Fintech has also accelerated the digitisation process and decreased the cost of information processing.

The second field is financial customer acquisition. Fintech significantly promotes financial customer acquisition by fintech start-ups and traditional financial organisations. Due to the advantages of fintech innovations, fintech start-ups and traditional financial organisations are granted unprecedented capabilities with regards to financial customer acquisition, and this can further improve their fintech business (Riemer et al., 2017).

Financial customer acquisition has led, for traditional financial organisation, to the problem of high switching cost. The proliferation of fintech services has brought more customers and capital to the fintech industry, especially for improving fintech infrastructure. As a consequence of improved fintech infrastructure, client databases are invested in, and utilised by, traditional financial organisations to organise their client information and develop their competitive advantages against fintech start-ups. Fintech start-ups and traditional financial organisations need to gain and retain financial customers to control their cost (Vives, 2017). High Switching cost of fintech infrastructure is one of the reasons why traditional financial organisations have lost their advantages to fintech start-ups in term of financial customer acquisition (Hau et al., 2019; David and Slomka, 2015).
The third field of fintech industry studies is about enhanced competition in fintech industry. With increases in scale, many fintech actors have been attracted into the fintech industry, and at the same time, the participation of fintech actors has intensified competition between fintech start-ups and traditional financial organisations (Jagtiani and Lemieux, 2019). Many banks use fintech to conduct traditional financial services via mobile devices and this change also stimulates the demands of fintech and opens up markets for non-bank companies to provide financial services (Abdillah, 2020). To be specific, the high efficiency brought about by emerging fintech has also significantly impacted traditional industries and traditional financial services. Commenting further upon this, for example, Gozman and Willcocks (2019) found that the application of cloud technologies has provided many convenient functions for fintech services, including: the establishment of user platforms, cloud storage of big data, and so on. At the same time, these new practices have also impacted traditional-model banking participants. However, Jaksic and Marinc (2019) argue that fintech innovations have not critically impacted traditional models because traditional financial organisations have more competitive advantages over new fintech companies, and traditional financial organisations could continue focusing on traditional services and enhancing competitive advantages by deploying new technologies step by step. To fintech companies and traditional financial organisations, facing enhanced competition, they need to concentrate more on their performance analysis, financial management, and client management, improving the financial industry service standards (Hatzakis et al., 2010).

The enhanced competition could be positive and harmful to the entire industry. There are various financial products and different kinds of fintech innovations that exist in
the fintech industry. Even though applying advanced technologies such as machine intelligence (ML) or artificial intelligence (AI) to fintech innovation will positively improve efficiency directly in the transaction, such as lower cost for cross-border transaction services; Adomavicius et al., (2018) argued that the advanced technology could reduce humans’ participation in financial services and enhance the competition in the fintech industry, which could negatively impact on fintech actors. Many scholars claim that fintech enhances the fintech industry’s competition, mentioned the uncertainties and risks of fintech can also negatively affect the development of fintech industry (Chuen, 2017; Chuen, 2018; Panisi, 2017; Cai, 2018; Chen et al., 2019), which connects to the fourth topic of fintech industry studies.

The fourth field is controlling risks in the fintech industry. A more extensive financial market and enhanced competition have brought more risks to the fintech industry. The increasing number of fintech start-ups has impacted the existing market led by traditional financial organisations. Fintech start-ups use online lending platforms as a technology base, generating a channel conflict and threat to physical bank branches (Lai and Order, 2017). It supports the Campbell and Frei’s (2010) research on the transition from physical banking to online banking and the adoption of the latter by traditional financial organisations. In their opinion, this transition will lead to the changes of financial services channel and the previous conventional financial services. It is an opportunity for them to remain customers long-term, which supports the switching cost theory as reviewed before. Some physical banks suffer from competition with fintech start-ups. Because fintech innovation has changed the financial customers’ behaviour from offline to online; therefore, offline physical banks need to burden increasing operation costs to decrease financial customers,
leading to higher risks. The adaptation process of banks to the enhanced market competition is required to be shortened to handle its risks created by channel conflict and threats by fintech start-ups (Iman, 2019).

Shadow bank is another potential risk in the fintech industry and attracted scholars’ attentions. It utilised bank loan securitisation to expand credit unlimitedly. Based on securitisation, non-banking financial institutions seem like conventional credit banks that can perform traditional bank functions. To some extent, shadow banks successfully meet the specific needs of fintech customers (Buchak et al., 2018). The problem is that the regulatory requirements of shadow banks are substantially lower (or do not exist) compared to those that govern conventional banks which have given rise to the systemic risks that is existing in the shadow bank model (Adrian et al., 2013). Shadow banks created in the developing fintech industry leads to potential risks. It follows that fintech regulation is needed to regulate the fintech industry and control the risks.

In the following four sections, four identified essential elements in fintech industry studies are organised and defined. How fintech elements were analysed in fintech industry studies will be specified before reviewing fintech regulation studies.

2.3.1 Fintech actors

There are five fintech actors in the fintech industry. In this section, the five fintech actors will be defined. The first is fintech start-ups. Fintech start-ups are new companies that specialise in combining new technologies with financial services to benefit financial consumers. Fintech start-ups have tried to drive significant
innovations in payments, wealth management, loans, crowdfunding, capital markets, and insurance by reducing operating costs, targeting more market segments, and offering more personalised services than traditional financial service companies (Puschmann, 2017). Fintech start-ups aim to promote their financial services and this, in turn, enhances competition between them and traditional financial organisations (Lee and Shin, 2018). The diversification of financial services is one of the main drivers of the growth of the fintech industry. This has put traditional financial organisations at a disadvantage. This is because instead of relying on a single financial organisation to meet their needs, financial consumers have begun to choose the services they needed from various fintech start-ups. For example, a consumer can manage his/her loan through SoFi, one of the most prominent fintech start-ups engaged in the internet loan business. While fintech start-ups focus on other fintech innovations, such as crowdfunding and P2P lending, more traditional IT and e-commerce companies have also started to be benefited from the workings of the finance industry (such as IBM, Tata, Apple, Amazon and Alibaba). It means that more traditional IT companies started to participate in the fintech industry.

The second fintech actor is defined as technology developers, referring to those providing sharing platforms and technology infrastructure for the financial industry, including big data analytics, cloud computing, artificial intelligence, smartphones, and mobile services. Their technology and infrastructure provided fintech start-ups with hardware fundamentals to launch innovative financial services. Developed fintech infrastructure significantly reduces the cost of deploying initial services, especially for fintech start-ups (Arner et al., 2016). Big data analytics can provide start-ups with tools to analyse customers’ behaviour, enabling them to provide more personalised
services to customers, while cloud computing provides traditional fintech organisations with enormous computing power to provide web-based services to customers. (Cerchiello, and Giudici, 2016). Algorithmic trading strategies can be used to predict the behaviour or habits of individual customers, thus providing more accurate and personalised services like big data analysis. It can be widely used in financial services to provide advisory services. Social media is one application that uses algorithmic trading strategies and has promoted community development in crowdfunding and person-to-person lending services (Fanning, and Grant, 2013). With the popularisation of mobile devices, traditional infrastructure are gradually being shifted from offline to online. The emergence of the mobile network further reduces infrastructure cost and provide more convenient services such as mobile payment and mobile banking. Technology developers are making much profit due to the massive demand for technology applications in the fintech industry (Lee, and Shin, 2018).

The third fintech actor is government. Governments in many countries have established specific regulatory environments for fintech development (Frost, 2020). Through the adoption of national economic development plans and economic policies, the governments of various countries have regulated fintech actors to varying degrees (such as financial service licensing, relaxed capital requirements, tax incentives, and so on.) to stimulate fintech innovation and development, and enhance their global financial competitiveness. Singapore, for example, is changing its rules on online payments to make it more provider-friendly and spur the development of payment technology. In addition, traditional financial organisations such as banks, securities, and the insurance industry have been subject to stricter regulation, capital
requirements and reporting requirements by government regulators. Regulatory requirements significantly influence fintech actors’ activities and development (Castro et al., 2020). For example, lax regulatory requirements for fintech start-ups allow them to offer consumers more personalised, cheaper and more accessible financial services than traditional organisations.

The fourth actor is fintech consumers. The revenue for fintech start-ups is mostly derived from individual customers and small and medium-sized enterprises (SMEs). According to a survey by Carlin et al. (2017), the usage rate of fintech services was the highest among young and affluent customers. The early adopters of fintech were often tech-savvy, young, urban, and high-income groups. Currently, millennials (those between the ages of 18 and 34) make up a significant portion of fintech spending in most countries. Tech-savvy millennials will account for the largest share of the world’s population in coming decades and they will drive the growth of Fintech services (Anand and Mantrala, 2019; Lee and Shin, 2018; Zalan and Toufaily, 2017).

The fifth fintech actor is traditional financial organisations (TFOs) in the financial industry include banking, securities and insurance. TFOs are a major driving force of the fintech industry. As discussed previously, TFOs need to re-evaluate their services and strategies for enhanced competition against fintech start-ups. TFOs will face direct competition from fintech start-ups, so fintech start-ups is also a threat to the development of TFOs (Dany et al., 2016). TFOs have an advantage over fintech start-ups in terms of economies of scale and financial resources. However, according to Lee and Shin (2018), they tend to focus on bundled services and provide consumers with one-stop integrated financial products and services rather than unbundled
professional products and services, which may lead to high switching cost. While TFOs initially regarded these fast-growing fintech companies as a threat, they tend to shift their focus to working with fintech start-ups with various funding rules (Shim and Shin, 2016). In exchange for providing funding, they can leverage the insights of these start-ups to stay ahead of the game in terms of technology.

2.3.2 Fintech actors' interactions

The interaction between actors is another focus of existent fintech industry literature. How fintech actors interact with each other is essential to understanding the fintech industry.

In the fintech context, there is still no consensus on the types of interactions. Within existent literature, scholars have tried to categorise actors’ interactions. For example, Edquist (2010) listed three types of interaction: competition, transaction, and networking. There are lots of descriptions of interactions in the ecosystem theory which contains different theories, including Mitleton-Kelly’s (2003) social ecosystem, Moore’s (1993) business ecosystem, Iansiti and Levien’s (2004) business ecosystem, Power and Jerjian’s (2001) business ecosystem and other contributions. They classified actors as keystone, dominators, and niche players, and actors’ interactions are described as the following four relationships: competition, cooperation, parasitism, and symbiosis. Co-opetition was later used to demonstrate the interactions and relationships that exist between different actors (Moore, 1993; Anggraeni et al., 2007; Peltoniemi and Vuori, 2004). It is helpful to understand the interactions between the various actors’ interactions, especially for interactions between TFOs, technology developers and fintech start-ups in fintech research. There is a pre-requisite need to
identify the interactions of different fintech actors.

The banking industry faces competition against fintech start-ups due to disruptive innovations such as the more internet-based financial solutions conducted by fintech start-ups. More customer-oriented and user-friendly digital applications are chosen by financial consumers and have become new principles for designing financial services (Xin et al., 2010). Fintech start-ups are relatively deregulated compared to TFOs (Arner et al., 2015). Thus, fintech start-ups have more opportunities to develop new fintech innovations and financial services using new technologies (Gozman et al., 2018; Wonglimpiyarat, 2017). In response to this threat, many traditional banks have formed strategic alliances with fintech start-ups. For example, Alipay has reached an understanding with many Chinese banks to improve China’s online payment system (Shim and Shin, 2016). Sometimes, when banks pursue a digital strategy and hire a chief digital, they are more likely to form alliances with fintech start-ups (Klus et al., 2018).

Cooperation is a foundation of fintech actors’ interactions. Capgemini (2018) stated that most fintech start-ups fail if they do not establish partnerships with other participants in the fintech industry like banks and entrepreneurs. This is because partnerships can pool resources and benefit from lower costs (Davis et al., 2016; Gimpel, 2018; Shim and Shin, 2016). Partnerships with TFOs will benefit fintech start-ups by solving service distribution issues and may also even make their core service competitive in the marketplace (Verhage, 2018). Through financial products and services, fintech start-ups, technology development, and TFOs interact more frequently with financial consumers than before. Most of the interactions between
them are caused by terminal products and services, including product and service supply and demand issues, data management issues, privacy security issues, and so on (Vezzoso, 2018; Gai et al., 2018). This also causes the potential risks due to the high frequency of financial transactions online (Cao et al., 2019). Therefore, understanding the interactions among the fintech start-ups, technology developments and TFOs is important in fintech industry and regulation studies, and this thesis as well.

Many scholars have also described the relationships that exist between fintech start-ups and TFOs (as subsequently noted) in different research. Navaretti et al., (2018) reviewed the relationships that exist between fintech start-ups and banks. They conducted concept analysis and described the interaction in the fintech industry as game is still open and a lot of work is still in progress, which shows the complexities of this kind of interaction. Brandl and Hornuf (2017) analysed the German banking fintech network and found that most relationships are related to product-related collaboration with fintech start-ups. In addition, they suggested that this is because most fintech start-ups have developed an algorithm or software solution whose value can only be determined when the software has more thoroughly adapted to customer needs. Klus et al., (2018) analysed data covering the 100 largest banks in Canada, France, Germany, and the United Kingdom. They found that the types of banking fintech alliances that exist are very similar in all four countries. Therefore, in the market-based (Canada and UK) and bank-based (France and Germany) financial systems, there is no significant difference in the way banks interact with fintech. In addition to the fintech start-ups, technology-driven companies that provide banking services are becoming more and more common, and this is resulting in increasing pressure for traditional banks to modernise their core businesses. Banks try to face the
challenges of digitalisation by cooperating with various forms of fintech start-ups. Understanding these types of interactions and how they are regulated become important in fintech industry studies.

However, very few of their descriptions show the linkages between this type of interaction and its regulation by governments. Government plays an important role in actors’ interactions. According to the national innovation system (NIS) theory, the government has close interactions with other actors (Kumaresan and Miyazaki, 1999). In the fintech industry, the government also plays a vital role in regulating other actors. Policy instruments are one of the most crucial regulatory influencing methods (Borras and Edquist, 2013). A government’s policy instruments can significantly impact all fintech actors, including governments themselves. Wieczorek and Hekkert (2012) summarised systemic policy instruments to solve eight types of systemic problems related to the actors’ interaction; including lack of trust, missing of ties between actors, over dependence on dominating partners, and so on. One of the systemic problems scholars summarised which is related to the government is defined as the presence actors’ problems like government transition failure or capabilities failure (Smith 2000; Klein-Woolthuis et al., 2005). To address this problem, Wieczorek and Hekkert (2012) claim that systemic policy instruments issue by policymakers should target multiple goals, including stimulating and organising government participation. Policy instruments are theoretically essential to the fintech interactions, but relative discussion is still missing.

2.3.3 Fintech institutions

The regulatory institution is defined as the fintech institution in this thesis. Nelson
(1992) defines institutions as economic and social entities that establish practical rules that influence innovation. Another definition of institutions made by North (1991) considers an institution to be a set of practices, rules, and laws that guide or restrict actors’ innovative behaviour. Crawford and Ostrom (1995) raised a specific categorisation that the rules, norms, and strategies belong to hard institutions, and common habits, routines and shared concepts used by humans belong to soft institutions. This research focuses on hard aspect of institution and follows North’s view by understanding fintech institutions as rules of the fintech industry.

In terms of the rules of the fintech industry, fintech regulatory institutions are the primary focus of this research. The rules and fintech regulatory institutions represent the pattern or mechanism of how governments regulate the fintech industry. This definition echoes Ho and O’Sullivan’s (2019) research. They listed the institutions’ problems associated with standardisations of smart cities, including absence of laws and policies related to standardisation, lack of common standards leading to competitions and risks of monopoly. In one of those, the absence of regulations relevant to standards and public purposes will increase the risks of public safety and defence. In their research, the regulatory institution was regarded as the institution and policy instruments played important roles in regulatory institution. Specific details and types of rules in fintech regulation will be summarised after introducing the concept of policy instruments in the fintech regulation section.

2.3.4 Fintech infrastructure

According to Wieczorek and Hekkert (2012), the traditional definition of infrastructure includes physical buildings, networks, roads, and so on. It also contains
basic knowledge such as professionalism, strategic information, financial planning, etc. (Wieczorek and Hekkert, 2012). From a technical point of view, infrastructure is one of the five essential elements (alongside, security and privacy, data techniques, hardware, applications and management, and service models), that constitute the technical level of fintech infrastructure. Adequate infrastructure can improve the execution efficiency of big data processing including: the development and use of parallel processing financial dedicated hardware, heterogeneous computing, general-purpose computing (GPGPU) on graphics processing units, large-capacity distributed storage (MDS) and high-performance communications mechanism (Gai et al., 2018). Mobile networks are also an important aspect of infrastructure that has stimulated fintech development (Shim and Shin, 2016). Many novel technologies including: centralised computing, fog computing, and edge computing, have been developed as alternatives to financial systems (Ho and O’Sullivan, 2018; Wieczorek and Hekkert, 2012). Fintech infrastructure provides a guarantee of data security and interoperability (Arner et al., 2020). In terms of data security, adequate infrastructure can reduce the risks posed by fintech through physical methods (Gai et al., 2017). Zhang et al., (2017) proposed a QuantCloud infrastructure designed for financial data analysis in terms of data interoperability. This method uses large-scale SSD-backed (Solid-state drives) data storage to interconnect technical data-driven research.

Although, there are other perspectives upon fintech infrastructure that also need to be noted. For example, infrastructure can also be an energy-saving solution. Energy-related data collection and data-driven resource management are the two fundamental aspects of green finance.
This research focuses on the fintech industry and the regulation; therefore, fintech infrastructure is defined from a technical point of view as those technologies related to fintech, which means other definitions of infrastructure such as physical buildings, roads, and planning are excluded in this study.

### 2.4 Fintech regulation studies

#### 2.4.1 The concepts of fintech regulation

Regulation is defined as the set of commands, as deliberate state influence, or all forms of social or economic influence (Baldwin, *et al.*, 1998; Shleifer, 2005). Regulation is an action or activity to restrict behaviour and prevents unexpected risks for achieving a purpose (Harlow and Rawlings, 2006). The effects of regulation can be positive, negative, or neutral (Shleifer, 2005). In the fintech context, the importance of fintech regulation on the development and improvement of fintech is highlighted by many scholars (e.g., Gai *et al.*, 2016; Ng and Kwok, 2017; Arner *et al.*, 2015). Many fintech innovations, such as blockchain, cryptocurrencies, smart contracts and other distributed ledgers technology, are highly impacted by the fintech regulation (Brummer and Yadav, 2018; Macchiavello, 2017; Deng *et al.*, 2018; Hacker and Thomale, 2018; Fenu *et al.*, 2018; Fisch, 2019). For example, regarding controlling risks of fintech innovations, Huang (2018) summarised that the risks could be categorised as risk identification, measurement, prevention, early warning and disposal and financial consumers can be misled by risks from exaggerating publicity.

supervision is to control the risks of fintech actors to protect the public interest (Tsai and Peng, 2017). Wymeersch et al., (2012) stressed that the risks are complicated in the fintech industry because fintech actors are highly interactive. The problems that an individual fintech actor may experience can be easily spread to an entire financial system and may sometimes undermine public confidence in the financial industry. It follows, given this, that prudent supervision of fintech actors is vital for the fintech industry. The fundamental way of prudently supervising is to control the risk-taking behaviour of fintech actors (especially in advance) by introducing a series of risk management tools (generally as regulatory limits) based on risk identification (Xie et al., 2014). Management tools also can control the credit risk and liquidity risk (Sun, 2016).

The behavioural regulation of related actors is primarily aimed at making fintech transactions safer, fairer, and more effective (Anagnostopoulos, 2018). Behavioural supervision targets shareholders and managers of fintech organisations and also targets fintech-related funds and securities custody, trading and clearing systems. In so doing, it tries to exclude shareholders and managers who are not prudent, lack ability, are dishonesty or have bad credit records. In addition, related transactions between shareholders, managers and fintech organisations are strictly controlled to prevent them from damaging the legitimate rights and interests of fintech organisations or customers through optimisation (Lenz, 2016).

Regulation improves the efficiency of fintech transactions and helps to control operational risks. The funds of platform-based fintech organisations should be effectively isolated from customers to prevent the risk of misappropriation of client
funds and escape (Yap, 2016). It is also the case that fintech organisations are required to have sound organisational structures, internal control systems, and risk management measures, as well as business premises, IT infrastructure, and security measures that meet the requirements (Iman, 2018).

Financial consumer protection is the third type of fintech regulation method. In contrast to behavioural regulation, financial consumer protection protects the interests of financial consumers in fintech transactions (Cartwright, 1999; Todorof, 2019; Jagtiani and Lemieux, 2017; Trelevaven, 2015; Trelevaven, 2015; Bromberg et al., 2018). In contrast to behavioural regulation, financial consumer protection is targeted towards the long tail population of fintech services, but behaviour regulation mainly aimed at fintech organisations (Xie et al., 2014). Financial consumer protection is based on the consumer sovereignty theory, such as the infringement of consumer rights by fintech institutions under information asymmetry (Schwarzkopf, 2011; Yan et al., 2015). The interests of fintech organisations and financial consumers are not always consistent. The development of fintech organisations is the objective of prudent supervision. Behaviour regulation is not sufficient to protect the interests of financial consumers. In reality, and due to the limitations of professional knowledge, financial consumers’ understanding of financial products’ costs, risks, and benefits cannot be compared with fintech organisations. Fintech organisations have the dominance of internal information and pricing of financial products and can margin profit by the information asymmetry if regulation lacks financial customer protections (Jaksic and Marine, 2019).

Moreover, fintech organisations maintain a lock-in effect (Schulte, 2015) on financial
consumers. There will be an additional cost for financial consumers when they decide to choose another fintech services. For financial consumer protection, hence, self-regulation is necessary (Ng and Kwok, 2017). If there is no self-regulation, fraud is generally difficult to stop and penalise and cannot even be disclosed because of the might of large financial organisations. In such cases, self-regulatory supervision is ineffective, and government regulatory agencies have to implement mandatory supervision as agents of financial consumers (Ferracane and Lee-Makiyama, 2017).

In addition, in terms of financial consumers protections, there are three types of regulatory measures in fintech regulation studies. First, fintech regulatory institutions, such as regulatory policies, need to strengthen information disclosure (Jaksic, and Marin, 2019). Transparency enables financial consumers to understand the relationship between risks and benefits. Second, it is necessary to open channels for financial consumer rights protection, including compensation mechanisms and litigation mechanisms. Third, financial consumer complaints can be used to timely detect regulatory loopholes (Mcneal, and Hale, 2010).

In addition to these three conventional measures of fintech regulation, a technical measure of fintech regulation called Regtech has emerged in recent years. Regtech is designed to improve the efficiency of regulation processes through technological solutions. The advanced learning algorithm is applied to the analysis of regulatory issues (Larsen, 2016). Arner et al., (2017) highlighted the three functions of regtech in regulation: monitoring, reporting, and compliance. Cave (2017) focused on the data stream of regulation data in regtech. Regtech has shown its value to improve the regulation process and effectiveness by big data. The importance of the technology
base for implementing fintech regulation is implicated by their research.

The regulatory sandbox is another new fintech regulation measure that can handle specific types of regulatory issues. Many scholars (Ingle 2018; Arner et al., 2017; Di Castri and Plaitakis, 2018; Panisi, 2017) have highlighted the impact of the regulatory sandbox on the development of the financial industry. The regulatory sandbox is a term that relates to virtual technology. For the first time, the UK government has established and introduced it into the financial industry in 2015 (Goo and Heo, 2020). Under the premise of ensuring the rights and interests of financial consumers, financial institutions need to submit relevant applications to attain the specific approval of the FCA (Financial Conduct Authority). After being authorised, financial products or services are tested within the scope of application. The FCA monitors the entire process to ensure the safety of testing and evaluate the situation to determine whether it can be formally granted and promoted outside the sandbox. However, the key decision-making of regulatory methods is still made by humans, and regulatory technology or regulatory sandbox cannot completely simulate the whole process of regulatory policy-making (Yang and Tsang, 2018).

In addition to the fintech regulation methods that are introduced, policy instruments also have its roles in fintech regulation and the development of the fintech industry. Next section, the concepts of policy instruments will be introduced and then reviewing the literature of how policy instruments affect the fintech industry in the following section.
2.4.2 The concept of policy instruments

Regulation is regarded as one of the policy instruments (Borras and Edquist, 2013). The concept of policy instruments is introduced to provide another lens to understand the fintech regulation. The term policy tools has been used in many policy studies about science and innovation (Flanagan et al., 2011). Generally, policy tools refer to a governance technique, with one or more means involving the use of national resources or its conscious limitations, so as to achieve policy goals (Howlett and Rayner, 2007). The terms policy tools and policy instruments also possess a high degree of similarity in most literature, and the differences are not significant; therefore, policy instruments and policy tools are regarded as being one and the same in this research.

There are different ultimate goals of policy instruments which are related to the economy (growth, employment, competitiveness, etc.), environment, society, health, national defence, and security. How to achieve the ultimate policies’ objectives is essential in policy instruments research, and how to select and apply these instruments is the leading research direction in the field of policy research. This section first introduces the selection process and then summarise the various types of policy instruments. Factors of the selection process by policymakers are important in policy instrument research. Identifying the underlying mechanism of the selection process is important and helpful to develop a more detailed definition of the policy instruments. How to achieve policies’ goals is key to understand the patterns of the policy instruments (Linder and Peters, 1989; Vedung, 1998; Salamon, 1981, 2002; Hood and Margetts, 2007; Wuerzel et al., 2013).
Borras (2013) proposes three steps to select the appropriate policy instruments: select possible tools first, make specific design and/or customisation for the environment second, and third, to design a tool combination that can accurately identify and address the problems. Each policy instrument’s nature, function, and goal need to be concentrated when a policy instrument is selected. Furthermore, the complementary, synergistic, and comparative effects of different policy instruments should be considered to optimise the functions of the innovation system. The adaptation process of each policy tool is crucial because, in some situations, the effect of policy instruments takes time to play its role. High flexibility or the capability of customisation is essential to satisfy the dynamic innovation system (Ahlqvist et al., 2012; Hermans et al., 2019).

Three types of policy instruments are adopted in this research, including: regulatory policy instruments, economic and financing policy instruments and soft policy instruments (proposed by Borras and Edquist, 2013). Different types of policy instruments are proposed in the innovation field (Edler and Georgiou, 2007; Borras and Edquist, 2013). There are two important categorisations of policy instruments in policy research. Firstly, as mentioned, policy instruments can be categorised into regulatory instruments, economic and financing instruments, and soft instruments. Regulatory instruments use laws and regulations to establish the rules of the game and are obligatory; therefore, regulatory instruments are highly related to the concepts of the institutions of fintech industry. Economic and financial instruments are fiscal incentives in cash and in kind. Soft instruments complement regulatory instruments and economic and financial instruments by voluntary and non-coercive characteristic, such as information transition and knowledge diffusion (Ho and O’Sullivan’s, 2019).
This concept of policy instrument types is adopted to understand the policy instruments and fintech industry and regulation in this research.

In addition, based on this division, Edler and Fagerberg (2017) developed 15 types of policy instruments in innovation fields: Fiscal incentives for R&D, Direct support to firm R&D and innovation, Policies for training and skills, Entrepreneurship policy, Technical services and advice, Cluster policy, Policies to support collaboration, Innovation network policies, Private demand for innovation, Public procurement policies, Pre-commercial procurement, Innovation inducement prizes, Standards, Regulation, Technology foresight. This categorisation combines Borras’s (2013) three fundamental policy instruments and supply and demand perspective in innovation studies. Fintech is one of the innovations; therefore, Edler and Fagerberg’s (2017) categorisation is appropriate for fintech studies. Theses 15 types of policy instruments are briefly introduced as follows so that can further understand the policy instruments.

Policy instruments usually contain multiple objectives, and a policy objective could possibly be achieved by multiple effects of the multiple policies. Fiscal incentives for R&D, Direct support to firm R&D and innovation focus on the R&D on innovation creation by fiscal incentives, which have been adopted in many countries (Larédo et al., 2016). Moreover, the importance of the role of investing in technical colleges in stimulating the innovation process of enterprises has been verified by Barge-Gil and Modrego-Rico (2008). Bloom et al., (2002) prove that tax incentives can effectively boost the intensity of R&D. There are also many scholars who have described single R&D-type policy instrument in their research for instance, Guelllec and Van Pottelsberghe, (2001); Pastor and Sandonis, (2002); Petrakis and Poyago-Theotoky,
There have also been many academic evaluations of R&D policy instruments including work by: Bressers, (1988); Parry, (1995 and 2003); Carew, (2005); Shapira and Wang, (2007); Fier and Henric, (2009); Mansikkasalo and Söderholm, (2012).

In addition, Policies for training and skills, Entrepreneurship policy, Technical services and advice influence through supporting the abilities and skills that can generate innovation and commercialisation. Cluster policy, Policies to support collaboration, Innovation network policies impact on the interactions or network of actors at a different level of regions (Uyarra and Ramlogan, 2012; Cunningham and Ramlogan, 2012). The demand-type of innovation policy instruments has also raised many scholars’ attention including: Kaiser and Kripp, (2014); Guerzoni and Raiteri, (2015); Edler, (2016); Kaiser and Kripp, (2010); and the OECD, (2011). Public procurement policies, Pre-commercial procurement, Innovation inducement prizes are the three main types of innovation policy instruments focusing on the demand side.

The innovation policy instruments of regulation and standardisation affect both supply demand sides (Blind, 2009 and 2012). Standardisation refers to the unification of repetitive things and concepts in social practices such as the economy, technology, science, and management to obtain the social benefits. Understanding of the critical roles that standards can play in supporting technological innovation is indicated by Borras and Edquist (2013). The effects of regulatory policy instruments on innovation are different; they can be felt as either direct or indirect impacts. The direct impact of regulatory policy instruments indicates the explicit target, which is the innovation activities. Nevertheless, the indirect impact refers to the regulatory effect on
innovation policies driven by other policy instruments instead of regulatory policy itself. The last instrument is the technological foresight, which is a means for decision-makers and stakeholders to understand the future technology development trajectory and formulate policies so as to support and benefit from them.

In the next section, based on the defined concepts above, a literature review is conducted to summarise how those policy instruments impact the fintech industry and specify the research gap in fintech industry studies and fintech regulation studies.

2.4.3 Existent studies on policy instruments and fintech industry

To review existing literature on both policy instruments and fintech studies, the author searched ProQuest Database. The categorisations and search specifications were carried out as follows: The code ‘su(policy instruments) AND (Financial technology) AND ab(Policy instruments)’ was inputted into the search dialogue box first so as to search literature including ‘Policy instruments’ and ‘Financial technology’ in their title and ‘Policy instruments’ in their abstracts to be identified. In addition, different combinations such as ‘Policy tools’ or ‘Fintech’ were also used. The outcomes of these two approaches possessed few differences. Second, and to maximise validity considerations, the source types of the papers were strictly limited to ‘Conference paper and proceedings’ and ‘Scholarly journals with peer-review’, whilst the types of documents were limited to ‘Literature Reviews’ and ‘Conference Proceedings’ or ‘Conference Papers’. Last, texts needed to have ‘Full-text available’ and the preferred language for their (original) writing was set to ‘English’. Through this initial screening, 156 papers were identified. From this initial sort, irrelevant research terms were then excluded such as ‘energy policies’, ‘climate change’, and so on. This
brought the number of papers down to 71; a manageable number to review. It is important to note that this number cannot fully represent the actual total number of documents related to both fintech and policy instruments that exists. This potential limitation is, however, mitigated against, by the fact that research on fintech and policy instruments is still an emerging field. Mindful of this, a further search was executed involving that cited the other representative papers of fintech and policy instruments. 87 papers were collected in total. These studies correspond to the different elements of the fintech industry and how they are affected by policy instruments is reviewed as follows.

2.4.3.1 Policy instruments and fintech actors

Fintech actors include fintech start-ups, TFOs, governments, technology developers, and financial consumers. They experience different impacts from policy instruments. It is essential to how policy instruments influence fintech start-ups if one is to garner a full appreciation of the importance of policy instruments on the actions of fintech actors.

Fintech studies lack attention on the impact of policy instruments on fintech start-ups in some research. One such study is that which was undertaken by Gimpel et al., (2018) who analysed fintech start-ups through using a taxonomy of consumer-oriented service offerings. They created a taxonomy including 15 dimensions to understand fintech from the perspective of consumer-oriented fintech start-ups. The fifteen dimensions were: personalisation, Information exchange, interaction type, user network, the role of IT, hybridisation, channel strategy, data source, time horizon, data usage, data type, payment schedule, user’s currency, partner’s currency, and business
corporations. The first seven dimensions were categorised as different forms of interactions and, in so doing, supported the concept of systemic thinking in modern research. The detailed taxonomy of interaction types can comprehensively demonstrate the role of fintech start-ups in interactions with their users (Chircu and Kauffman, 1999). However, the influence of policy is ignored in their work despite the fact that it may be considered to represent a further dimension in its taxonomy.

However, existent research on how policy instruments affect fintech start-ups is still relatively detailed compared to the literature that exists which focuses on other fintech actors. Generally, a policy instrument can affect fintech start-ups from both supply and demand perspectives. Jun and Yeo (2016) analysed the entry of fintech firms into the fintech industry and how it affects competition in the retail payments market. They confirmed that the regulatory requirement placed upon fintech start-ups directly influences the balance of supply and demand in the retail payment market. Some cases indicate that policies can affect the actions and behaviours of fintech start-ups. Examples include, amongst others, privacy and security issues (Hussain et al., 2019), access to data (Vezzoso, 2018), strategies (Wonglimpiyarat, 2017) and so on. Two aspects of the impacts of policy instruments on fintech start-ups can be summarised to simplify the different and detailed impacts that are apparent in most fintech studies. First, a financial incentive; second, supervision by governments. In policy instruments studies, fiscal incentives can represent economic instruments and the first twelve policy instruments raised by Borras (2013), whilst degree of supervision from the government that exists can represent the last three policy instruments.

Shim and Shin (2016) used actor-network theory to analyse the historical
development of the fintech actor-network that is led by the government in Union pay, a state-owned company in China. Policy has continuously affected fintech start-ups at different historical development stages of fintech in China, including problematisation (before 2003), interestment (2003-2009), enrollment (2010-2013), and mobilisation (2014). It is more from a historical or developmental perspective to analyse the fintech regulation, and the impacts of policies on fintech start-ups were differentiated in different stages. The critical point is that they elaborated the four fintech development stages by identifying two focal actors: TPP6 companies, and Chinese central governments. These two development stages are important to note within the confines of this thesis because they are probably the most important factors in the fintech industry; however, it is still questionable as not to specifically define and consider TFOs as focal actors in their research. In addition, the concepts of policy instruments are rarely mentioned in Shim and Shin’s (2016) work. It is hard to summarise the policy implications by explaining the impact of individual laws or policies on two focal actors; this, therefore, is a further research gap that has fed into the approach and focus of the work herein developed.

The impact of policies on technology developers tends to be positive according to a majority of existent literature. Like the fintech start-ups, fiscal incentives and the degree of supervision that they are subjected to can cover most of the impacts that policy instruments have on technology developers. A key difference, however, is that the supervision is a more important factor for technology developers. Technology is a fundamental building block for start-ups to achieve business. Various countries support technology developers to achieve their goals through financial support, talent

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6 Third-party payment
training, and incentive policies. However, technical crimes, such as fraud, will also occur. One of the most common is that of small personal loan being offered through social media or platform. Online lending is still strictly regulated in most fintech industries. Due to the nature of communications between individuals, the content of information and its code parts cannot achieve higher levels of transparency, and the risk of fraud is, therefore, ceteris paribus, relatively high. As a consequence, the transaction scale of financial platforms built by many technology developers will be strictly restricted by policies and laws in most countries (Ng and Kwok, 2017).

Governments are the actor that implement policy instruments. The implementation of policy instruments can bring governance transition to the government. Jordan et al. (2005) explored governance transformation by demonstrating the deployment chart of new policy tools in eight industrialised countries and the EU. They also claimed that future research should focus on more complex and diverse ways of interaction between government and their governance in public decision-making. In addition, as Jordan et al. (2015) further note, governments review past policy instruments to change future policy goals or types of policy tools to narrow any perceived reality gaps. Arner et al. (2016) emphasised the importance of the reconceptualisation of regulation in their research. They believe that the rapidly changing nature of fintech means that it will require more and more regulatory technology. In addition, they also suggested that it will require governments (globally) to speed up roll-out of fresh and reinvigorated policy instruments to respond to the rapid changes that occur within the sector. Bromberg et al., (2017) considered that the growth of technology in financial services will continuously disrupt the global financial market. Therefore, they analysed the differences that exist with regard to implemented regulatory sandboxes.
to explore the implications of sandboxes for businesses, consumers, and domestic regulators. Similarly, Shim and Shin’s (2016) divided the development period of fintech into four stages as mentioned before. In each different period they noted how the government had used utterly different polices to achieve objectives. However, few of them focuses on the concepts of policy instruments and how they drive the entire fintech industry to change with the rapid development.

The impact of policy instruments on financial customers is diverse, and it is challenging to evaluate. In most existent research, financial customers are objects who are influenced by different types of financial services. Commenting further upon this aspect of research, LeBlanc and Nguyen (1988) focused their work on customers’ perceptions of service quality in financial institutions. In contrast, but still adding to the corpus of knowledge on the subject, Servon and Kaestner (2008) analysed consumer financial literacy and the impact of online banking on the financial behaviour of lower-income bank customers. From the latter research it was revealed that financial customers structurally belong to the bottom of the pyramid in the financial industry, and consumers are often affected by market changes. For example, if policies support emerging technologies (such as digital currency or blockchain), these technology developers of these support-mechanisms will be affected first; the consumer will only benefit thereafter. This is because it takes time for the benefits to filter through the system.

The goals of policy instruments are often related to financial inclusion and start-ups, and customers’ interests. Dealing with financial customers’ information lag and information asymmetry to correctly evaluate policy instruments’ impact is essential if
one is to garner a fuller appreciation of the sector and its inherent internal mechanisms. Many scholars believe that information disclosure and transparency for financial customers in the financial sector are significant to solving problems such as the lack of existent asymmetry (Healy and Palepu, 2001; Clarkson et al., 2007). However, at the same time, such information disclosure also has the potential to further complicate complex issues such as those related to issues of privacy and security (Anton et al., 2004). Customers’ information is valuable for markets (Taylor, 2004), and it follows that over information disclosure or transparency led by policy instruments can damage the benefits of fintech actors including fintech actors such as TFOs and fintech start-ups and cause potential negative influences for the fintech industry. This point is focused upon as it is presently less mentioned in existent literature about financial consumers.

Regulatory policies can affect TFOs from the perspectives of capital needs, anti-money laundering, and privacy and security (Lee and Shin, 2018). For TFOs, meeting the fast-updated policy requirements, as well as the cost of learning and adapting policies will be higher for each of their financial services and products. In addition, they have to face the prospect of new batches of fintech start-ups due to policy tools positively affecting the market, whilst the cost of competition also becomes higher. For example, as mentioned above, the rise of shadow banking is due to regulatory differences and technological growth that have promoted the housing loan market, and the market has a great demand for shadow banking (Buchak et al., 2018). This indirectly proves that the difference in policy instrument implementation will bring huge impulses to TFOs.
Prior to 2013, the Chinese government had implemented relatively loose policies to help domestic financial start-ups to grow rapidly. However, the emergence of third-party payment platforms quickly brought huge market shocks to the traditional bank and insurance industry, and prompted the entire industry’s digitalisation. Because of the emergence of financial fraud cases on large p2p platforms (the case of Ezubao being an obvious and well documented example), the policies enacted for fintech companies became more cautious. As a consequence of this regulatory shift, the traditional bank and insurance industry has begun to (re)gain market (Shim and Shin, 2016). In addition, and because the TFOs have a massive amount of valuable user data, policy instruments have regulated TFOs from privacy and security perspectives. In many countries, the exchange of database and platform data between institutions needs to be strictly monitored, and many government organisations focus on issues related to privacy and security issues (Ubaydli and McLaughlin, 2017). For instance, the Consumer Financial Protection Bureau (CFPB) of the United States of America focused firstly upon data security enforcement against online payment companies with many other institutions, together including the Securities and Exchange Commission (SEC), the Department of Justice (DOJ), the Financial Industry Regulatory Authority (FINRA), Commodities Futures Trading Commission (CFTC), and state attorney generals. As credit is the most important part of financial services, protecting user data from unauthorised access is in the interests of fintech development and should be one of the objectives of policy instruments (Allen et al., 2020).

2.4.3.2 Policy instruments and fintech interactions

There are relatively few studies on how policies affect fintech actors’ interactions. The
impact of policy instruments on the interaction of fintech actors can be explained in terms of supply and demand (Edler and Fagerberg, 2017). From the perspective of supply and demand, policies can stimulate an actor to implement fiscal incentives for R&D, training and skills, and technical services. Such improvements then impact subsequent interactions between the actor and others (Chiu, 2016). From the perspective of TFOs, it can be seen that the implantation of supply-demand policies has significantly enhanced their interactions with technology developers and improved services to financial customers. For example, various banks have upgraded their internal transaction systems and management systems through procurement, research and development, and so on, to manage customer information more conveniently and to expand their business volume. This demand for improved service quality comes from the improvement of technological means, and at the same time, it also increases the demand for technology developers and expands the market scale of fintech. The expansion of the market scale can satisfy issues of financial inclusion whilst also offering enhanced employment opportunities; thereby creating a virtuous circle (Tassey, 1982; Wang and Kim, 2007; Wolfond, 2017).

Regarding systemic policy instruments, it can be noted that policies affect the interaction between actors in the system in terms of industry standardisation and regulatory measures (Wieczorek and Hekkert, 2012). The interaction between TFOs and other actors has also been positively affected. For example, supply and demand policies significantly affect the interactions that occur between the insurance industry and technology developers (Yan et al., 2018). The collision that occurred between insurance and big data through the widespread popularisation and development of big data technology, has become a hot trend in the industry which has impacted
transaction fraud identification, led to precise marketing, consumer credit, and credit risk evaluation, supply chain finance, stock market forecasting, stock price forecasting, smart investment, fraud insurance identification, risk pricing and other specific businesses involving banking, securities, insurance and other fields have been widely used. Big data’s application and its analysis capabilities are becoming the core competitiveness of fintech actors and significantly influence their interactions in future development (Wang et al., 2021). Undoubtedly, big data has broad development prospects. However, the application of financial big data has faced a series of restrictions, including: insufficient data asset management, difficulties related to technological transformation, the lack of existent industry standards, pressure on security controls, and imperfect policy support. In order to promote the development and application of financial big data, more systematic policy support is needed to improve data management capabilities, industry standardisation construction, and application cooperation innovation (Helleringer, 2019). The policies can continue to strengthen basic capabilities and continuously improve the interaction in the fintech industry (Zhang et al., 2017; Yan et al., 2015).

Interactions between TFO and fintech start-ups involve both competition and cooperation. From the perspective of the impact of supply-demand policies, it can be noted that the implementation of policies has expanded the scale of the fintech industry and promoted the incubation of a large number of fintech start-ups. Due to the efficiency and consistency of service content, the financial services launched by fintech start-ups (such as mobile payment and online lending platforms) are sometimes more favoured by consumers than the services of TFOs. This difference has prompted TFOs to either develop their own digital payment procedures or to
pursue policies of cooperation with fintech start-ups. Policy instruments can affect their interactions by standardising platforms or technical systems.

The regulatory sandbox is a typical case that affects the interactions that occur between TFOs and fintech start-ups. The fundamental reason for regulatory sandbox is to lay the foundations for healthy competition in the financial industry (Noh, 2017). The regulatory sandbox can be used as a diagnostic tool to help fintech entrepreneurs determine their innovation capabilities, verify their technology concepts, and end customers’ market adoption rates. At the same time, they also assist with the making of strategic plans for scale, growth and impact, and provide an opportunity for financial customer feedback, as well as development of common value propositions to minimise potential systemic risks and protect consumers’ interests (Tsai and Peng, 2017). Despite the lack of unified framework of regulatory sandbox in different countries or regions, the regulatory sandbox can promote cooperation between financial organisations in most conditions (Arner et al., 2015; Bromberg et al., 2017).

The interactions between fintech customers and other actors are frequently affected by policy instruments. TFOs are likely to face more intensive competition from fintech start-ups, so governments need to monitor consumer behaviours more frequently to prevent potential risks for financial consumers. Information asymmetry is particularly troublesome for financial consumers. Jaksic and Marinc (2019) noted that regulatory frameworks led by policy instruments are essential to eliminate information asymmetry. For example, public ownership can provide infrastructure and reduce barriers to demand. In the secured loan framework, public credit registries can still promote the efficiency of transactions despite the existence of information asymmetry.
A regulatory framework like this affects the scope of available services and affects an organisation’s business costs by enabling access to fintech. It has played a vital role in realising financial intermediaries and facilitating domestic financial services, resource mobilisation and financial institution development, while also protecting depositors. In addition to information mismatch, consumer protection and financial education policies also affect the interactions that take place between fintech customers and other actors; it is a particularly important consideration for fintech customers with low education levels.

It is important to understand that most existent literature on how policy instruments affect interaction in the fintech industry are still limited to specific financial services. Du (2018) studied the participation of financial institutions in the fintech ecosystem from three perspectives: complacency, capabilities, and institutional pressure. He thinks that no organisation can make decisions with complete freedom, and that their decisions are affected and restricted by external factors such as government regulations, industry norms, and standards. This argument is also supported by the concept of imitative influence of similar organisation in the same industry of the institutional theory (Di Maggio and Powell, 1983). The decision-making process can be influenced by the environment (for example, Liang et al., 2007; Salge et al., 2015; Wang, 2010). Kang (2018) also studied the trends, security challenges, and service aspects of the fintech environment. Chen et al., (2017) also mentioned that if existing customers or companies want to use the payment services of the TFO’s system directly, it must depend on the TFOs that issue the payment instruments and related policies.
To briefly summarise, although existing fintech studies interpret how policies affect the interactions that occur between actors from the fintech system, they tend to focus on the particular one or two financial services in individual research: for example, mobile payment or online lending platform as the common cases. However, these types of research probably lack holistic considerations of fintech actors’ interactions from different financial services. For example, the fintech ecosystem of the crowdfunding financial service and P2P business share similar actors (Lee and Shin, 2018; Leong et al., 2017). It is still difficult to prove that the two are independent of each other and are not affected by the interaction of the other party. The impact of policy on interaction is more diverse and uncertain. Therefore, if it does not consider the fintech industry of different financial services dynamically and simultaneously, or if it considers the factors of only a single financial service, it is difficult to understand how policies affect the interactions in the whole fintech industry.

2.4.3.3 Policy instruments and fintech institutions

As noted in section 2.3.3, fintech institutions in this research are defined as the fintech regulatory rules in the fintech industry. This content is scarce in existent fintech research. As a consequence – and in order to further site this research – the literature review here firstly presented reviewed literature on how policy instruments deal with regulatory arbitrage, which is an aspect highly related to fintech institutions. How, according to existent literature, policy instruments affect the fintech institutions is then summarised.

Regulatory arbitrage means that fintech actors can reduce their regulatory capital requirements without reducing their business scale. Since regulatory capital is often
regarded as a regulatory cost, and fintech actors have motivation to engage in regulatory arbitrage. For example, in modern credit portfolio management, loan sales and asset securitisation transactions are standard tools used by fintech actors to engage in regulatory arbitrage (Buchak et al., 2018). Regulatory arbitrage is a significant driver of financial innovation (Knoll, 2008). For example, reducing the risk from stringent capital adequacy rules for banks motivated standardised marketable securities to develop long-term relationship-based assists. There are two aspects of regulatory arbitrage. The one is the actual effort made by the firms of reducing risks and maintaining competitiveness with the negative influence of laws and rules, and the other is the evasion of laws and rules and facilitating illegal behaviour in the worst case.

Buchak et al., (2018) noted that shadow banks are most active where TFOs face considerable regulatory burdens. Cumming and Schwienbacher (2018) stated that the different enforcement of rules and laws in the financial industry significantly impact on the venture capital. Regulatory arbitrage has both positive and negative effects for fintech. Policy instruments such as strengthening the enforcement of regulatory standards reduces the fluctuation of adverse effects. The importance of public policy on the venture capital market has been addressed by Armour and Cumming (2006), Kanniainen and Keuschnigg (2004), and Keuschnigg and Nielsen (2003, 2004). However, in their research, there is little mention of the possibility that strengthening enforcement impacts either the regulatory institution of the venture capital sector. Through the phenomenon of regulatory arbitrage, it is necessary to use policy instruments to establish an institution that can eliminate the differences that exist in supervision between different types of actors. In the fintech context, the new rules
generated during the implementation of different policies will have substantially different influences due to different policy objectives. For example, consumer data protection, start-ups information disclosure, anti-money laundering, require policies to define the proportion of rules according to the risk brought by the scale of the institutions (Restoy, 2019). This also requires an exact combination of different types of regulatory policy instruments and the creation of an exact and dynamic evaluation process to measure how such changes affect the institution. At the same time, policies should also encourage different fintech actors to coordinate policy actions in the same regulatory institution.

Policies affect the regulatory institution through the regulatory market and can also be achieved through the direct supervision of enabling technology. Policy instruments need to deal with the significant advantages or potential risks of specific innovations. For example, an innovation like Application Programming Interface (API) technology has been advocated to promote financing business in many countries (Dorfmüller, et al., 2017). However, DLT, due to its unique technology foundation as an innovation, is heavily regulated in most countries (Kakavand, et al., 2017). In some years ago, the application of biometric technology to financial services was treated cautiously as well (Kang, 2018). Especially with the massive increase of data capacity, the government needs to develop a new regulative institution to apply technology to fintech actors. For example, there is evidence that colossal risk generated by improper processing of personal data and lack of transparency and ethics; therefore, Singapore has issued high-level principles to allow companies to follow these principles to control those risks (Fan, 2018). The different natures of fintech innovation shows the difficulties when policy-makers select the policy instruments to change the regulatory
Policy instruments can also trigger the development of regtech to enhance the effectiveness and efficiency of regulatory institutions. In the United Kingdom, both the Bank of England and the Financial Conduct Authority have recently used new digital technologies for regulation (Arner et al., 2016). The idea of regtech is to replace rules written in a natural legal language with computer code, and to use artificial intelligence for regulatory purposes. This new method of designing regulatory rules is in line with the government’s objectives (Anagnostopoulos, 2018). Regtech is more precise because computer code is more accurate than natural language. The process of translating legal concepts into computer code will make the rules more precise (Burt et al., 2017; Colbert; 2015). In addition, replacing ambiguous legal terms with precise computer code may change meaning; however, the scope of the rules will become narrower because they have become more precise. Disambiguation may also cause meaning to deviate from its original focus. The question of which elements of the regulatory framework will be benefited from greater precision is still unclear (Pasquale, 2019; Packin, 2018).

Digital reporting will change the type and speed of information available to regulators. This is because it will allow supervisors to access the information recorded within the supervised entity. Regulators will get more accurate information than regulators do presently. The reform of digital report will provide current regulative institutions with better quality evidence for decision-making; once a transaction is recorded on a shared record in the industry, regulators will also be notified, thereby obtaining a near real-time picture of the transaction performed by the regulated entity (Helleringer,
2019; Arner et al., 2017). Currently, each regulated entity has developed its own
cognitive processes of how to comply with regulatory requirements. The current rules
allow different interpretations of the same law. However, if highly standardised
regtechs are used between regulated entities, consistency will increase (Burt et al.,
2017).

Above, from a technical point of view, the systemic or institutional issues of fintech in
the literature are studied. However, it is also limited to the direct impact of policy
stimulus on fintech development. Even though the regulative institution plays a vital
role in the fintech industry, it is rare that explore the possibility that policies can
achieve their goals by changing the regulatory mechanism, regardless of whether it is
a market or technical factor, the regulatory institution can be formed, such as self-
regulation.

Self-regulation relies on market mechanisms, and regulated entities have specific
commercial incentives to comply with certain standards (Baldwin et al., 2012; Ferran,
2015). If self-regulatory agencies make their own rules that are not bound by law or
accountable to governments, people will worry about their legitimacy (Ogus, 1995).
At the law enforcement level, the same problem also arises. If self-regulatory
organisations assume greater responsibility than members of the the general public,
issues of trust are likely to arise (Ferran, 2015) which may lead to implementation
difficulties. This, in turn, may negatively affect the business or reputation of its
members (Armour et al., 2016). Due to this, regulators may set entry requirements
that suit their members rather than the public interest.
The theoretical concepts of self-regulation are relatively complete, but discussions in the fintech context are still infrequent. How policy instruments can generate and affect the fintech institutions is still remaining unexplored. This is a further research gap addressed by this thesis.

2.4.3.4 Policy instruments and fintech infrastructure

Problems caused by infrastructure are significant in financial industry. Usually, there is a lack of specific infrastructure types; often related to the lack of information update and standardisation (Farrell and Saloner, 1985; Swann, 2010; Tassey, 1982, 2000, 2017). Due to the fact that governments, especially in developing countries with relatively weak market technological capabilities, are often more informed than the market, governments play a very critical role in the implementation of standardisation policies, such as participating in standardisation activities with different stakeholders with different interests or providing financial support (Gao et al., 2014; Wang and Kim, 2007).

With regard to infrastructure in the field of fintech, existent research suggests that most governments have adopted a series of policies to create a digital service infrastructure policy. Such policies include reforms that have allowed financial organisations to use digital technology to identify and verify financial customers who do not exist and regulate customer information exchange between different participants. In the European Union, the new payment system directive (PSD2) has established the possibility of data exchange between payment account data held by payment service providers (including banks) and third-party providers (such as account aggregators or payment initiators) with the customer’s consent (Cortet et
The Singapore government has established a centralised platform to provide residents with a unique electronic key that can be used to verify their identity in various transactions (Fan, 2018). In India, a centralised system can store, protect, and facilitate the exchange of customer financial data, which can be provided by financial companies and released to financial companies with customers’ consent (Guild, 2017). Cumulatively, policies can promote the development of fintech infrastructure and the reduce the adverse effects of the information asymmetry (Jaksic and Marin, 2019).

Governments also further influence the fintech industry through the establishment of innovation centres, regulatory sandboxes and innovation accelerators. The Innovation Centre is the most widely used of these promoters. They provide support and guidance for innovative companies or products to promote a full understanding of regulatory requirements. A regulatory sandbox can assess the risks associated with new financial services in a controlled environment. So far, sandboxes have mainly been used to assess whether consumers will be adequately protected when using new applications, products or services. The criteria for accepting projects, test parameters, applications and exit strategies vary. In some cases, the result is only an authorisation to continue to provide tested products or services, while in other cases, it may also include adjustments to existing regulatory requirements or formal instructions. Only a few jurisdictions have created innovation accelerators to explicitly support projects directly related to central bank operations or supervision (Cortet et al., 2016; Kohler, 2016). However, the above research on the infrastructure of fintech is rarely closely related to various actors and interactions. For example, how will the support policy of the fintech infrastructure like Innovation Centre penetrate the interaction between various actors, and whether it can satisfy the interests of the target actors? Will the
government-supported policy to create a digital service infrastructure affect the current regulatory system? A more holistic perspective to studying how policy affects fintech infrastructure is missing; this deficiency within existent literature is a further consideration addressed by this thesis.

2.5 Summary and resultant research gaps

Generally, policy instruments are not always the focus of attention in existing fintech literature. Puschmann (2017) focused on the development and evolutionary process of fintech and framed three dimensions for future directions of fintech research as innovation degree (disruptive, incremental), innovation object (business model, financial product/service, organisation, process, system), and innovation scope (inter- and intra-organisational perspectives). Gai et al., (2018) generalised a framework containing five fintech dimensions: privacy and security, data techniques, hardware and infrastructure, applications and management, and service models. Gozman et al., (2018) focused on fintech start-ups and proposed a conceptual framework for fintech innovation. The framework indicates that the services, business infrastructure, and technical components are the three main components of fintech innovation. It is critical for policy-makers to balance protecting consumers and fostering innovations. Despite this, policy instruments were excluded in both frameworks.

Several scholars have focused on the fintech industry and regulation. For example, Arner et al., (2017) focused on increasing the efficiency and effectiveness of regulation by the technology. Buchak et al., (2018) studied the regulation of shadow banks in the fintech industry, whilst Jagtiani and John (2018) focused on the regulatory challenges of fintech on consumer protection. Magnuson (2018)
summarised three regulatory challenges of fintech as being: decentralisations, regulatory opacity, and reputation and cooperative behaviour. To summarise, policy instruments are one of the practical solutions that can increase the efficiency and effectiveness of regulation, shadow banks’ problems, customer protections, and other regulatory challenges. However, the roles that policy instrument play have only been scarcely addressed in most fintech regulation studies.

With reference to specific fintech elements and policy instruments, Eickhoff et al., (2017) and Milian et al., (2019) stressed the need for research and policy efforts to develop compliance toolkits for fintech actors to meet the requirements of regulation. Wonglimpiyarat (2017) mentioned the importance of the foresight exercise, which can be seen as one policy instrument (see Edler and Fagerberg, 2017), for policy-makers to identify the upcoming fintech technologies and the advantages for fintech start-ups. Arner et al., (2017) studied the relationship between regulatory measures and equity requirements and claimed that these are particularly important for new technology experiments and regulatory arrangements. Their research further confirmed the importance of policy instruments.

Table 2.1 shows that the policy instruments’ roles in each fintech element in the fintech studies. However, these studies tend to be static and the research considering the whole fintech elements is rare. A more holistic and dynamic perspective is still insufficient in understanding how policy instruments affect each fintech element in the fintech industry. One of the possible reasons is that there are no uniform definitions of the structural elements of the fintech industry. For example, Shim and Shin (2016) used actor-network theory to dynamically analyse China’s fintech
industry and generalised that China’s policy toward fintech can be viewed as pragmatic techno-nationalism. This theory emphasises the interactions between different actors and the role of technology in shaping policy processes (Young et al., 2010). Ho and O’Sullivan’s (2019) study focused on actors and their interactions and stressed the infrastructure aspects in smart system standardisation. To some extent, using different frameworks to study fintech has led diversification. Despite this, research considering all four structural elements (fintech actors, fintech interactions, fintech institutions, and fintech infrastructure) remains non-existent; a further gap is identified and, in turn, addressed by this thesis.
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*Source: author collated.*
Considering these four elements simultaneously leads garnering a different and more fulsome understanding of the fintech industry and fintech regulation. Jagtiani and Lemieux (2017) focused on the rising competition between TFOs and fintech start-ups under different regulatory institutions. The roles of policy instruments on fintech infrastructure will affect TFO and fintech start-ups’ market share and sales channels that may bring different views of the rising competition. Ho and O’Sullivan (2019) identified the roles of policy instruments on the evolving standardisation challenges of ‘smart systems’ innovation. They analysed the four elements in the industry summarised the policy instruments’ roles in the standardisation of smart systems. However, the research field of smart systems that they focused was information communication technology, and the concentration of their research tends to be in the infrastructure area, which means that the implications to the fintech industry are limited. Shim and Shin (2016) used actor-network theory to dynamically analysed China’s Fintech industry. They focused on the fintech actors, fintech interactions, fintech institutions at the same case research and comprehensively explained the change and development of China’s fintech. However, the concept of policy instruments was not introduced in their study. The explanations of the role of each specific policy are completed, but the generalisation of the mechanisms of how policy instruments affect the fintech industry and fintech regulation remains unclear. This research will address this research gap.

### 2.6 Research questions

Through the summary of fintech literature and identified research gap from previous sections in section 2.5, it is found that how policy instruments affect the individual element of the fintech industry is relatively completed compared to the studies
considering all four elements that were investigated from literature: fintech actors, fintech interactions, fintech institutions, and fintech infrastructure. In a limited number of fintech studies that consider these multiple elements at the same case, and the mechanisms of the policy instruments’ roles in the fintech industry are not made clear. Therefore, this research aims to identify how different policy instruments dynamically affect the fintech industry by integrating and considering all four elements of the fintech industry that can contribute to both existing fintech industry studies and fintech regulation studies. The research objective is to understand the mechanisms of how policy instruments dynamically affect the fintech industry through fintech actors, interactions, institutions, and infrastructure.

The research question is **RQ: How do policy instruments dynamically affect the fintech industry?**

The main research question can be addressed by answering four sub-questions as follows.

**SQ1.** What are the fintech actors, fintech interactions, fintech institutions, and fintech infrastructure?

**SQ2.** How do policy instruments dynamically affect fintech actors, fintech interactions, fintech institutions, and fintech infrastructure?
CHAPTER 3 ANALYTICAL FRAMEWORK

3.1 Introduction

The analytical framework of this research is developed in this chapter. The System of Innovation (SI) Framework developed by Ho and O’Sullivan (2019) is applied in this research. To understand the dynamic fintech industry, section 3.2 first divides the fintech development stages to the initial stage, the growth and problematisation stage, and the improvement stage. In section 3.3, the theoretical background of FTIS is introduced. In section 3.3.1, the concepts of the Innovation system, National Innovation System (NIS), Technology Innovation System (TIS), and System of Innovation (SI) framework and how FTIS is developed are introduced in this section. In section 3.3.2, the four structural elements of FTIS are defined as actors, interactions, institutions, and infrastructure, respectively. Section 3.4 develops the analytical framework based on the FTIS framework and presents how the research question will be answered.

3.2 The three fintech development stages

In recent years, there have been significant changes in fintech development. Dividing different stages of fintech development in fintech research is important to understanding the patterns of changes and transitions that occur. It follows, *ceteris paribus*, that there is a need within this specific piece of research to identify the specific stages of fintech development before identifying the four elements in each stage, and thereafter analysing how policy instruments (both individually and cumulatively) influence them.
In literature, Puschmann (2017) summarised the evolutionary process of the digitisation of the financial services industry. The process is divided into three stages: internal digitisation (1960-2010), provider-oriented digitisation (2010-2020), and customer-oriented digitisation (from 2020). The criteria for measuring the digitisation process are: strategy focus, organisational focus, and system focus. A further (and different) division of fintech development was raised by Arner et al., (2015). They concentrated on financial service digitisation and financial globalisation and defined the fintech development stages as fintech 1.0 (before 1987) to fintech 3.0 (2009 to present) with fintect 2.0 being between 1987 and 2009. Shim and Shin (2016) divided the development stages according to the different actors, regulations, and the government’s policy goals into the following: problematisation (before 2003), interessement (2003-2009), enrollment (2010-2013), mobilisation (2014 to present).

Compared to the perspective advanced by Puschmann (2017), the criteria for dividing fintech development stages by Shim and Shin’s (2016) is more of an industry perspective. This difference is important to note because, as literature indicated, the dynamic and holistic perspective is needed to analyse the fintech industry and regulation. The trend of fintech development known from their research is that the regulatory issues in the fintech industry are becoming more complex. Dividing different stages of fintech development in fintech research was helpful to elaborate the development process in fintech research explicitly, and its importance in understanding regulatory issues in fintech research was also explored. Next several specific industry’s perspective fintech studies are summarised to understand the fintech development pattern, and how to divide the stages.

Boss et al., (2019) studied Austria’s fintech ecosystem by conducting statistical
analysis using first-hand industry data provided by Fintech Austria; the country’s largest fintech interest group. They noted that the domestic fintech industry was small but growing significantly, and they found that there would be systemic implications and financial stability risks if oligopolies or monopolies were not monitored in a timely fashion. Developing these themes further Boss et al., (2019) further stressed the importance of monitoring the structure of the fintech industry so that future trends could be identified and outsourcing avoided where it might risk fintech actors’ interactions between fintech start-ups and banks. Pöchel et al., (2019) studied the role of nonbank finance in Austria’s financial industry, and suggested that it supported economic actively at the initial stage and enhanced the competitions which could be sources of systemic risk in the following stages. From an analysis of the situation in Austria it can be suggested that fintech development stages can be divided into the following parts: the initiation stage when fintech start-ups grow rapidly, and initial interactions between fintech start-ups and TFOs emerge; second stage when the fintech industry is continuously growing and risks that could impede fintech develop start to develop; the third stage in which policy-makers address relevant regulatory issues and improve the fintech ecosystem.

The findings of the Austrian case can be applied to other fintech research; making such work inherently generalisable – a trend which, it is hoped, is also true of the new and original findings advanced by the author in this thesis. With reference to the application of the lessons of Austria to other scenarios, Ahn and Cho, (2019) studied fintech services in Korean fintech industry. They introduced the rapid growth of international and Korean’s fintech market around 2010, and compared the development issues in Korean’s industry with other countries. The conclusion that the
authors came to was that regulation in Korea slowed fintech development to some extent and summarised solving institutional and technical problems as a key in activating the Korean fintech industry. As noted, Shim and Shin (2016) divided the development stages into four stages. According to their research, at the stage of problematisation, they focused on the initial development of China’s third payment party, and the initial interactions between TPPs and state-owned banks. The regulatory issues occurred in the interessement and enrollement stages, and the standardisation of online payment were necessary. The mobilisation stage improved China’s economy by breaking up monopoly and establishing the business-friendly environment. From above cases of fintech studies and existent literature, most fintech research tend to analyse the development of fintech industry as the three stages: the initial stage, the problematisation stage, and problem-solving stage.

Given this plethora of opinions within existent academic writing, this thesis adopts a three-stage approach to the analysis of ‘different periods’ of fintech development and to analyse how policy instruments affect the industry. The first stage is the initiation stage. In this stage, the fintech industry is initially established or significantly developed as a distinct entity that is different to the (given) nation’s traditional financial industry. During this stage, the market scale, fintech actors and their interactions increasingly expand. The second stage is the growth and problematisation stage. In this stage, fintech innovation is further developed and various forms of technology and innovation emerge. Moreover, regulation becomes necessary to address present and potential risks in the development of the fintech industry. The third stage is the improvement stage when the risks are addressed and further regulation is implemented to address potential risks and further improve the fintech
industry. This approach provides dynamic perspective to answer the research question.

3.3 Fintech innovation system (FTIS) framework

3.3.1 Theoretical background of the FTIS framework

This thesis develops a FTIS framework so as to enable an enhanced understanding of the fintech industry to be conveyed to readers. Given this, the concepts of the innovation system, the National Innovation System (NIS), Technology Innovation System (TIS), and System of Innovation (SI) framework are introduced in this section.

An innovation system refers to all important economic, social, political, organisational, institutional, and other factors that influence the development, diffusion, and use of innovation (Edquist, 2001). An innovation system approach is needed in the fields of technological policies and industrial dynamics and such an approach represents a more systemic thinking approach of analysing technology development (Johnson, 2001). The innovation system approach was developed to analyse the changing configuration of the world economy (Castellacci et al., 2005). It was an essential part of the innovation study of social science and widely used at the national level systems (Edquist and Johnson, 1997; Lundvall, 1992; Nelson, 1992).

There are different specifications of NIS. Carlsson (1995) proposed the Technological Innovation System (TIS), which specialises in analysing technology fields. The sectoral Innovation System (SIS), raised by Breschi and Malerba (1997), is clustered on products produced from a firm or a group of start-ups that influence specific sectors. The Regional Innovation System (RIS) is also a widely-used concept in the
academic field, and was developed by Cooke et al., (1997), Braczyk et al., (1998), and Asheim and Isaksen (2002). Table 3.1 summarises the different types of innovation system approaches, and the representative studies.

Table 3.1 Representative studies using the innovation system approach.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Approaches</th>
<th>Study context</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeman (1987)</td>
<td>NIS</td>
<td>Japan</td>
<td>Social economic adaptation</td>
</tr>
<tr>
<td>Lundvall (1992)</td>
<td>NIS</td>
<td>Scandinavian countries</td>
<td>User–producer interactive learning</td>
</tr>
<tr>
<td>Nelson (1993)</td>
<td>NIS</td>
<td>15 developing and developed countries</td>
<td>Co-evolution between technology and organisation firm-based competence and routines</td>
</tr>
<tr>
<td>Carlsson (1995)</td>
<td>TIS</td>
<td>Swedish technological system</td>
<td>Technological knowledge networks</td>
</tr>
<tr>
<td>Breschi and Malerba (1997)</td>
<td>SIS</td>
<td>Various sectors in OECD countries</td>
<td>Inter-sector knowledge interaction</td>
</tr>
<tr>
<td>Saxenian (1991)</td>
<td>RIS</td>
<td>IT sectors in Silicon Valley</td>
<td>Blurred firms in a region</td>
</tr>
<tr>
<td>Cook et al., (1997)</td>
<td>RIS</td>
<td>Innovative regions in Europe</td>
<td>Localised social and productive interdependence</td>
</tr>
</tbody>
</table>

Source: adapted from Chang and Chen (2004)

Carlsson and Stankiewicz (1995) defined TIS as a network of agents interacting in the economic or industrial area under a particular institutional infrastructure and involved in the generation, diffusion, and utilisation of technology. A network of agents represents the actors and their interactions within the system, and economic or industrial area under a particular institutional infrastructure and involved in the generation, diffusion, and utilisation of technology relates to the innovation process of TIS in the institutional environment.

Actors, networks, and institutions are three structural elements of a TIS (Carlsson et al., 2002; Hekkert et al., 2007; Bergek et al., 2008) and the concept TIS is widely used to understand technology innovations and their changes and transitions. Bergek et al., (2008) used the TIS approach to explain how technology innovation works and
to comment on changes in the Swedish health care sector. Grubler et al., (2012) established an energy technology innovation system (ETIS) to understand the technological changes that occur in energy systems and designing policies.

Based on TIS, Ho and O’Sullivan (2017, 2018) established a standardisation framework that can identify standardisation road mapping and also used it to explain how standardisation supports innovation by summarising the elements of standardisation through literature. This framework was used to analyse the complex dynamics in TIS and answers the questions of what innovation activities are relevant to standardisation, why standardisation is needed, when something needs to standardised, and how to standardise. This framework can analyse the limitations of each standardisation and the reasons for the operation problems that are caused by those limitations. However, it is also the case that this framework still does not sufficiently address the role of policy in the process; how policy instruments affect the standardisation process is not explained by this framework. To try to address this gap within existent understanding, based on the systemic policy framework developed by Wieczorek and Hekkert (2012), Ho and O’Sullivan (2019) developed SI framework that aims to address the standardisation challenges of smart system innovation and reveals the roles of government in this process. Structural elements in the SI framework are divided into: actors, interactions, institutions, and infrastructure; these as Ho and O’Sullivan (2019) notes, are different from the structural components of TIS. Replacing the network in TIS to interactions and infrastructure can further understand how policy instruments standardise the infrastructure.

Through using the SI framework, it is possible to analyse how policy instruments
affect the four elements of the fintech industry, which were identified in fintech industry studies. The SI framework has several advantages in this respect. With specific reference to this project, the framework was developed as follows. First, a research gap was identified from the literature review. This, in turn, also gave rise to the research objective that focuses upon understanding the mechanisms of how policy instruments affect the fintech industry through fintech actors, interactions, institutions, and infrastructure.

SI framework could provide these particular four elements and identify what policy instruments when and how affect these four elements. The second strength is that the SI framework provides a holistic and interdisciplinary perspective, which can consider nation-bounded factors, technology-bounded factors, and sector-bounded factors. Because fintech studies cover many factors, they need researchers and policy-makers a holistic view and interdisciplinary knowledge. SI framework helps conduct fintech and policy research when the research is complicated and multidisciplinary. The third advantage of SI is that it can provide a historical and evolutionary perspective. Understanding how policy instruments affect the fintech industry requires historical and evolutionary perspectives to identify why, when and how policy instruments impact the fintech industry, combining the division of the fintech development stages. By summarising the three advantages, the SI framework is adopted in this research and the fintech innovation system framework is developed (FTIS) based on the SI framework to answer the research question. The activities and functions, boundaries of the FTIS framework are then defined based on the concepts of innovation system approach, TIS, and SI framework. The components of FTIS will be defined at the following sections.
In terms of the TIS, Liu and White (2001) categorised that the basic activities of TIS are including creation, diffusion, and exploitation. The primary function of an innovation system is to support an industry's growth by, for example, supplying resources. It is also essential to study the functional pattern of the innovation system for a TIS (Bergek and Jacobsson, 2003). Therefore, the function of FTIS is also defined in this thesis. Edquist (2010) summarised ten essential activities in most SIs: provision of research and development and creating knowledge in engineering, medicine, and the natural science, and creating and changing the institutions. However, there is still no consensus as to the generalised activities and functions of SI. Based on Edquist's (2010) list of activities, this study developed the following functions that are expected to be significant in FTIS for its development: formation of new product market, articulation of quality requirements emanating from the demand side with regards to the new product, creating and changing organisation needed for the development of new fields of innovation, networking, creating and changing institutions, incubating activities, facilitating innovation process. According to the fintech regulation studies that were reviewed, the formation of a regulatory environment is indispensable activity of FTIS.

The boundaries of SIs determine what is inside and outside the given system. Edquist (2010) suggested three ways of specifying boundaries of SIs: spatial, geographical and sectoral aspects. For NIS and RIS, spatial and geographical boundaries are significant to identify the region of the innovation system, whereas the sectoral aspects of boundaries are more relevant for TIS and SIS. In this research, the spatial and geographical boundaries of the FTIS are considered at the national level because
most public policies influencing the FTIS and process are designed and implemented at the national level. Whether national level public policies related to the fintech industry are in the system or outside the system is an important issue to define. Wieczorek and Hekkert (2012) provided a systemic policy framework based on TIS which defined policy instruments as outside factors which can also effectively address the systemic problems. This framework is helpful to identify the causes of the systemic problems and appropriate policy instruments in their research. Therefore, to understand how policy instruments affect the fintech industry in this research, the policy instrument is defined as an outside element which is excluded from FTIS.

### 3.3.2 The Components of FTIS

From fintech literature, four elements of the fintech industry are identified; therefore, based on the fintech studies, the components of FTIS are defined as: actors, interactions, institutions, and infrastructure

The first component of FTIS is the actors. Markus et al., (2016) stated that the actors could be a decisive factor in the success or failure of an innovation. A single actor may also play a significant role in a system’s dynamics and the establishment of institutions (Kwak et al., 2011). Liu and White (2001) categorised actors into two categories: primary actors who directly participate in innovation activities, and secondary actors who influence the behaviour of primary actors through their interactions. Markard and Truffer (2008) defined the actors of TIS as those organisational actors who are directly engaged in innovation activities. Other actors who indirectly undertake innovation activities and influence the TIS actors’ behaviour are defined as external actors. In the SI framework (Ho and O’Sullivan, 2019), actors
are not divided into either primary and secondary or internal and external actors but are instead defined in such a manner so as to envelop companies, knowledge institutes, government, and other parties, include legal/financial organisations, intermediaries, and consultants. From the literature, the thesis defines FTIS actors as fintech start-ups, traditional financial organisations (TFOs), governments, financial consumers, and technology developers.

The second component of FTIS is interaction. Interaction is one of the structural elements in the SI framework (Ho and O'Sullivan, 2019). Carlsson et al., (2002) defined that the network of TIS could determine the actors, interactions, activities, and information flows, and the knowledge of innovation can be gathered and shared within the network. Generally, a network is established by the relationships that exist between different actors. The relationships between actors can be influenced by different objectives, distances, interests, quality, standardisation, and so on (David and Greenstein, 1990; Swann, 2010). With regard to FTIS, this thesis focused on their competition or cooperation relationship between different actors as the interactions of FTIS.

The literature review also showed that the interactions between government, fintech start-ups and TFOs could be regarded as significant interactions in the financial industry, compared to other actors’ interactions. Financial consumers and technology developers can influence the behaviours of government, fintech start-ups, and TFOs. In Liu and White’ (2001) categorisation, government, fintech start-ups and TFOs are primary actors and technology developers and financial consumers are secondary actors. This thesis will involve both types of interactions and the primary actors’
interactions will be concentrated.

The third component of FTIS is defined as institution. This thesis adopts North’s (1991) definition of an institution which regards the institution as a set of practices, rules, and laws that guide or restrict actors’ innovative behaviour. Freeman (2002) stated that the institutions in TIS should adjust for the development and diffusion of technology innovation. Kukk et al., (2016) highlighted the significant influence of institutions on the TIS. In the SI framework, the institution is defined as rules, laws, regulations from a hard perspective and customs, common habits, routines, established practices, traditions, norms, expectations from a soft perspective. Base on the literature review and research gaps, rules, laws, and regulations in fintech industry are focused from a hard perspective in FTIS framework.

The fourth component of FTIS is defined as infrastructure. From fintech studies, vital fintech infrastructure have been summarised including the security application, centralised computing, mobile network, regtech, etc. In this study, the infrastructure of FTIS is defined as the physical technologies related to fintech service. Although there are Physical, knowledge, and financial aspects of infrastructure in the SI framework (Ho and O’Sullivan, 2019), the technical aspect of fintech infrastructure will be concentrated to address the research questions.
3.4 Analytical framework

In this section, the analytical framework of this research based on the FTIS framework is further developed. Fig 3.1 shows the FTIS framework and the four structural elements. Because, the policies have different effects in different stages of fintech development (Shim and Shin, 2016); Based on the FTIS framework, and the fintech development stages which were divided into the initiation stage, the growth and problematisation stage, and the improvement stage, the analytical framework is developed for dynamically analysing the policy instruments’ roles in FTIS in different stages. Fig 3.2 shows the analytical framework of this research. The vertical axis and horizontal axis represent the structural elements of FTIS and the three fintech development stages, respectively.

There are two tiers to use the analytical framework. The first tier aims to answer the SQ1: what are the fintech actors, fintech interactions, fintech institutions, and fintech

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**Analytical framework**

**Fig 3.1 FTIS framework.**

Sources: adapted from Wieczorek and Hekkert (2012) and Ho and O’Sullivan (2019)

- Actors: Fintech start-ups, technology developers, government, traditional financial institutions, financial consumers.
- Interactions: Individual contacts between different actors, actors’ network.
- Institutions: Rules, Laws, and regulations
- Infrastructures: Physical architectures.
infrastructure? Therefore, the point is to identify what are the structural elements of FTIS and their changes in the initiation stage, the growth and problematisation stage, and the improvement stage respectively. The second tier focuses on exploring the roles of policy instruments in FTIS in the three stages, which answers the SQ2: how do policy instruments dynamically affect fintech actors, fintech interactions, fintech institutions, and fintech infrastructure? By integrating the answers of SQ1 and SQ2, the main research question of how policy instruments dynamically affect the fintech industry will be answered.

Fig 3.2 Analytical framework of policy instruments’ roles analysis in FTIS

*Source: author composed.*
CHAPTER 4 METHODOLOGY

4.1 Introduction

This chapter discusses the methodology. The philosophical perspective is firstly introduced in the section 4.2. In detail, research approach and research strategy are discussed and chosen in the section 4.2.1 and section 4.2.2 respectively. In section 4.3, research design follows next and presents the research method and the case setting of this research in the section 4.3.1 and 4.3.2 respectively. After, data collection and data analysis will be respectively introduced in section 4.4 and section 4.5. Then, Section 4.6 introduces validation assessment and Section 4.7 demonstrates ethical consideration. At last, this chapter will be summarised in section 4.8.

4.2 Philosophical perspective

4.2.1 Research approach

Guba and Lincoln (1994) proposed four important paradigms: positivism, post-positivism, critical theory, and constructivism, and these are widely used in social science studies as research approaches (Drahos, 2017). There are also many other paradigms in academia. In this research, Tsang’s (2014) classification of research approaches: Positivism, Interpretivism, and Critical realism, is focused and discussed as follows.

A research approach is composed of ontology, epistemology, and methodology (Scotland, 2012), and influences the theoretical rationale of research and reflects different ways of observing the world and making sense of it (Crotty, 1998). Ontology
reveals the nature of existence, the components of reality and how people can comprehend existence. Epistemology is used to identify ways of constituting valid knowledge and how it can be absorbed. Methodology decides the particular form of research methods.

Positivists believe there is a single and objective truth or reality which can be captured and observed and the epistemology of positivism is that truthful and objective knowledge is possible, and that there are regularities in observable empirical events (Hempel, 1966). This particular research approach usually proposes a hypothesis and then conducts an analysis of the patterns that can apply to individuals (Milles et al., 2014). Quantitative, experimental, structural-level and hypothetico-deductive methods are widely used in positivism research (Orlikowski and Baroudi, 1991).

In contrast, interpretivism argues that reality or the world are socially structured by subjective meaning from humans and interpretivists believe humans are purposive actors and create ideas and attach meanings to the social world (Walsham, 1995). It follows from this that there are multiple realities differentiated by different humans or ideas and the epistemology of interpretivism is that knowledge is generated by interpreting the subjective meanings and actions of events according to own references in multiple realities (Berger and Luckmann, 1967). Furthermore, it is believed that it is impossible to know the actual natural world as Walsham (2006) further notes. In interpretivism research, understanding the experience of events or actions, especially in different human’s meanings or own frame references, is vital before focusing on the causal relationships between events (Hammersley, 2008). As a result, qualitative methods such as ethnographies and case studies are most widely
used as its methodology in interpretivist research (Klein and Myers, 1999).

With reference to positivism, Sawyer and Sawyer (2005), Sayer (2000), and Berth et al., (2002) argue that patterns generated from empirical studies are insufficient for claiming causal explanations. They also argue that it is difficult to generate a deeper mechanism that explains the patterns. In contrast, critiques of interpretivism suggest that the experience and interpretation of reality cannot fully depict or validate reality (Walsham, 2006). It follows that sometimes idealist view could undermine the causal explanations of events or activities and weaken the ability to determine various theories of realities (Iosifides, 2012; Tushnet, 1982). Therefore, both positivism and interpretivism are not adopted in this study.

Critical realism is another vital research approach. Fig.4.1 shows the reality of the domains of critical realism. To be specific, critical realists believe that there is an independent existence of the world or reality that rejects conflates with knowledge or perceptions (Mingers, 2013). Critical realism also recognises that the knowledge of reality and social constructions is subjective (Sayer, 2000). Critical realists also recognise that reality is intransitive and stratified (Archer and Archer, 1996; Bhaskar, 2014). Critical realism firmly maintains a realist ontology because it is against both classical positivism and interpretivism ontology, reducing the social reality or world to that which can be empirically observed or perceived as human knowledge. Critical realism also explains that there must be enduring entities that cause or induce events generated from regularities that can be given from both experiments and the absence of regularity in reality (Bhaskar et al, 1998). This point of view connects to the scientific reasoning process of critical realism research called as retroduction
This view of causal mechanism is also the core of critical realism, and it has been more widely adopted in mainstream science research as a core philosophy and research approach (Illari et al., 2011), including in the field of information system research (Mingers, 2013; Losoncz, 2017). Markus and Silver (2018) hold that this philosophical paradigm is very useful to examine the role of IT uses and consequences. In this study, critical realism is adopted as the research approach.

![Fig 4.1 The reality domains of critical realism](Image)

The reason why critical realism is used as the research approach and theoretical rationale in this research is as follows. To identify the dynamic process and mechanism of how policy instruments affect the fintech innovation system behind the phenomenon, critical realism provides a suitable view to analyse it (Tsang, 2014). Because critical realism provides a potential to identify causality through shaped structures and mechanisms, the causality that critical realism research focuses on is
not the regularity of observable empirical events, which is positivism, but the mechanisms that can generate events, processes, and phenomena. In detail, the critical realism research approach enables to develop an analytical framework and then apply it to actual fieldwork that is relatively different from the empiricist view of positivism and the idealist view of interpretivism. In this research, a framework is constructed and developed that provides a clear view to guide the research, as the previous chapter illustrates. Then, this framework will be used to collect data through observing and measuring the events and phenomena simultaneously. By analysing the events in the three different fintech stages, the actors, interactions, institutions, infrastructure of FTIS in the initiation stage, the growth and problematisation stage, and the improvement stage can be identified (SQ1). Through analysing the data, the causal explanations of how policy instruments affect the fintech innovation system by influencing actors, interactions, institutions, and infrastructure are identified then (SQ2). By integrating the results, the research questions will be answered.

4.2.2 Research strategy

Blaikie (2007) introduced four methods of reasoning relating to research strategy: induction, deduction, retroduction, and abduction. Suitable combinations of research strategies provide a well-designed method by which to undertake research (Reichertz, 2013).

Induction aims to generalise universal theories from particular observations of patterns, regularities, and mechanisms. As an approach, it consists of observation, observing patterns, and then generalises to a theory (Katz, 2001). Deduction works from the more general to more specific (Blaikie, 2007); a top-down approach. To an
extent, it represents a reverse process to induction. As an approach, first it tests theories by eliminating false theories and keeping corroborated theories, and then, it deducts hypotheses and uses collected data to test hypotheses (Johnson-Laird and Byrne, 1991). The validation of the conclusion of deductive research requires that all the premises in the inductive study are true, and definitions and terms are consistent and clear (Prawitz, 2006).

Retroductionism believes that there is an independent existence that can only be perceived by concepts and discourses, and that people can influence social reality but not by way of choosing (Ayim, 1974). The first methodological step of retroduction is to observe regularities, which are generated from empirical events or descriptions, as the potential underlying causal mechanism which could be non-observable (Mingers et al., 2013). This mechanism can explain how these events, descriptions, and phenomena are generated (Downward and Mearman, 2007). The next step, according to Mingers et al. (2013), is documenting and modelling the regularities so that hypothetical models or competing explanations of a mechanism for further observation can be constructed. The final step is to conduct more research, fieldwork and other deduction processes using observation and experiment methods to testify and verify the existence of those mechanisms. This, in turn, leads or closes to the actual potential mechanism (Mingers et al., 2013; Blaikie, 2007). Retroduction is adopted as the research strategy in this thesis.

Abductive reasoning possesses a range of different definitions (Walton, 2014). What most have in common, however, is the same characteristics; namely, that abduction is mainly used in interpretivist research (Eriksson and Kovalainen, 2015). Abduction-
adopted research considers that social reality is constructed by purposive and conscious social actors attaching meaning to the world. Abduction research works by observing people’s interpretations and tries to re-describe the events or phenomenon to scientific explanations and causalities which could create a grounded explanation (Peirce, 1974).

Retroduction was selected as the research strategy of this study. Particularly, the regularity of this research is the development of the fintech industry that is continuously affected by policy instruments. There is still no clear framework from literature to analyse this regularity, primarily what elements of the fintech innovation system existed and were dynamically affected by policy instruments. So, based on current perceived literature, the analytical framework was needed and developed, which can explain the phenomenon that the fintech industry is affected by policy instruments through its actors, interactions, institutions, and infrastructure. This framework will guide this study to collect and analyse the data and lead to a real potential explanation. Besides, in the process of data analysis, other reasoning method is supplementary and sometimes necessary to answer the research questions. Blaikie (2009) mentioned that combining different strategies will probably create an advantage. For example, to answer the research question: how policy instruments dynamically affect the fintech industry, inductive reasoning and abductive reasoning are needed to answer the question form of how. Because questions of how is often required researchers to consider the derived questions or sub-questions. Another situation that this thesis might use deductive reasoning and inductive reasoning strategy is to process data in data collection and data analysis. In general, critical realism is the core philosophy base, and retroduction is the reasoning method of this
research. Research approach and research strategy are given. Next section will introduce the research design.

4.3 Research design

4.3.1 Research method

The qualitative single-case method will be adopted as the research method in this research. A research method is a strategy inquiry that can transit from a philosophical base to research design. (Myers and Avison, 2002). There are two methodologies in the literature, which is quantitative research and qualitative research. Bell et al., (2018) put forward the importance of understanding context in qualitative research, which emphasises understanding the context through behaviour and value, and helps to combine the sensitivity of background information with rigorous explanations. This methodology provides the view of exploring the unquantifiable function, such as the influence of policy instruments on the institution of FTIS in this case, which is unquantifiable. Qualitative research provides an actual view that can construct a framework demonstrating the basic assumptions and predictions (Patton, 1990). As an approach, it is open and flexible, and allows participants to express important issues, whilst also enabling researchers to have more opportunities to access real explanations through investigations with participants’ answers excluded predetermined concepts and opinions. A qualitative method was used in this study to provide rich descriptive, exploratory and explanatory research (Yin, 2009; Maxwell, 2012) on the effect of policy instruments on the fintech industry.

As Yin (2012) notes, there are several specific research methods in qualitative research including: experiment, archival analysis, history, and case study. Each
research method is different by collecting and analysing empirical evidence, which can be used for exploratory, descriptive, and explanatory purposes. Appropriate research methods can help answer research questions. Based on Yin’s (2003) comments on the case study, several reasons why the case study research method is applied to this study are summarised. First, the case study is suitable for answering the questions of how and why. The second reason is that the case study research method does not require control over behaviour events like the historical research strategy. Thirdly, the case study approach is an appropriate research method by which to examine contemporary events, while investigators cannot manipulate the relevant behaviours. As a result, a qualitative case study was adopted as the research method for this thesis.

4.3.2 Case study setting and background

There are three criteria used to select a case (Yin, 2012). First, the case setting needs to be critical and rational for research design. Second, the single case should represent a unique or extreme being worth documenting and analysing. Third, the single case should be revelatory case that allows researchers to observe and analyse the phenomenon (Yin, 2011). These three rationales also connect to the validation assessment of a case study which will be further explained after introducing the case setting and data collection.

For this study, China’s fintech industry represents a critical, unique, extreme and revelatory case. This is for a number of reasons. First, around 2013, and with the development of technology infrastructure and mobile services, a fintech boom occurred in China (Loubere, 2017). China's mobile internet users have maintained a
year-on-year growth of more than 10% (Yuan et al., 2016), and a large number of fintech-based start-ups appeared between 2013 to 2015 (Deng et al., 2014). Compared with the conventional financial ecosystem, emerging fintech innovations, such as crowdfunding, cloud payment and sharing economy, represent that China's fintech industry is rapidly expanding as more and more individual actors and innovations are involved in the financial system. Therefore, there are specific and qualified structural elements of FTIS that can be found in China's fintech industry. It follows, that China's fintech industry is a critical case in fintech research.

In addition to issues of increasing demand and technological developments, policies are a critical factor in fintech research (Chiu and Iris, 2016). As the core of the economy, TFOs are heavily regulated in China (Shim and Shin, 2016). Since 2003, the Chinese government has started to shape an environment conducive to the development of fintech by implementing a series of policies for the Chinese financial industry. The period from 2003 to 2012 is considered as the initial stage of China's fintech development. As Table.4.1 shows, in 2015, 10 ministries and commissions jointly issued the “guiding opinions on promoting the healthy development of fintech”, which clearly stated that they should further encourage fintech innovation and development. Since 2014, the government work report by China’s premier minister has referred to the development of China's fintech for four consecutive years. The government has significantly emphasised the importance of the deep integration of finance and technology and has issued more policies to guide the exploration and construction of the fintech environment.
<table>
<thead>
<tr>
<th>Time</th>
<th>Policies or events</th>
<th>Departments</th>
<th>Key Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 2015</td>
<td><em>Regarding vigorously advancing the innovation of the institutional system and solidly doing its opinion of science and technology financial services</em></td>
<td>People’s Bank of China, Ministry of Science and Technology, China Banking Regulatory Commission, China Securities Regulatory Commission, China Insurance Regulatory Commission</td>
<td>To vigorously nurture and develop the financial organisation system that serves technological innovation, we need to accelerate the innovation of technological credit products and its service models, explore the construction of insurance products and services that are in line with the characteristics of technological innovation, and further deepen the experimental integration of technology and finance.</td>
</tr>
<tr>
<td>8th August 2016</td>
<td><em>Notice of the State Council on Printing and Distributing the National Thirteenth Five-Year National Science and Technology Innovation Plan</em></td>
<td>State Council</td>
<td>To guide banking and other financial institutions to innovate credit products and financial services, speed up the development of science and technology insurance, encourage insurance organisations to initiate or participate in the establishment of venture capital funds, explore and standardize the development of Internet finance for service innovation, and promote the development of specialised financial institutions and service centers construction.</td>
</tr>
<tr>
<td>18th September 2016</td>
<td><em>Notice of the State Council on Printing and Distributing Beijing’s General Plan for Strengthening the Construction of National Science and Technology Innovation Center</em></td>
<td>State Council</td>
<td>To promote the deep integration of technology and industry, technology and finance, technology and economy, nurture a group of innovative leading companies with international competitiveness, gather world-renowned corporate technology innovation headquarters, build a cross-border innovation cooperation network, and promote the construction of an Internet financial innovation center.</td>
</tr>
</tbody>
</table>

Under the stimulus of deregulation, the vigorous development of China's fintech industry has spawned many start-up companies and innovative business models. Severe problems caused by the lack of regulation have also emerged. For example, Ezubao was one of the most famous P2P online lending platforms in China. At the end of 2015, the Ministry of Public Security of the People's Republic of China (MPS) and a range of financial supervision departments (including the People's Bank of China (PBC), the China Banking Regulatory Commission (CBRS), the China Securities Regulatory Commission (CSRS), and the China Insurance Regulatory Commission (CIRS)) discovered that a range of frauds had been enacted by Ezubao. The investigation revealed that Ezubao illegally absorbed more than 50 billion yuan of funds, and that there had been over 1 million victims of fraud. In 2016, the cumulative number of P2P problem platforms in China was 421 (Albrecht et al., 2017).

Policy-makers and researchers also have paid much attention to the role of policy-making in the fintech area during the last two to three decades. There were huge changes in policies, market environment and the diversification of policy instruments in China’s fintech industry. Based on actively encouraging innovation in fintech, the Chinese government has adopted policies and regulations to promote further the construction of market order and the healthy development of the industry (You, 2018). In the early stage of the fintech industry development before 2015, due to the low barriers for customers to entry, industry criminal cases have occurred frequently, such as Ezubao (Guo and Shen, 2016). Facing industrial chaos, the decision-makings by the government have guided and standardised China's fintech industry.

In 2016, the Chinese government adopted “the principle of encouraging legality and
struck illegality” as the core principle and launched a one-year special rectification of internet finance in China. 2016 is regarded as the first year of strengthened supervision of fintech in China (as Table 4.2 shows), and more penetrating supervision was implemented since then (Liu and Lu, 2017; Yiu, 2016). The institution of deregulation thereafter started to be controversial in China's fintech industry. The traditional financial strength represented by the big four banks advocated strict supervision (Lei, 2014); while some economists who advocate free market believed that the inclusion of fintech in the traditional financial regulatory framework would stifle new economic power (Labbe, 2017). This divergence is of critical importance to the implementation of specific regulatory policies. Generally, due to the unhealthy development of the Chinese fintech environment, such as Ezubao, most experts tend to think that over deregulation is not appropriate for the healthy development of China's fintech. Such discussions and divergence of opinion underline the extent to which the chosen case study conforms to the need to be revelatory; a further reason for its section as the case study for this thesis.
Table 4.2 Examples of national fintech supervision policies in 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Policies or events</th>
<th>Departments</th>
<th>Key contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>10th March 2016</td>
<td>Requirement of Internal Financial Information Disclosure</td>
<td>China Internet Finance Association (CIFA)</td>
<td>To require P2P practitioners to update at least 21 indexes based on platform operation information every day, such as total transaction amount, total transaction volume, number of borrowers, number of investors, and accumulated per capita loan amount, etc..</td>
</tr>
<tr>
<td>12th April 2016</td>
<td>Internet finance risk special rectification work implementation plan</td>
<td>State Council</td>
<td>To completely deploy and arrange rectification work on Internet financial risk in the current and next period. In the meantime, based on the division of responsibilities the relevant departments also released a plan for the implementation of special risk rectification work in the Internet finance-related fields. The “penetrating” supervision was first proposed. The special rectification work started in April 2016 and was originally planned to be completed by the end of March 2017. According to Caixin.com, the special event will be postponed for about one year and is expected to be completed by the end of June 2018.</td>
</tr>
<tr>
<td>13th April 2016</td>
<td>Notice on Strengthening Risk Prevention and Education Guidance on Bad Network Loans on Campus</td>
<td>Ministry of Education China Banking Regulatory Commission</td>
<td>It called for strengthening the supervision of bad campus internet loads, to establish a real-time early warning mechanism for bad campus internet loads. Timely discovering problems in the campus network problems, timely analyzing and evaluating the potential risks of bad campus internet loads, and promptly issuing warning information to students in the form of telephone, text messages, networks and campus radio.</td>
</tr>
<tr>
<td>13th April 2016</td>
<td>The implementation of internet financial advertising and the implementation of special rectification work on financial risks in the name of investment and financing</td>
<td>General Administration of Industry, Commerce, Central Propaganda Department</td>
<td>To deploy and carry out special rectification work across the country, focus on rectifying internet financial advertising and financial activities which is in the name of investment and financial management. The special rectification is divided into four stages: project formulation, mobilisation, clean-up and remediation, assessment and summary.</td>
</tr>
<tr>
<td>13th April 2016</td>
<td>Non-bank payment institution risk special rectification implementation plan</td>
<td>People’s Bank of China</td>
<td>To increase the special rectification and supervision on customer provision, require the payment institution to deposit the customer provision into Central Bank or other commercial banks that meet the requirement, and gradually cancel the interest expense on the customer provision for the payment institution.</td>
</tr>
<tr>
<td>13th April 2016</td>
<td>P2P network loan risk special rectification work implementation plan</td>
<td>China Banking Regulatory Commission</td>
<td>According to whether fit the definition of “information mediation”, whether cross the “red line” in the business process, whether there is illegal financing, etc., P2P online loan platform is divided into three types of compliance, rectification, or banned. Special</td>
</tr>
</tbody>
</table>
rectification is going to carry out nationwide.

<table>
<thead>
<tr>
<th>14th April 2016</th>
<th><strong>Internet insurance risk special rectification work implementation plan</strong></th>
<th>China Insurance Regulatory Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For insurance companies relying on the Internet to conduct cross-border business development, a clear focus shall be placed on investigating and rectifying the following issues: 1. Insurance companies cooperate with third-party network platforms that do not have operational qualifications to conduct Internet insurance business. 2. Insurance company cooperate with internet credit platform, such as providing trustworthy services, establishing capital pool and illegal fundraising, may lead to transfer the risks to the insurance sector. 3. Within operating the internet credits guarantees for Internet credits business process, the insurance company had incomplete wind control measures and inadequate internal control management.</td>
<td></td>
</tr>
</tbody>
</table>

(Source: State Council Policy database, Link:  
http://www.gov.cn/zhengce/chengcewenjianku/index.htm)
4.4 Data collection

4.4.1 First phase of data collection

Data collection was divided into three phases in this research. The first stage was the pilot test, the second stage was the formal data collection phase, and the final stage was predominantly a revisiting interviews phase. The pilot study was conducted in August of 2019. The pilot study aimed refine the initial data collection plan (Yin, 2012), and it also provided conceptional clarifications of the holistic view of the fintech innovation system in China. Before conducting a pilot interview, documents related to China's fintech industry and regulation to ensure the effective interview and the premise of basic local knowledge were collected. Then, valuable information from official public documents, published policies, existing literature, research reports, were collected. Documents were mainly as Chinese content documents, such as official documents from the Chinese government websites. Furthermore, professional research reports from authority agencies like Morgan-Stanly, IBM, Ernst and Young, Deloitte, Goldman Sachs, McKinsey Co, and Bain and Company were also referred in this data collection.

After reading the relevant documents and preparing the pilot interview, 4 face-to-face interviews with persons who were considered to be representative actors in China's fintech industry, were conducted. Interviewees included two persons TFOs (including a chief manager and a strategy manager from Shanghai’s branch of Industrial and Commercial Bank of China), 1 person from organisations affiliated to the government who is a policy researcher in China Banking and Insurance Regulatory Commission (CBIRC), and 1 person from a fintech start-ups who was running a security’s
company that used a great deal of technology.

Because of the Covid-19 pandemic and ethical consideration, all formal face-to-face interviews were postponed to some extent, and the interview method was changed from ‘in person’ to online. However, the changes in interview methods did not impact the results of study. Based on the report of documents preparing and pilot interviews, the consistency of fundamental conceptions about the analytical framework, especially for elements of China's fintech innovation system and its overall picture, was confirmed. Further appointments for the formal interview were also confirmed.

**4.4.2 Second phase of data collection**

The second phase of data collection was formal data collection which was undertaken to analyse this case. Six sources of evidence can be collected as data, including documents, archival records, interviews, direct observations, participant observation, and physical artefacts (Yin, 2012). Documents and interviews were two forms of data collection in this case study.

In terms of the interviews, there are semi-structured interviews, focused interviews, and structured interviews, along with a formal survey. In this research, semi-structured interviews were conducted because of their open-ended nature (Yin, 2013). The ontological and epistemological of semi-structured is that reality is socially constructed and interpreted by participants’ worldviews. This phase was conducted from December 2020 to February 2021. The appendix will show the initial plan that was influenced by the pandemic. The analytical framework positively assisted in conducting data collection both of documentary research and semi-structured
interviews. The contents needed to be gathered could potentially answer what elements are included in China's FTIS and how policy instruments affect them at the three development stages. Therefore, the key step of data collection is identifying the details of policies and the actors in China's fintech innovation system.

Documents are crucial sources of data for qualitative research (Patton, 2005). The scope of documents used in this project included policies and regulation documents related to fintech development in China. In total 52 documents from the state council official website by both exact search and fuzzy search of fintech, financial technology, and Internet finance were collected. Furthermore, 6 effective regulations and laws, such as Notice by the People's Bank of China of Issuing the “Fintech Development Plan (2019-2021)”, which directly mentioned fintech or financial technology in the title and 180 documents related to fintech, financial technology, Internet finance and other technology-driven finance were collected too. Relevant information, including the official notice, essential views, speeches, or interviews by actors of China's fintech innovation system, official suggestions and recommendations, an initial plan, important milestones are collected from the official website, such as the People's Bank of China, Ministry of Industry and Information Technology (MIIT), CBRC, CSRC, and industry reports and news from authoritative research industry and media such as Caixin website, and Xinhua Net. For example, the industry reports from Xin Hua net shows that the “Guiding Opinions on Promoting the High-quality Development of Trade” purposes to build an open, collaborative, and efficient standard technology research and development platform to strengthen the supporting role of manufacturing innovation on trade and promote the organic integration of the Internet, the Internet of Things, big data, artificial intelligence, blockchain and trade.
Semi-structured interviews were conducted to gain deeper insight from professionals, practitioners and entrepreneurs. 39 semi-structured interviews were conducted in this case study. Analytical framework guided the way of doing semi-structured interviews. Firstly, fintech start-ups, technology developers, governments, fintech consumers, and TFOs from the China’s fintech innovation system were identified in analytical framework. Therefore, the informants were chosen based on these categorisations. Through literature and analytical framework, the relative focus of the actors determines the proportion of informants in each type. After all formal interviews, 10 informants from TFOs, 8 informants from government and official regulatory authorities, 7 informants from fintech start-ups, 5 informants from fintech consumers, and 5 informants from technology developers were calculated. Furthermore, 4 professors from Fudan University, Shanghai Jiaotong University, Xi’an Jiaotong University, Shanghai University of Finance and Economics were interviewed to gain a broader and relatively theoretical view of China's fintech innovation system. Each mentioned university is in the top 50 class in China.

Before around a month, each informant received a participant information sheet (See appendix) that indicates the research background, purposes and procedures of interviews, and other declaration. 50 potential participants were invited, 47 replied to the email or messages, and 39 made an appointment. Before the interviews began, consent forms (See appendix) were asked to sign, and both interviewers and interviewees agreed with the audio-recording and paused the interview at any time. Each interview lasts 45 minutes at the minimum case and 90 minutes at the maximum case. 39 interviews are completed, and no cases are paused or withdrawn. Because
these interviews are semi-structured, the provided questions, based on the guide of literature and analytical framework, contain several closed questions (see appendix) and an uncertain number of open questions based on informants' unique roles and specific interests or thoughts. The question set is mainly based on the model framework.

4.4.3 Third phase of data collection

The third phase of data collection of this research was revisiting interviews to gain updated information (Bernard and Bernard, 2013; Bryman, 2016). This phase was conducted between January and March 2021. There were 5 revisiting interviews conducted. The interviewees who were reinterviewed were involving 1 from a TFO, 1 informant from Fintech start-ups engaged in financial leasing, 1 informant who is working for a technology development department of China Merchants Bank, 1 informant from CBIRC, and 1 informant who is the consumer of fintech. They were asked the same questions as the formal interviews alongside one or two additional questions. The revisiting interviews were all taken online.

4.4.4 The summary of data collection

In summary, documentary and semi-structured interviews are adopted as a source of data for the case study. Both primary and secondary data are successfully collected through the whole data collection process. Primary data was collected from the semi-structured interview, including pilot interview, formal interview and revisiting interview. Table 4.3 shows the details of the interview timeline and arrangement. Primary data was gained from the formal interview and the revisiting interview, and 39 interviews were conducted. The roles of interviewees are shown as well. For
secondary data, official documents, industry reports, and news from media are collected from databases and websites. Secondary data provides, to some extent, more details of the case and replenish the variety of data.

The data collection of this research also follows the three principles of data collection proposed by Yin (2012) that can maximise the benefits. The first principle is using multiple sources of evidence. In this time, the data collected from the documentary research and the semi-structured interviews allowed me to view attitudinal and observational issues in this research. Next, I created a database in my personal computer, U-disk, and Cloud disk to store the data. These data are organised and examined regularly. Third, the data collection is maintaining a chain of evidence that can increase the reliability of the information. Specifically, it creates the notion that allows an external observer to follow the derivation of any evidence, especially for data from interviews. Therefore, Table.4.3 was created to demonstrate the three phase of data collection and the list of interviews. Table 4.4 entails the interview codes and organisation code for clearer categorising. The next section will introduce the data analysis.
Table 4.3 Interview timeline and arrangement

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Interviewees</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 2019</td>
<td>Pilot interviews (The first phase)</td>
<td>2 from TFOs 1 from the government 1 from a fintech start-ups</td>
<td>All pilot interviews were conducted online Around an hour per informant Before Covid-19 pandemic</td>
</tr>
<tr>
<td>December 2020 to February 2021</td>
<td>Formal semi-structured interviews (The second phase)</td>
<td>10 informants from TFOs 8 informants from the government 7 informants from fintech start-ups 3 informants from Fintech consumers 3 informants from technology developers 4 professors from the universities</td>
<td>All formal interviews were conducted online Lasts 45 minutes at minimum case and 90 minutes at maximum case.</td>
</tr>
<tr>
<td>March 2021</td>
<td>Revisiting interviews (The third phase)</td>
<td>1 informant form a TFO 1 informant from the government 1 informant from a fintech start-up 1 informant who are a technology developer 1 informant who are a financial consumer</td>
<td>Added one or two questions on this basis to supplement the missed parts.</td>
</tr>
</tbody>
</table>

Source: collated by author.
Table 4.4 List of Interview and codes of interviewees

<table>
<thead>
<tr>
<th>Interview codes</th>
<th>Organisation codes</th>
<th>The role of Interviewees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFO1</td>
<td>TFO 1</td>
<td>President</td>
</tr>
<tr>
<td>TFO2</td>
<td>TFO 1</td>
<td>Director</td>
</tr>
<tr>
<td>TFO3</td>
<td>TFO 2</td>
<td>Vice President</td>
</tr>
<tr>
<td>TFO4</td>
<td>TFO 2</td>
<td>Operation and strategy manager</td>
</tr>
<tr>
<td>TFO5</td>
<td>TFO 3</td>
<td>Vice President</td>
</tr>
<tr>
<td>TFO6</td>
<td>TFO 3</td>
<td>Director</td>
</tr>
<tr>
<td>TFO7</td>
<td>TFO 4</td>
<td>Financial manager</td>
</tr>
<tr>
<td>TFO8</td>
<td>TFO 4</td>
<td>Director</td>
</tr>
<tr>
<td>TFO9</td>
<td>TFO 5</td>
<td>Financial manager</td>
</tr>
<tr>
<td>TFO10</td>
<td>TFO 5</td>
<td>Staff</td>
</tr>
<tr>
<td>G1</td>
<td>Government 1</td>
<td>Director</td>
</tr>
<tr>
<td>G2</td>
<td>Government 1</td>
<td>Staff</td>
</tr>
<tr>
<td>G3</td>
<td>Government 2</td>
<td>Director</td>
</tr>
<tr>
<td>G4</td>
<td>Government 2</td>
<td>Staff</td>
</tr>
<tr>
<td>G5</td>
<td>Government 3</td>
<td>Director</td>
</tr>
<tr>
<td>G6</td>
<td>Government 3</td>
<td>Staff</td>
</tr>
<tr>
<td>G7</td>
<td>Government 4</td>
<td>Director</td>
</tr>
<tr>
<td>G8</td>
<td>Government 4</td>
<td>Staff</td>
</tr>
<tr>
<td>FS1</td>
<td>Fintech start-up 1</td>
<td>General Manager</td>
</tr>
<tr>
<td>FS2</td>
<td>Fintech start-up 1</td>
<td>General Manager</td>
</tr>
<tr>
<td>FS3</td>
<td>Fintech start-up 2</td>
<td>Director</td>
</tr>
<tr>
<td>FS4</td>
<td>Fintech start-up 2</td>
<td>Director</td>
</tr>
<tr>
<td>FS5</td>
<td>Fintech start-up 3</td>
<td>Staff</td>
</tr>
<tr>
<td>FS6</td>
<td>Fintech start-up 3</td>
<td>Staff</td>
</tr>
<tr>
<td>FS7</td>
<td>Fintech start-up 4</td>
<td>Staff</td>
</tr>
<tr>
<td>FC1</td>
<td>Fintech consumer 1</td>
<td>User</td>
</tr>
<tr>
<td>FC2</td>
<td>Fintech consumer 2</td>
<td>User</td>
</tr>
<tr>
<td>FC3</td>
<td>Fintech consumer 3</td>
<td>User</td>
</tr>
<tr>
<td>FC4</td>
<td>Fintech consumer 4</td>
<td>User</td>
</tr>
<tr>
<td>FC5</td>
<td>Fintech consumer 5</td>
<td>User</td>
</tr>
<tr>
<td>TD1</td>
<td>Technology Developer 1</td>
<td>Project manager</td>
</tr>
<tr>
<td>TD2</td>
<td>Technology Developer 2</td>
<td>Project manager</td>
</tr>
<tr>
<td>TD3</td>
<td>Technology Developer 2</td>
<td>Staff</td>
</tr>
<tr>
<td>TD4</td>
<td>Technology Developer 3</td>
<td>Staff</td>
</tr>
<tr>
<td>TD5</td>
<td>Technology Developer 4</td>
<td>Staff</td>
</tr>
<tr>
<td>U1</td>
<td>University professor 1</td>
<td>professor</td>
</tr>
<tr>
<td>U2</td>
<td>University professor 2</td>
<td>professor</td>
</tr>
<tr>
<td>U3</td>
<td>University professor 3</td>
<td>professor</td>
</tr>
<tr>
<td>U4</td>
<td>University professor 4</td>
<td>professor</td>
</tr>
<tr>
<td>RTFO2</td>
<td>TFO 1</td>
<td>Vice President</td>
</tr>
<tr>
<td>RG5</td>
<td>Government 3</td>
<td>Staff</td>
</tr>
<tr>
<td>RFS2</td>
<td>Fintech start-up 1</td>
<td>General Manager</td>
</tr>
<tr>
<td>RTD2</td>
<td>Technology developer 1</td>
<td>Project manager</td>
</tr>
<tr>
<td>RFC1</td>
<td>Fintech consumer 1</td>
<td>User</td>
</tr>
</tbody>
</table>

*Note*: Interview codes are labelled based on the abbreviation of actors. The last five (e.g., RTFO) represent the interviewees who attend the revisiting interviews; therefore, the interview codes are added "R" for individualising.

*Source*: collated by author.
4.5 Data analysis

The data analysis of qualitative research is more subjective compared to quantitative research, and the universal procedure of analysing qualitative data is still open and not unified (Bryman, 2016; Crabtree et al., 1999; Saunders, 2007). Systematic data analysis based on the concepts provided by Chambliss and Schutt (2018) is applied to this research for analysing the considerable amount of collected data. There are five steps, mainly introduced in this section, of the systematic data analysis: data preparation, data familiarisation, data categorising and coding, data comparison and identification, and data presentation.

4.5.1 Data preparation

The first step of data analysis is data preparation. The main aim of data preparation is to process the raw data from different sources or formats to make it accessible, readable, and processable. The first necessary process was translation. All of the interviews were translated from Chinese to English. The transcript approach constructed by Oliver et al., (2005) was used to translate the raw contents. Thereafter, all the transcripts were manually typed, stored and organised into Microsoft Word documents for further analysis.

4.5.2 Data familiarisation

The next step of systematic data analysis is to be familiar with the translated and transcribed data. This process was crucial as it enabled the author to understand the data from a more holistic view before the next step. In detail, first, the research aims, objectives and questions were reviewed again, and some informal drafts and notes for semi-interview preparation, then the transcribed data was listened and read many
times to gain the comprehensive understanding and accurate meaning of contents interpreted by it (Morse, 2015). From the pilot study to data analysis, the process of data familiarisation was continuously being done. The key information, especially for those repeatedly in many times, was highlighted during the whole process (Grbich, 2012).

4.5.3 Data categorising and coding

The third step of data analysis was data categorising and coding. In this research, a concept-driven approach (Gibbs, 2018) was adopted. The concept-driven approach allows researchers to assign tags and labels to the data by the organised vital concepts or terms (Coffey and Atkinson, 1996; Huberman and Miles, 2002).

Besides the organised framework which provides the guide to data categorising and coding is evident in this research, through the data preparation and familiarisation, the key concepts and terms were widely appearing in the data; therefore, although there is an influence by the existed framework outlined by the author (Thomas, 2006), the concept-driven approach is suitable in this research.

By using concept-driven data analysis approach, two steps were undertaken in data coding. First, the whole transcribed data was rearranged by different concepts and terms. Key concepts that repeatedly appeared in the transcription were identified and highlighted in accordance with the advice advanced by Gale (2013). In this research, five key concepts in the initial frame of codes were Policy, Actors, Interactions, Institutions, and Infrastructure. The initial list of codes represented the critical aspects of data related to the research questions.
The second step was to rearrange the data from a policy instruments-oriented view so as to enable identification of the underlying mechanisms of how policy instruments dynamically affect China's fintech industry through actors, interactions, institutions, and infrastructure based on the different time when policies were issued. The concepts of promulgation time (to identify which stage), general purposes, and the roles in four elements of each policy were supplemented to analyse. 79 policies or significant events were categorised and coded.

4.5.4 Data comparison and identification

The fourth step was data comparison and identification. This step enables the discovering and summarising of underlying mechanisms and patterns by comparing the similarities and differences of the case data. This, in turn, generated the findings of this research. Through undertaking this step, the data comparison and identification process generate the findings of the research, and this is why it is considered as the most essential step of data analysis (Chambliss and Schutt, 2018). By this step, the specific elements affected by policy instruments in China's Fintech industry were identified; answering the first and second sub-research questions. By comparing the different impacts of policies on different elements in the Fintech innovation system and their similarities, the mechanisms of how policy instruments affect the fintech innovation system were explored.

4.5.5 Data presentation

The last step of data analysis is data presentation. The following three chapters (Chapters 5, 6 and 7) reveal the case results, whilst the case study is discussed in Chapter Eight. To be specific, the whole data analysis process needs to be presented.
Also, the final results of the data analysis should be explicit to be presented: 1. Key policy promulgations were listed in chronological order by three different stages of development of China's industry. 2. Actors, Interactions, Institutions, and Infrastructure are assigned to each policy promulgations to identify how policy instruments dynamically affect China's FTIS through its actors, interactions, institutions, and infrastructure.

### 4.6 Validation assessment

Validation assessment is divided into three steps in this research: validity construction, internal validation, and external validation, in keeping with the approach advanced by Yin (2012). Construct validity is essential to establish correct operational measures for the concepts being studied. In this research, multiple sources of evidence, including documentary and semi-structured interviews were used and establish a chain of evidence. The details are introduced in the previous section.

In terms of internal validation, it is essential to follow four steps to assure the internal validity of data. The first step is the principle of the triangulation paradigm, which applies the combination of methods and data sources in the same phenomenon (Denzin, 2017). In this research, both primary and secondary data were collected from documentary and semi-structure, and the validation of data is confirmed by each other (Jick, 1979). The second step is to control the process of sampling. Several measures were conducted to eliminate the individual bias and conflicts between different points of view and facts. First, during all phases of data collection, different data from different sources are continuously compared and validated. For example, if the date of policy promulgation mentioned by one of the interviewees was utterly different from
the data shown on the official website, the relevant data of interviewees to the policy
data were removed from data analysis to assure accuracy and effectiveness. Second,
 thick descriptions ensure internal validation too. In this research, 39 semi-structured
interviews and considerable numbers of the document will well support its validation.
Indeed, the limitation of this research, such as the time limitation, is listed in the
chapter conclusion.

External validation shares a similar logic to the rationale of using whether single-case
study or multiple-case study and whether the research findings can be generalised or
not (Zucker, 2009). Compared to multiple-case studies, it is true that external
validation of a single-case study is relatively weak, even though the case satisfies the
requirement as a critical, unique and extreme, and revelatory case as discussed in the
case setting. However, Yin (2013) pointed out that if the research findings can be
replicated to other case studies for analytical generalisation, the result will be
accepted even if there is no further replication. In this research, an analytical
framework was proposed and it is not strictly limited so that other case studies cannot
apply to explore other different cases analysing the impact of policy instruments on
other fintech industry. In other words, the findings of this research are usable in future
studies for further generalisation.

4.7 Ethical considerations

This research is under ethical consideration for returning a low risk for the result. All
participants, informants, contact staff came from start-ups, government and
organisations, universities and traditional institutions. Vulnerable groups were not
included in this research. Most research activities, including three stages of data
collection, were conducted during official working hours, which is not later than 6 p.m. Regarding the appointment time, participants were told and understood that they could reschedule it at any time. Before interview appointments, all informants received a participant sheet introducing the research agenda and a consent form to sign. The participant sheet and the consent form are listed in the appendix. With all interviews being held online, notes and recordings were permitted by interviewees. Anonymity and confidentiality were taken into consideration, and participants were assured that all personal information and other sensitive contents would be removed after data transcribing and during the data analysis stages. All interview data was secured and the study was granted ethical approval by the university. All the above points are also included in the granted ethical approval by the university.

4.8 Chapter Summary

In this part, the contents of the methodology used in this research were summarised. First, different philosophical perspectives, methods of reasoning, corresponding research approaches and research strategies were analysed. Critical realism and retroduction were adopted in this research. Then, the research method was introduced, and a qualitative case study was adopted in this research. Following the scenario, a suitable case for this research is selected: China's fintech industry. In the third section, the three phases of data collection were proposed, including pilot test, formal interviews and revisiting interviews. Although there was an unexpected Covid-19 pandemic, data collection work was completed. Using the data, data analysis was conducted next. Data preparation, data familiarisation, categorisation and coding, comparison and identification, and presentation were demonstrated then. Validation assessment and ethical consideration were essential and followed after data analysis.
CHAPTER 5 THE INITIATION STAGE

5.1 Introduction

This chapter presents the initiation stage of China's fintech system from 2003 to 2012. Section 5.2 summarises the structural elements of China's fintech industry at the initial stage of China's fintech development. Section 5.2.1 introduce the background of the initiation stage first. Section 5.2.2 identifies the China’s financial regulation at the initiation stage. Then, section 5.2.3 demonstrated the TFOs at the first stage, and section 5.2.4 elaborated the fintech start-ups. Third-party payment (TPP) companies are concentrated because it is one of the most crucial fintech start-ups for China's fintech development at the initiation stage. The interactions between fintech start-ups and TFOs are identified in the same section. Section 5.2.5 introduced the technology developers and fintech infrastructure at this stage. Thereafter, Section 5.3 shows how policy instruments affect China's FTIS at the initiation stage. Section 5.3.1 identifies the role of policy instruments on the fintech actors and their interactions. Then, section 5.3.2 focuses on the fintech institutions, and section 5.3.3 concentrates on fintech infrastructure. The summary is provided in section 5.4.

5.2 Structural elements of China’s fintech industry at the initiation stage

5.2.1 Background of the China’s fintech industry at the initiation stage

The year 2003 was a milestone for both payment systems and e-commerce’s development, in which China’s fintech development accelerated significantly. Interviewee TFO1, TFO4 TFO8, G1, FS2, FS3, FS4, FC2, U2, U3 recognised that
2003 represented the year in which the fintech industry emerged in China. In 2003, Alibaba, the largest B2B company in China, launched a C2C service called Taobao. In order to win the competition with many C2C companies and international companies such as eBay, Alibaba adopted the following approaches and strategies.

In terms of fintech start-ups, Alibaba developed its instant messaging application services, called Aliwangwang, which is a communication platform between buyers and sellers (Gao and Zhang, 2011). Second, Alibaba concentrated and invested more in its C2C business compared to its B2B business (Interviewee FS2). Third, the online payments system of Alibaba called Alipay was developed. Alipay is regarded as the most critical driver to the success of Alibaba. Taobao held an 86% share of transaction volume in 2008 (Watling, 2014). The increasing share held by Alipay absorbed many interests from leading banks and financial organisations and initiated China’s fintech development and triggered the interactions between fintech start-ups and TFOs.

Government departments also started to focus on China’s fintech development, whilst the securities and insurance industry also significantly started to undergo a number of changes. Despite these developments, corresponding policies mentioning the exact term fintech or internet finance were rare because of cognitive delay (Interviewee G2). Interviewee G3 stated that it was hard to understand fintech’s mechanisms, which made making fintech related policies challenging for most policy-makers at the start of the initiation stage.

Later years, China’s e-commercial sales sharply increased 250% approximately from
2005 to 2010 (PwC\textsuperscript{7}, 2016). The term fintech became much more popular in China. The working flow of TPP have been developed compared to a few years ago. Figure 5.1 shows how TPP works compared to the traditional payment chain. As is shown in the figure. In detail, traditional payment chain connects consumers and merchants by three intermediates: issuing bank, card network, and acquiring bank. With the joining of TPP companies, two intermediates, which are card network and acquiring bank, involved in payment with linked card were jointly provided by TPP companies, and directly connecting to merchant’s e-wallet which is provided by TPP companies as well. Then, TPP companies gradually merge the financial service from issuing bank so that consumers can directly pay with e-wallet such as Alipay or WePay, and connect it with bank account. This figure also shows how TPP started to participate more in the payment process and represents how the fintech start-ups has involved more in traditional financial services at this stage.

\textit{Source: collated by author based on case data.}

At this stage, financial regulation towards TPP was still in its infancy stage in China (Interviewee G2). In 2010, PBC, a central bank of China, promulgated a policy that allowed non-bank financial organisations to develop their own online TPP. At the

\textsuperscript{7} PricewaterhouseCoopers
same time, non-financial organisations started to participate in China’s fintech industry. For example, Tencent combined its instant messaging application WeChat and WePay, to develop its TPP services. In 2011, PBC began issuing TPP licenses to fintech start-ups. Organisations that own TPP licenses can cooperate with a broader range of participants, (i.e. not limited to the TFOs), to broaden potential innovation services, and potential partners included P2P platforms. The influence of TPP on the fintech industry was significant in China because it possessed improved efficiency compared to the traditional payment chain (see Fig 5.1). TPP also stimulated many new forms of fintech innovation services (Interviewee FS3).

TPP is one important example of fintech innovation services in China that shows the significant fintech development at this stage. Shim and Shin (2016) also stressed the importance of analysing TPP’s development to understand the role of policies in China’s financial industry. Besides, there are many new forms of fintech innovation services including, but not limited to, payment processing, risk management tools, personal financial management tools, cooperate loan on platform, asset and identity management, and financial data analysis tools. However, overall, at the initiation (first) stage of China’s fintech innovation development, the policy instruments directly mentioning the term fintech and relating to those new fintech innovation services are still scarce (Interviewee G8). The government’s learning process and speed of issuing fintech-related policies was still slow (interviewee TFO1, TFO2, TFO3, TF5, G1, G3, G5, FS2, FS5, FS7, TD2, U2, U3) and were not in line with the growing number of fintech market scale (interviewee TFO2, TFO4, TFO5, TFO6, G1, G3, G5, G6, FS1, FC2, TD1, TD2, TD3, U2, U3). Following the guidance of analytical framework, structural elements of FTIS will be identified first, and then analyse how policy
instruments affect them at this stage.

5.2.2 China’s financial regulation at the initiation stage

In this section, governments and the institutions of China’s FTIS at the initiation stage will be determined. China's financial regulation and supervision system is a critical part of China's FTIS. Fig 5.2 illustrates the financial regulation and supervision system of China's FTIS. It was used as the base institution of the current FTIS until the merger of CBRC and CIRC to form CBIRC in 2018. Before that, the regulatory institutions of China's FTIS included the PBC, CBRC, CSRC, and CIRC. The four government organisations controlled two systems: financial organisation's system, and the financial market system. The actors of TFOs, fintech start-ups and government are included in this system. Interviewees TFO3, TFO9, G2 stated that the policies promulgated from financial regulation and supervision institutions could directly affect TFOs, fintech start-ups. However, at the imitation stage, financial consumers and technology developers were mostly affected through their interactions with TFOs, fintech start-ups or other regulations from the non-fintech system such as laws and standards (Interviewee G7).
The responsibilities of PBC\(^8\) related to fintech development includes 1. Promulgating regulatory policies, 2. Formulating and implementing monetary policies, 3. Issuing RMB and managing currency circulation, 4. Supervising the financial market, managing credit, building a social credit system, managing foreign exchange, and treasury, 5. Maintaining payment and settlement systems, and anti-money laundering system, 6. Conducting financial industry statistical survey, analysis, and forecasts, and 7. Engaging international financial activities. These show the main responsibilities of fintech regulation belonged to PBC in China. However, the financial organisation system and financial market were expanding and PBC cannot focus on specific regulatory issues in banking, securities, and insurance industry in China. To supplement the PBC, three more specific regulatory authorities were established. On March 24, 2003, the “Notice on Adjusting the Party’s Leadership System of Financial Regulatory Institutions” was issued and established the CBRC, CSRC, and CIRC and

\(^{8}\) [http://www.gov.cn/fuwu/2020-03/26/content_5495794.htm](http://www.gov.cn/fuwu/2020-03/26/content_5495794.htm) [Accessed in 4/19/2020].
abolished the Central Committee Financial Work Committee (CPC). The reasons for establishing CBRC, CSRC and CIRC were that monetary policy functions and bank supervision functions needed to be separated in order to ensure the independence and flexibility of monetary policy, strengthen financial supervision, and maintain the consistency of bank supervision alongside seriousness of regulations. Since then, the initial financial regulatory institution of China’s FTIS was established.

Table 5.1 The responsibilities of CBRC in 2012

| 1. | In accordance with the provisions of laws and administrative laws, publish regulations and rules for the supervision and management of banking financial institutions and their business activities |
| 2. | Review and approve the establishment, change, termination and business scope of banking financial institutions in accordance with the conditions and procedures stipulated by laws and administrative regulations |
| 3. | Implement qualification management for directors and senior managers of banking financial institutions |
| 4. | Prudent operation rules for designating banking financial institutions in accordance with laws and administrative regulations |
| 5. | Conduct on-site supervision of the business activities of banking financial institutions and their risk status, establish a banking financial institution supervision and management information system, analyse and evaluate the risk status of banking financial institutions |
| 6. | Conduct on-site inspections of the business activities and risk status of banking financial institutions, specify on-site inspection procedures, and standardize on-site inspections |
| 7. | Communicate with relevant departments to establish a banking emergency handling system, and designate banks to also deal with emergencies, clarify the handling institutions and personnel and their responsibilities, handling measures and procedures, and deal with banking emergencies in a timely and effective manner |
| 8. | Responsible for the unified compilation of statistical data and statements of banking financial institutions across the country, and publish them in accordance with relevant national regulations, and guide and supervise the activities of banking self-regulatory organisations |
| 9. | Carry out international exchanges and cooperation activities related to banking supervision and management |
| 10. | Take over or facilitate institutional restructuring of banking financial institutions that have or may have a credit crisis that has seriously affected the legitimate rights and interests of depositors and other customers |
| 11. | Revocation of banking financial institutions that have illegal operations, poor operation and management, etc. |
| 12. | Inquire about the accounts of banking financial institutions and their staff and associated actors suspected of financial violations, and freeze applications for suspected transfer or concealment of illegal funds by judicial authorities |
| 13. | Ban the establishment of banking financial organisations without authorisation or illegally engaging in business activities of banking financial institutions |
| 14. | Responsible for the daily management of the board of supervisors of key state-owned banks and financial institutions |
| 15. | Undertake other matters assigned by the State Council |

Notes: These contents were presented in Chinese government official website and translated by author. Links: [http://www.gov.cn/banshi/qy/rlzy/2012-10/26/content_2251433.htm](http://www.gov.cn/banshi/qy/rlzy/2012-10/26/content_2251433.htm).
Compared to CSRC and CIRC, CBRC played a more crucial role at the initiation stage of China’s fintech industry (Interviewee G4). In this research, these regulatory authorities are defined as the government of China’s FTIS, and the promulgated policies by government form the institution of China’s FTIS. Table 5.1 elaborates the responsibilities of CBRC for better understanding to its functions in China’s FTIS. CSRC and CIRC regulate securities and insurance industry in China. When fintech start-ups engaged in the financial services in banking, securities, or insurance industry, corresponding regulatory authorities would take responsibilities to conduct regulation. From the table, it was found that the responsibilities of CBRC on fintech regulation were more detailed than PBC’s. In addition to issue policies on China’s banking industry, CBRC needs to timely supervise the business activities and its statistical data as sixth and eighth responsibility show. The issued sectors of collected fintech-related policies in this research are mostly from PBC, and CBRC (Interviewee G4), which indicates their importance as the institution of China’s FTIS.

5.2.3 TFOs of China’s FTIS

TFOs are defined as banks, securities companies, and insurance companies that are regulated by the regulatory authorities in this case. In 2012, TFOs of China’s FTIS included 3 policy banks including the China Development Bank, 5 large commercial banks, 12 joint-stock commercial banks, 144 city commercial banks, 212 agricultural banks, 190 rural cooperative banks, 2,265 rural credit cooperatives, 1 postal savings bank, 4 financial asset management companies, 40 foreign-funded corporate financial institutions, 66 trust companies, 14 auto finance companies, 4 consumer finance companies, 635 rural banks, 10 Loan companies, and 46 rural mutual fund cooperatives. Table 5.2 summarises the details of the banking industry in China. The
total asset of the banking financial organisations was 113.3 trillion RMB in 2012. This table also presents how widespread the TFOs in China were and the diversification of TFOs indicates the challenges of fintech regulation at this stage. The most TFOs of China’s FTIS at the initiation stage still engage in the traditional payment financial services (Interviewee TFO2). The TFOs in this table were heavily regulated by the People’s Bank of China, and CBRC (Interviewee G5). Their interactions with fintech start-ups started to be active during this stage (Interviewee FS1, FS2, FS3).

In addition, in terms of securities companies in China, as of 2012, there were 109 Chinese securities companies, and 18 listed securities companies. The total asset of securities companies was 901.99 billion RMB. In terms of insurance companies in China, there were 10 insurance group companies, 130 insurance companies, and 11 asset management companies nationwide. National insurance premium income was 1.43 trillion RMB, and insurance companies paid 0.39 trillion RMB for the year. The total assets of the insurance industry were about 6 trillion RMB (Sun et al., 2017). These data supported the reasons why PBC needed to establish three more regulatory authorities, and reflected the difficulties to supervise. In this section, TFOs of China’s FTIS at the initiation stage were identified which will help to understand how policy instruments affect them.
<table>
<thead>
<tr>
<th>Types of banks in China</th>
<th>Organisations</th>
<th>Definitions</th>
</tr>
</thead>
</table>
| **Policy banks**        | China Development Bank (CDB)  
The export-import bank of China  
Agricultural development bank of China (ADBC) | A policy bank (policy lender/non-commercial bank) refers to a professional TFOs founded by the government, with non-profit and the goal of implementing the government's economic policy, and carrying out financial business in a specific field (Cheng, 2009). Policy banks are state-owned. |
| **Large state-owned joint-stock banks** | Industrial and commercial bank of China (ICBC)  
Agricultural bank of China (ABC)  
Bank of China  
China construction bank (CCB)  
Bank of Communications of China (BCM) | The five largest comprehensive state-owned banks in China. Compared to other commercial banks, they own many financial facilities, large scale of employees, large number of financial customers, and strong profitability (Interviewee TFO9). |
| **Joint-stock commercial banks** | China Merchants Bank,  
Shanghai Pudong Development Bank, China CITIC Bank, China Everbright Bank, Huaxia Bank, China Minsheng Bank, China Guangfa Bank, Industrial Bank, Ping An Bank, Zheshang Bank, Hengfeng Bank, Bohai Bank, etc. | Joint-stock commercial bank held by corporate legal persons. They mostly take the form of a shareholding system, operating independently and accounting independently (Interviewee TFO7). Deposit is their main source of funds (Interviewee TFO8). Profit maximization is the business purpose and can conduct wider range of business than policy banks (Interviewee G1). |
| **City commercial banks** | Bank of Beijing, Shanghai Bank, Bank of Jiangsu, Bank of Nanjing, Bank of Ningbo, Shengjing Bank, Huishang Bank, Bank of Tianjin  
Hangzhou Bank, Xiamen International Bank, etc. | City commercial banks are an important component and special group of China's banking industry. Its predecessor was the City Credit Cooperative established in the 1980s. At that time, its business positioning was to provide financial support for small and medium-sized enterprises and play a fundamental role for the local economy (Interviewee G1). |

*Source: collated by author based on case data.*
5.2.4 Fintech start-ups of China’s FTIS

The number of fintech start-ups and the number of investment cases in China significantly increased from 2010, as shown in Fig 5.3 and Fig 5.4 respectively. These figures show the trend of fintech start-ups in China’s fintech industry, which matches to the general three development stages of China’s fintech industry. Compared to the next two stages (after 2013), it is apparent that the scale of fintech start-ups was still at the initial stage, and there was a big gap between the scale of TFOs. Even so, many interviewees agreed that the TFOs have already faced the significant competitions from fintech start-ups since 2010. This gap reflected the impacts of fintech innovation services on China’s fintech industry at the time.

This also shows that the fintech interactions among fintech start-ups, TFOs, and governments have become more frequent and complicated at the initial stage. Interviewee TFO2 and FS2 agreed on this statement and think the interactions between TPP companies, traditional banks and governments were even more active than the number demonstrates. For example, Alipay's success with online payment services at the early stage of China's fintech development established the initial network of China's fintech industry (Interviewee FS1). In addition, Alibaba started to cooperate with traditional banks to expand the fintech network, including the Industrial and Commercial Bank of China and the China Construction Bank, two of the largest banks in China (CAICT, 2018). At this stage, the TPP and interactions involving Alipay need to be concentrated in this case. Besides, this kind of active interactions between different actors of China’s FTIS needs to be focused to understand the role of policy instruments on the fintech industry.
5.2.5 Technology developers and fintech infrastructure of China’s FTIS

During the first stage of China's FTIS, China’s fintech infrastructure was also in its infancy. Payment system (PS), Central Securities Depository (CSD), Securities Settlement System (SSS), Transaction Database (TR) in China were still not clearly defined until 2013 when The Notice of the General Office of the PBC on Relevant Matters concerning Implementing the Principles for Financial Market Infrastructure was issued (Interviewee TD2). PS is composed of intermediary agencies that provide payment and clearing services and professional technical means
to realise payment instruction transmission and fund clearing (Interviewee TD1). CSD refers to the central registration and settlement agencies to manage all securities entering the system with an electronic book system, including the unified management of investor securities accounts, the implementation of a securities custody system, and the distribution of rights and interests related to the securities deposited by investors, etc (Interviewee TD3). SSS refers to the system can perform verification and calculation of the securities after the completion of the securities transaction (Interviewee TD3). TR refers to real-time and application-oriented database, which requires high response (Interviewee TD4). China Foreign Exchange Trade System, PBC Clearing Centre, China Central Government Securities Depository Trust and Clearing, China UnionPay, Interbank Market Clearing House, City Commercial Bank Fund Settlement Centre, Rural Credit Bank Fund Settlement Centre, China Securities Registration and Settlement, Zhengzhou Commodity Exchange, Shanghai Futures Exchange, Dalian Commodity Exchange and China Financial Futures Exchange were identified as the technology developers who operating system as mentioned above.

In addition, mobile networks are also widely used in initial and fundamental fintech infrastructure, and the development of smartphones and mobile networks promoted the development of fintech in China (Interviewee FS4, TD1). The rising number of fintech start-ups and fintech consumers created massive cellular demand and data for technology developers, and the demands of fintech infrastructure also rose. Mobile operators started to develop their fintech infrastructure and business networks for the emerging fintech industry (Interviewee FS3, TD1). For example, China Mobile and UnionPay developed a new payment service, Trusted Service Manager (TSM), which
promoted remote payment services by mobile devices. In addition to mobile networks, emerging computer hardware technologies such as servers, storage, were used as the fintech infrastructure at the initiation stage of China’s FTIS (Interviewee TD2). Other fintech infrastructures, such as fingerprint recognition, face recognition, cloud servers were still in their infancy in the fintech field and were not widely used.

Fintech start-ups and TFOs demanded updated fintech infrastructure (Interviewee G2). Interviewee FS1 claimed that, in the initial stage, although this phenomenon is not very obvious, the cost of updating fintech infrastructure has become one of the reasons for the fierce competition between fintech start-ups and TFOs in the fintech industry. For the TFOs, infrastructure upgrades brought expensive costs, and this made it difficult for them to compete with emerging fintech start-ups in terms of capabilities. There were learning and switching costs and a time-lag in the upgrade of infrastructure for TFOs. Overall, upgraded infrastructure expanded the scale of the financial market; therefore, this was an opportunity for banks, securities companies, and insurance companies (Interviewee TFO7, TD2, U3).

5.3 The policy instruments’ roles on the China’s FTIS

5.3.1 The roles on TFOs, fintech start-ups and actors’ interactions

The economic and financial policy instruments, and regulatory policy instruments affected the TFOs fintech start-ups and their interactions. In terms of TFOs, Table 5.3 shows that the policies or events which profoundly influence TFOs at the initiation stage from fiscal incentives and positive entrepreneurship aspects, such as shareholding system. In China, shareholding system regulates the proportion of foreign investment in state-owned banks (Interviewee G2). In 2003, the Measures for
the Implementation of Administrative Licensing Matters for Chinese-funded Commercial Banks issued by CBRC standardised that the total investment ratio to Chinese commercial banks as a foreign promoter or strategic investor shall not exceed 25%. However, the numbers of foreign-funded organisations who invested in Chinese banks as strategic investors were still increasing, and calls for continued improving of the upper limit of shareholding were also emerging (Interviewee G1). In 2004, “Some Opinions of the State Council on Promoting the Reform, Opening and Steady Growth of Capital Markets” mentioned:

“The tasks of promoting reform, opening and steady growth of capital markets are: building transparent and efficient capital markets featuring a rational structure, a sound mechanism, perfect functions and safe operations while aiming at the expansion of direct financing, improvement of the modern market system and the fuller play of the basic role of market in resources allocation. To fulfil such goals, we must establish an efficient capital markets system in helping enterprises of various types raise funds and in satisfying diverse investment needs.”

Since then, the ratio started to increase and absorbed more foreign investment into China’s financial industry. There were two cases. In June and July 2005, the China Construction Bank (CCB), one of the largest banks in China, signed subscription agreements with the Bank of America and Temasek Holdings, which had, respectively, purchased 9% and 5% of China Construction Bank. In the same year, the China Construction Bank Corporation was officially listed on the Hong Kong stock exchange. (Evans, 2008; Rinzinwangmo et al., 2009). The Bank of China (BOC) also
cooperated with the Royal Bank of Scotland Group and Temasek Holdings in August 2005. They paid $3.1 billion to buy 10% of shares respectively, and the bank of China was officially listed in 2009 (Baker, 2013). Industrial and Commercial Bank of China (ICBC) and Agricultural Bank of China (ABC) were successfully listed because of the incentives by policies at that time (interviewee TFO3). CCB, BOC, ICBC and ABC are called Big-four and playing significant roles in China’s financial industry and later FTIS. The advantages of scale stimulated by the foreign capitals ensure TFOs’ competitive advantages in the financial market.

The Securities, funds, futures, and life insurance industries were listed in the “Restricted Foreign Investment Catalogue”. In detail, life insurance companies were required that the proportion of foreign capital shall not exceed 50%. Futures companies were required to be controlled by Chinese holding. Fund companies and securities companies were required that the proportion of foreign shares shall not exceed 49% and 1/3 respectively. But the restriction was continuously lifted. In October 2012, CSRC revised the “Rules for the Establishment of Securities Companies with Foreign Equity” and the “Trial Provisions on the Establishment of Subsidiaries by Securities Companies” to increase the upper limit of foreign equity in joint venture securities firms to 49%. In 2019, “Special Management Measures for Foreign Investment Access” increased limits to 51% for the above four industries. Interviewee TFO2 and Interviewee G3 stated that the profitability of TFOs was not competitive against deregulated fintech start-ups at that time. Therefore, the improved shareholding system was critical as one of the fiscal incentives to TFOs.
Table 5.3 Examples of fiscal incentives of policies at the initial development stage in China

<table>
<thead>
<tr>
<th>Time</th>
<th>Issuing sectors</th>
<th>Policies or events</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2004</td>
<td>PBC</td>
<td><em>Expansion of the Floating Range of Loan Interest Rates of Financial Institutions</em></td>
</tr>
<tr>
<td>January 2004</td>
<td>State Council</td>
<td><em>Some Opinions of the State Council on Promoting the Reform, Opening and Steady Growth of Capital Markets</em></td>
</tr>
<tr>
<td>February 2004</td>
<td>CBRC</td>
<td><em>Opinions of the Central Committee of the CPC and the State Council Concerning Several Policies on Promoting the Increase of Farmers’ Income</em></td>
</tr>
<tr>
<td>October 2004</td>
<td>PBC</td>
<td><em>The People’s Bank of China decided to allow financial organisations to lower the RMB deposit interest rate</em></td>
</tr>
<tr>
<td>February 2005</td>
<td>State council</td>
<td><em>Several Opinions of the State Council on Encouraging, Supporting and Guiding the Development of Individual and Private Economy and Other Non-Public Sectors of the Economy</em></td>
</tr>
<tr>
<td>August 2005</td>
<td>PBC</td>
<td><em>Interim Measures for the Administration of the Basic Data of Individual Credit Information</em></td>
</tr>
<tr>
<td>August 2005</td>
<td>PBC</td>
<td><em>The national unified personal credit information basic database is officially launched</em></td>
</tr>
<tr>
<td>March 2008</td>
<td>PBC CBRC CSRC CIRC</td>
<td><em>Some Opinions of the People's Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission and the China Insurance Regulatory Commission on the Financial Support for Accelerating the Development of the Service Sector</em></td>
</tr>
<tr>
<td>May 2010</td>
<td>State Council</td>
<td><em>Several Opinions of the State Council on Encouraging and Guiding the Healthy Development of Private Investment</em></td>
</tr>
<tr>
<td>August 2011</td>
<td>CBRC</td>
<td><em>Measures for the Administration of the Sale of Wealth Management Products of Commercial Banks</em></td>
</tr>
<tr>
<td>September 2011</td>
<td>CIRC</td>
<td><em>Notice on Issuing the “Measures for the Supervision of Insurance Intermediary Service Group Companies (for Trial Implementation)” Companies (for Trial Implementation)</em></td>
</tr>
<tr>
<td>October 2011</td>
<td>Nine financial sectors</td>
<td><em>Some Opinions of the several departments on Promoting the Integration of S&amp;T and Finance, and Accelerating the Implementation of the Independent Innovation Strategy</em></td>
</tr>
<tr>
<td>November 2011</td>
<td>CIRC</td>
<td><em>Notice of the China Insurance Regulatory Commission on Prohibiting Insurance Funds' Involvement in Private Lending</em></td>
</tr>
</tbody>
</table>

Source: collated by author based on case data.
Fintech start-ups benefited from the economic and financing policy instruments at the initiation stage of China’s FTIS as well. Table 5.4 shows the important examples of entrepreneurial policies that fiscally supporting the development of fintech start-ups. Many Interviewees agreed that these policies were important as the basis of the proliferation of fintech services in China at the second development stage.

Table 5.4 Examples of entrepreneurial policies at the initial development stage in China

<table>
<thead>
<tr>
<th>Time</th>
<th>Issuing sectors</th>
<th>Policies or events</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2005</td>
<td>State council</td>
<td>Several Opinions of the State Council on Encouraging, Supporting and Guiding the Development of Individual and Private Economy and Other Non-Public Sectors of the Economy</td>
</tr>
<tr>
<td>March 2008</td>
<td>PBC, CBRC, CSRC, CIRC</td>
<td>Some Opinions of the People’s Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission and the China Insurance Regulatory Commission on the Financial Support for Accelerating the Development of the Service Sector</td>
</tr>
<tr>
<td>May 2010</td>
<td>State council</td>
<td>Several Opinions of the State Council on Encouraging and Guiding the Healthy Development of Private Investment</td>
</tr>
</tbody>
</table>

Source: collated by author based on case data.

For example, according to the “Some Opinions of the People’s Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission and the China Insurance Regulatory Commission on the Financial Support for Accelerating the Development of the Service Sector”, the loan limits for SMEs were further relaxed and stimulated the development of the credit financial organisations in China. Interviewee FS4 believed that the development of lending platforms was benefited with the lower limitations. In addition, “Several Opinions of the State Council on Encouraging and Guiding the Healthy Development of Private Investment”
allowed private capital to set up financial start-ups. The restrictions on the shareholding ratio of financial start-ups were further relaxed (Interviewee FS2). This indicates the financial start-ups can be further benefited by more capital investment. Interviewee TFO1 described the changes of China’s financial industry at the initiation stage as:

“Firstly, it preliminarily established a modern corporate governance structure for state-owned commercial banks, including the general meeting of shareholders, the board of directors, supervisors, and the management. Secondly, it also indicates the behaviours of TFOs from a rough development model to service and customer demand as the leading factor, highlighting its operating characteristics and enhancing differentiated competitiveness to better balance development speed, quality, and economic benefits. Thirdly, the Fintech actors’ management level was increased”.

These evidence prove that the significant roles of economic and financing policy instruments on TFOs and fintech start-ups at the first stage. Most interviewees believe that two fintech actors were both benefited from the policy instruments from a financing perspective, but fintech start-ups were received much more than TFOs. Interviewee G5 stated that the decisions that allow more foreign capitals into Chinese commercial banks need to be cautious. At this point, it seems that the roles of economic and financing policy instruments on the interactions between TFOs and fintech start-ups were unbalanced and still needs to be analysed with subsequent changes.
5.3.2 The roles on the institutions of China’s FTIS

At the initiation stage, the roles of policy instruments on the institutions of China’s FTIS were two-fold; they established the initial fintech regulatory institution which changed the structure of the regulatory system of China’s fintech industry, and standardise the fintech products and fintech institutions.

The establishment of CBRC in 2003 is a milestone that represents the important regulatory policy instruments’ roles. Before its establishment, PBC took the responsibilities of both the central bank and the supervision roles of the financial industry. However, in the fact and trend of the development of the more diversified system of China’s financial industry, the risks of the banking industry were getting higher and higher, and the requirements for financial industry supervision were higher and higher. (Interviewee G3). One of the reasons for the increasing financial risks in China was that regulatory arbitrage started to be uncontrollable in China (Interviewee G3). Interviewee G2 mentioned that it was difficult to regulate fintech start-ups and technology developers because of the limited effective regulations. At the same time, Interviewee TFO9 believed that many risks existed in TFOs, including banks’ weak risk management capabilities, the imperfect nature of financial organisations’ credit management systems, and their insufficient knowledge of risks. Therefore, there was a need for regulatory institutions to regulate and guide fintech actors to avoid risks.

Interviewee G1 believes that the reason why CBRC was established was to supplement the part regulatory functions of PBC. “Banking Supervision Law of the People’s Republic of China” was issued in 2003 and CBRC was announced and established in the same year. It clarified the specific responsibilities and legal
guarantees of CBRC, and this law and the “Commercial Bank Law” have become two of the most fundamental financial institutions in China’s FTIS.

With regard to the roles of policy instruments, several responsibilities related to financial institutions were separated from the PBC and given to CBRC. CBRC is responsible for supervision of banks, financial asset management companies, trust and investment companies, and other deposits financial institutions. PBC remains to strengthen, formulate, and implement monetary policies, focusing on strengthening the macro-control of the financial industry and preventing and resolving systemic financial risks. The separation of the regulatory institutions may optimise regulatory resources and improve the efficiency and effectiveness of the fintech regulation (Interviewee U3).

“*The financial industry at that time was far less diversified and complex than it is now. If it were too late to establish CBRC to separate the responsibilities of regulation, The PBC would not have enough power to supervise the current fintech industry, and risks will inevitably get out of control*” (Interviewee TFO2).

Interviewee G2 also supported TFO2’s opinions and stated that it should have been established earlier to avoid risks.

The second role of regulatory instruments on the institutions of China’s FTIS was the standardisation. In addition to the established CBRC, there were more issued policies or events on fintech which guided to standardisation. Twenty specific policies were collected and Table 5.5 shows some representative examples.
Table 5.5 Examples of policies on the institutions at the initial development stage in China

<table>
<thead>
<tr>
<th>Time</th>
<th>Issuing sector</th>
<th>Policies or events</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2004</td>
<td>CBRC</td>
<td>Notice of China Banking Regulatory Commission on Promoting the Five-grade Assets Quality Classification Management in All Non-banking Financial Institution</td>
</tr>
<tr>
<td>October 2004</td>
<td>CSRC</td>
<td>Measures for the Administration of Securities Investment Fund Management Companies</td>
</tr>
<tr>
<td>August 2005</td>
<td>PBC</td>
<td>Interim Measures for the Administration of the Basic Data of Individual Credit Information</td>
</tr>
<tr>
<td>January 2006</td>
<td></td>
<td>The national unified personal credit information basic database was officially launched</td>
</tr>
<tr>
<td>December 2005</td>
<td>CBRC</td>
<td>Announcement of the CBRC on Further Opening up China's Banking Industry</td>
</tr>
<tr>
<td>November 2006</td>
<td>State Council</td>
<td>Regulation of the PBC on the Administration of Foreign-funded Banks</td>
</tr>
<tr>
<td>November 2006</td>
<td>PBC</td>
<td>Provisions on Anti-money Laundering through Financial Institutions</td>
</tr>
</tbody>
</table>

Source: collated by author based on case data.

To be specific, “Measures for the Administration of Securities Investment Fund Management Companies” standardised the administration in the securities industry. In addition, “Measures for the Administration of Financial Institutions Reporting of High-Value Transactions and Suspicious Transactions” standardised the reporting of financial transactions and defined what suspicious transactions are. Policy instruments started to standardise the fintech institution that significantly influenced the fintech development (Interviewee TFO4). “Interim Measures for the Business Management of Derivative Transactions of Banking Financial Institutions”, and “Notice of CBRC on Promoting the Five-grade Assets Quality Classification Management in All Non-banking Financial Institutions” further standardised the specific risk management methods of financial transaction. Derivative products (Derivative Products) refer to
new financial products derived from traditional basic financial instruments, such as currency, interest rate, stocks and other trading processes, including futures, options and swaps (Interviewee TFO5). These policies specified the requirements when fintech start-ups or TFOs apply for a derivative product trading business. Through the more supervision on fintech start-ups and TFOs, the risk was more controlled and transparent, and more other fintech actors including financial consumers and technology developers started to participate in initial fintech industry in China (Interviewee FS2). These policies indicated the regulatory policy instruments roles on the fintech institution. Generally, polices on fintech actors at this stage incentive the initial development of China’s fintech industry from an economic perspective. Regulation on each fintech actors were still relaxed and TFOs received stricter regulation than fintech start-ups (Interviewee TFO1, FS3). Policies intensified the competitions between TFOs and fintech start-ups (Interviewee FS1).

5.3.3 The roles on technology developers and infrastructure of China’s FTIS

Financial and technical support by economic and financing policy instruments, and standardisation by regulatory policy instruments are the overall roles of policy instruments on the fintech infrastructure of China's FTIS at the first stage.

“The Notice of the General Office of the PBC on Relevant Matters concerning Implementing the Principles for Financial Market Infrastructures” is seen as the one of the most significant policies that affected the fintech infrastructure of China’s FTIS at the initiation stage (Interviewee G6). It confirms “Principles for Financial Mark Infrastructures” issued by Committee on Payment and Settlement Systems (CPSS) and International Organisation of Securities Commissions (IOSCO). Detailed and
specific guidance was given by principles for the assessment of financial market infrastructure, such as operating process, system response and etc (Interviewee G3). The principles provided standards for regulators to evaluate the fintech infrastructure and thus reduce the technical errors and financial risks (Interviewee G1), which suggested the standardisation role of regulatory policy instruments. However, this policy was issued in 2013 which means, in turn, fintech infrastructure of China’s FTIS at the initial stage were still infancy.

Table 5.6 presents the policies that supported the technical development of China’s fintech infrastructure at the initiation stage. With the slow standardisation process, fintech infrastructure were positively incentive by economic and financial policy instruments (Interviewee TD5). Interviewee G3 commented on the purpose of polices and suggested that they were initiated to provide technical support to China’s initial fintech infrastructure development. For example, “Notice of the China Banking Regulatory Commission on Further Strengthening the Supervision of Trust and Investment Companies” mentioned the importance of fintech infrastructure in CBRC regulatory and provides specific guidance for regulators to prevent financial risks in the industry. In addition, the government demanded a nationalised online payment system for further digitisation (Interviewee G5). The government issued many policies to promote the digitisation of China's online payment system. It follows, that the infrastructure of China’s FTIS was also stimulated from a demand perspective as well. “Some Opinions of the People's Bank of China, the National Reform and Development Commission, the Ministry of Public Security, the Ministry of Finance, the Ministry of Information Industry, the Ministry of Commerce, the Station Administration of Taxation, China Banking Regulatory Commission and the State
Administration of Foreign Exchange on Promoting the Development of Bankcard Industry” stated that PBC must promote the development of bank IC card applications in accordance with the new industry standards of the “China Financial Integrated Circuit (IC) Card Specifications”. It standardised the issue of bank cards which provided a favourable environment for the further development of TPP related technology developers and fintech infrastructure, thereby promoting the development of the payment system. From 2005 to 2010, China's online sales had increased by an average of 250%, reaching 4.5 trillion RMB at the end of 2010 (CAICT, 2018). This is important within the confines of this thesis because the results of the increase on online sales reflected the policy instruments roles of technical support and standardisation on fintech infrastructure of China’s FTIS.

Most interviewees believe that the development of fintech infrastructure enhanced the competitions between fintech start-ups and TFOs. There were specific guidelines on TFOs’ financial infrastructure development, however fintech start-ups such as TPP companies were not regulated as heavily as the TFOs. Interviewee G2 believes that the regulation and laws were not announced in a timely manner compared to the rapid development of TPP companies, and it was hard to in-time standardise the infrastructure of fintech start-ups. Interviewee FS3 believes that the development for fintech infrastructure also provided technological foundation that helped TPPs’ further development.
### Table 5.6 Examples of technical support of policies on the infrastructure at the initial development stage in China

<table>
<thead>
<tr>
<th>Time</th>
<th>Issuing sectors</th>
<th>Policies or Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2004</td>
<td>CBRC</td>
<td>Notice of the CBRC on Further Strengthening the Supervision of Trust and Investment Companies</td>
</tr>
<tr>
<td>November 2006</td>
<td>PBC</td>
<td>Measures for the Administration of Financial Institutions’ Reporting of High-Value Transactions and Suspicious Transactions</td>
</tr>
<tr>
<td>December 2006</td>
<td>CBRC</td>
<td>Notice of the CBRC on Issuing the Guidelines for the Financial Innovation of Commercial Banks</td>
</tr>
<tr>
<td>March 2008</td>
<td>PBC, CBRC, CSRC, CIRC</td>
<td>Some Opinions of the PBC, the CBRC, the CSRC and the CIRC on the Financial Support for Accelerating the Development of the Service Sector</td>
</tr>
<tr>
<td>June 2009</td>
<td>CBRC</td>
<td>Notice of CBRC on Further Strengthening the Risk Management of Derivative Transactions between Banking</td>
</tr>
<tr>
<td>March 2010</td>
<td>PBC</td>
<td>Notice of the People’s Bank of China on Issuing the Measures for the Administration of the RMB Cross-Border Payment and Receipt Management Information System</td>
</tr>
<tr>
<td>November 2011</td>
<td>CIRC</td>
<td>Notice of the China Insurance Regulatory Commission on Prohibiting Insurance Funds’ Involvement in Private Lending</td>
</tr>
</tbody>
</table>

*Source: collated by author based on case data.*

### 5.4 Chapter Summary

This chapter shows the results of data analysis for the initiation stage of China's FTIS. Firstly, what the actors, interactions, institutions, and infrastructure existed at this stage are identified. The importance of TPP's rising and the complicated interactions between TPPOs and TFOs in China's FTIS development are highlighted. Then, three roles of policy instruments are generalised: First is the fiscal incentives and entrepreneurship policies by economic and financial policy instruments, and regulatory policy instruments for fintech actors and fintech actors' interactions. Second is the initial establishment and standardisation of regulatory institutions by regulatory policy instruments. The third is the technical support to technology
developers by economic and financing policy instruments, and standardisation on the fintech infrastructure's development by regulatory policy instruments. The next chapter will discuss the different situations in the second development phase of China's FTIS.
CHAPTER 6 THE GROWTH AND PROBLEMATISATION STAGE

6.1 Introduction

After the initiation stage, with the development under the stimulus of encouraging policies, China’s FTIS entered the growth and problematisation stage (2013-2018). The section 6.2 will introduce structural elements of China’s fintech industry at the growth and problematisation stage first. The section 6.2.1 will present the background information. P2P online lending platforms and TPP will be elaborated in this section. Section 6.2.2 will introduce the actors and their interaction of China’s FTIS at the second stage. Infrastructure and institution of China’s FTIS at the second stage will be presented in section 6.2.3 and section 6.2.4 respectively. With the collected data from documents and opinions of interviewees, section 6.3.1 identifies two types of policy instruments in terms of how policy instruments affect fintech actors and interactions: economic and financial instruments and regulatory instruments. Section 6.3.2 indicates the policy instruments roles on the institution of China’s FTIS at the second stage. The third is that the economic and financial policy instruments on infrastructure of China’s FTIS, which will be introduced in section 6.3.3. The summary of this chapter will be given at the last in the section 6.4.

6.2 Structural elements of China’s fintech industry

6.2.1 Background of the China’s fintech industry

The background of this stage to provide overall understanding why this period is called the growth and problematisation stage will be firstly introduced. In terms of financial consumers in China’s FTIS, the number of financial consumers significantly
increased with the development of TPP and fintech infrastructure (Loubere, 2017). As introduced in the case setting and case background in Chapter 4, in the second stage of China's fintech development from 2013 to 2017, the number of registered fintech start-ups and investments has continuously increased (growth). Fig 6.1 shows the prominent fintech start-ups in China's FTIS in 2017. Various fintech start-ups have been engaged in China’s fintech industry and further boost the fintech development (Interviewee TFO10). At the same time, the financial frauds that occurred at this stage have profoundly impacted China's fintech industry (problematisation) (Interviewee G2, U1). The promulgation of fintech policies has also become more frequent and specified to fintech regulation at this stage (Interviewee TFO4, G5).

Fig 6.1 China’s main fintech start-ups at the second stage

Source: edited by author based on case data.

6.2.1.1 The growth and problematisation of P2P online platforms

Due to the stimulus of deregulation policies and fiscal support at the first stage of China's FTIS, P2P lending platforms were further developed during the second stage.
P2P lending became even more popular in China at this stage (Interviewee TFO2, TFO4, TFO5, G1, G2, G3, FS1, FS2, FS4, FS5, FC1, FC2, FC3, FC4, TD1, TD2, U1, U3). P2P is based on new network technology and network topology, and was mostly applied to the personal loan business between different individual financial consumers on the P2P lending platforms in this case. In 2015, the number of P2P lending platforms was around 2,500 and the number of active financial consumers increased by approximately 7 million⁹.

Although there were risk control platforms for P2P lending such as the application called "Magic mirror" created by fintech start-ups that can show the risk level of each loan based on the big data model (Li et al., 2018), a series of problems such as bad debts, broken capital chains, and fraud also appeared on a large number of P2P platforms (Interviewee TFO5). Ezubao is the most significant case of fraud that occurred at that time. The investigation revealed that Ezubao illegally absorbed more than 50 billion yuan of funds, and the number of victims was 1 million approximately. In 2016, the cumulative number of problem P2P platforms in China was 421 (Albrecht et al., 2017). Thunderstorm was a common term to describe the phenomenon of P2P platform bankruptcy (Interviewee TFO2, U1). It is a phenomenon that also caused panic in the China’s financial market (Interviewee FS7). It is believed that, as a consequence of such fraud, policy direction changed significantly from being relaxed, and deregulated being strict and regulated from this point (Interviewee TFO1, TFO4). From 2017 to 2018, the number of P2P lending platforms decreased by 900, and P2P consumers dropped from 39 million to 33 million (Gao et al., 2021). Due to the Thunderstorm of P2P lending platforms,

regulatory issues of fintech were taken seriously by the government (Interviewee G5).

6.2.1.2 Growing China’s TPP

Due to the announcement by the State Council in 2013 that private companies were allowed to set up private banks on a trial basis, five private banks obtained operating licenses; including fintech start-ups like Alibaba and Tencent. Compared to traditional banks, new TPPs such as WeBank (operated by Tencent) issued loans based on their credit rating system (Interviewee FS6). TPPs had further increased their share of the loan market (Interviewee FS4) and it represented the huge growth of TPPs in China’s fintech industry during this period. In response to competition with TPPs, traditional banks, mainly state-owned banks, sought new market opportunities and technology innovation and therefore to increase their share in China’s fintech industry.

With the development of TPPs, fintech start-ups and TFOs started to conduct more types of fintech services at this stage. By combining advantages of online mobile device and TPPs, the fintech services includes but not limited to consumer finance on payment, financing, saving, investment, and so on (Interviewee FS7). For example, fintech start-ups such as Ant Fortune of Ant Financial Group and Licaitong of Tencent Group started to provide saving and investment services to financial consumers through mobile devices (Interviewee FS6). Fintech start-ups or TFOs used emerging technologies to vigorously develop innovative financial services, and promoted inclusive finance and small and microfinance (Interviewee TFO3, TFO4, TFO8, FS1, FS3, FS4, TD2, TD3). Technology developers also started to participate in more fintech services at the second stage (Interviewee TD1). For example, cloud computing provided by Ant financial cloud, Tencent cloud, Ping An Cloud, Baidu financial cloud...
became a mainstream staple of financial IT architecture. The infrastructure of financial cloud deployment was rapid, and cloud computing technology was further developed at this stage. In general, fintech actors started to be heavily regulated by policies at this stage because of their growth and problematisation.

6.2.2 Proliferation of fintech actors and interactions

Interviewee TFO5 described the fintech actors and their interactions at the second stage with the word proliferation. Fig 5.3 and Fig 5.4 in chapter 5 which present the growing number of fintech start-ups and investment support TFO5’s argument and most interviewees expressed similar opinions about China’s FTIS at this stage. Furthermore, this period was also described by the CAICT (2019) as diversified. The market scale of fintech increased, attracted more fintech start-ups, and this further stimulated growth of China’s fintech industry. The CAICT (2019) stated that:

“In 2013, Alipay launched “Yuebao” online wealth management products and services, which prompted a large number of Alipay users to pay more attention to wealth management products. Internet wealth management platforms gradually started, and Tencent Licaitong and Ant Fortune went online one after another. There are 692 online lending platforms in China, and the development of online lending platforms continued to rise during this period. The rapid development of online wealth management and online lending platforms has accelerated the active exploration of Internet financial models in traditional financial segments.”

In addition to the online lending platforms, the insurance industry was further developed during the second stage. Zhong An Insurance was established in November
2013, and CITIC Insurance was established in April 2014. 6 companies, including Securities and Guotai Junan, obtained qualifications to launch pilot network securities businesses.

In 2015, there were state-owned commercial banks, 12 joint-stock banks, 17 private banks, 39 foreign banks, 134 city commercial banks, 1262 rural commercial banks, plus 1 Development Financial Institutions China Development Bank (CDB), 2 policy banks, including The Export-Import Bank of China, and Agricultural Development Bank of China, and 1 post bank; the Postal Savings Bank of China. In addition to the traditional banking industry, the securities and insurance industries grew alongside the development of financial technology. Taking the securities industry as an example, in 2014, the revenue of China’s Internet securities industry reached 211.35 billion RMB, whilst only a year late the size of the Internet securities industry market was 375.08 billion yuan, a year-on-year increase of 77.5% (CAICT, 2020). In addition to the scale, the way of financial services changed. TFO4 thinks that, in the future, fintech and the securities industry will be more closely integrated. In some areas, it may subvert the existing financial services, and drive the reduction of service costs, the improvement of efficiency, and the continuous expansion of coverage.

At this stage, fintech infrastructure included a payment and settlement system composed of China UnionPay and the Net Union Clearing Company, financial IT facilities, and a credit information system. The fintech infrastructure (technology developers) interacted with the services layer (fintech start-ups) of fintech and the fintech service layer connected to the fintech user layer (TFOs, fintech start-ups, financial consumers). TPP, Internet banking investment and wealth management,
credit financing, Internet consumer finance, and other popular fintech business were also sufficiently improved during this stage. The user layer included TFO, enterprise users (fintech start-ups), and individual users (financial consumers) (Sun et al., 2017).

In terms of governance at the second stage, the government more frequently issued policies that directly mentioned the concept of fintech. 34 significant fintech-related policies at the initiation stage of China’s FTIS from 2003 to 2012 were collected. Comparatively, 38 policies at the growth and problematisation stage of China’s FTIS from 2013 to 2017 were collected. The more frequent policy or events show the acceleration of the policy from problematisation, designing, implementation, and evaluation (Interviewee G2). This played a positive role in developing the regulatory institution of China’s FTIS (Interviewee G1); however, problems such as P2P financial fraud still appeared. The government not only needs to issue more fintech policies, but also requires collaboration with other different government departments to share data, and actively interact with other participants in fintech industry, thereby reducing learning time to fintech innovation (interviewee G4). Fintech-related policies gradually changed from being advanced via a single department to multiple departments, and this change was regarded as a positive signal for China’s FTIS and as a necessary action for further regulations (Interviewee G4).

6.2.3 The Infrastructure of China’s FTIS

The fintech infrastructure of China’s FTIS in the second stage can be categorised in three ways. With regard to the first, the first is the payment and settlement system run by payment clearing organisations. Net Union Clearing and China UnionPay are the only two licensed payment clearing organisations in China, and they provide clearing
services funds for internet financial companies (Interviewee TD5). In the traditional payment business, the business process of China UnionPay’s clearing model is from acquisition to transfer to clearing (Interviewee TFO3), which involves the card issuer, the acquirer, and the clearing platform. The three parties are divided according to the ratio of 7:2:1 respectively, namely China UnionPay’s fee income accounts for 10% of the settlement amount paid (Interviewee TD5). Net Union Clearing was established in August 2017 and was the only licensed payment clearing organisation in China to handle online payment services involving bank accounts initiated by non-bank payment institutions (Interviewee TD4). At the end of 2018, Net Union Liquidation had not yet participated in the distribution of handling fees (Interviewee TD3). Therefore, in terms of China UnionPay and Net Union Clearing were two dominant technology developers that ran payment and settlement at the second development stage of China’s FTIS.

The second is financing IT infrastructure, it is noted that the transformation and upgrading of financial IT facilities were essential foundations for TFOs to realise fintech profit. Therefore, in the context of the rapid development of fintech, TFOs significantly increased their demand for financial IT facilities and services. For example, in the banking sector, the size of the banking IT facility service market in 2018 (based on solution revenue) exceeded 40 billion yuan; in the field of internet securities, the China Securities Association (CSA) used IT investment as an indicator of corporate scoring in 2017, and Internet Securities Enterprises’ investment in IT continued to increase. In 2018, the securities industry (according to the caliber of 98 securities firms) invested a total of 13.07 billion yuan in IT infrastructure, a year-on-year increase of 16.9% (CAICT, 2019). These stats show how TFOs valued the
importance of financing IT infrastructure, and also shown the guaranteed demands leading to technology developers’ development.

With reference to the third point, the credit system, it is recorded that the credit system is the cornerstone of security for the development of fintech services and is used in internet credit financing, as well as some additional scenarios such as anti-fraud, identity verification, and credit decision-making. In 1932, the establishment of China’s first credit reporting agency, The China Credit Bureau, represented the beginning of the development of China’s credit reporting industry. Since 1980, PBC has guided the establishment of a social credit information system. In February 2018, Baixing Credit Information obtained the first personal credit information business license issued by the Central Bank. This is important to note because it illustrates how the credit information industry has influenced the government-led situation and transformed into a more market-oriented and commercialised competition model.

The development of credit system was also important to the private enterprises and individual financial consumers. At this stage, PBC had more than 80% of information and data resources. Among them, in personal credit investigation, the credit investigation system of the PBC operation and maintenance has achieved full coverage of the lending business of licensed financial institutions in China. In 2018, the number of financial consumers included in the PBC’s credit investigation database reached 970 million; accounting for a cumulative total of more than 3.3 billion pieces of credit information and more than 6.5 billion pieces of public information. It has established credit files for 25.42 million enterprises and other organisations and more than 3,900 lending institutions of various types (CAICT, 2019). This shows how
enormous data that credit system was handling and the importance of the credit system on the development of China’s fintech industry (Interviewee G2).

6.2.4 The institutions of China’s FTIS

The institutions of China’s FTIS changed at this stage (Interviewee TFO1), led by the proliferation of the fintech actors and interactions (see also in Section 6.2.2).

To cope with the more complex fintech industry, changes to the institution of China’s FTIS became more frequent in this stage. Individual users began to become active in the fintech industry, and the scale of online lending businesses such as small cash loans and P2P lending continues to increase. The rapid development of the fintech industry had required the adapting time for regulators to study new Fintech business and the response time for corresponding policy formulation, and it also required the government to issue policies more quickly to reduce systematic financial risks (Interviewee TFO1). Systematic financial risks at this stage include, but are not limited to, incomplete coverage of the official credit population, non-interoperable databases, lack of a unified official credit rating system, low cost of online financial crime and difficulties of tracking (Interviewee G1).

In terms of the incomplete coverage of the official credit population, the registered China’s credit population was 380 million in 2015, which coverage was particularly low (PwC, 2016). The non-interoperable database was one of the reasons why the official credit population was low (Interviewee G1), which represents the low data openness and low compatibility between different industries and platforms, including the government, telecom industry, medical industry, banking, Internet companies, etc.
Different organisations have different channels of data collecting and evaluation models, which results in inconsistent standards and an enormous waste of resources. Some interviewees (FS3, FS4, TFO4) also considered the institution of China’s FTIS at the second stage to be one of the reasons to subsequent P2P lending financial fraud and the financial consumers’ confidence crisis.

Since then, China’s fintech regulatory system has had more frequent changes, including improvements to law and regulatory processes. How these policies specifically affect the institution of China’s FTIS at this stage are presented in the Section 6.3.2.

6.3 The roles of policy instruments on China’s FTIS

6.3.1 The roles on fintech actors and interactions of China's FTIS

In this stage, concepts such as Internet finance and Fintech have been more directly mentioned in policies than the initiation stage (Interviewee G5). First, policies have been encouraging and supporting the development of the fintech industry at this stage as well (Interviewee TFO1, FS3, TD2). Table 6.1 summarised the policy instruments that affect China’s FTIS at this stage. There were regulatory instruments, economic instruments and soft instruments. These kinds of policy instruments have stimulated the development of fintech by supporting entrepreneurship, improving systemic capability and complementarity, enhancing demand for innovation, establishing legal framework that protects financial consumer rights, and etc.

Compared with the initiation stage, the contents of encouragement and support on fintech actors in the articles of policies became more specific and detailed. For
example, “Several Opinions of the State Council on Encouraging and Guiding the Healthy Development of Private Investment” which was issued at the initiation stage described private investment as the most online fintech services in China (Interviewee TFO4). However, policies issued in the second stage, including but not limited to, “Guiding Opinions of the People’s Bank of China on the Development of Mobile Payment Business, Opinions of the State Council on Promoting the Innovative Development of Cloud Computing and Cultivating New Business Forms of the Information Industry” and “Notice of 15 Ministries and Commissions including the China Banking Regulatory Commission on Issuing the Implementation Plan for the Special Rectification of Risks concerning Online Peer-to-Peer Lending” specifically targeted one type of fintech as mobile payment business, cloud computing, and P2P platforms. At the same time, regulatory policy instruments also became more detailed to deal with the proliferation of fintech actors, and their interactions (Interviewee G1), and TFOs still received more strict regulation compared to fintech start-ups (Interviewee FS2). The protection of financial consumers was started to be focused by government from this stage (Interviewee G3). However, the relevant policies and laws were still not sufficient at that time compared to the recent (Interviewee FS3).
Table 6.1 Examples of economic and regulatory policy instruments on fintech actors and interactions at the growth and problematisation stage in China

<table>
<thead>
<tr>
<th>Policies</th>
<th>Date</th>
<th>Issuing sectors</th>
<th>Contents</th>
<th>Influences</th>
<th>The types of policy instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opinions on Further Deepening the Financial Services for Micro and Small-Sized Enterprises</strong></td>
<td>2018-06</td>
<td>PBC, CBIRC, CSRC</td>
<td>Using modern fintech and other means to promote activities for small and micro enterprises’ accounts receivable financing, give full play to the function of insurance credit enhancement and sub-insurance, and improve the availability of financial services for small and micro enterprises</td>
<td>1. Funding SMEs (Fintech actors) a total of 150 billion yuan for refinancing and rediscounting 2. Decreasing the SME’s (Fintech actors) refinancing interest rate by 0.5%</td>
<td>Economic and financial policy instruments</td>
</tr>
<tr>
<td><strong>Guiding Opinions on Further Expanding and Upgrading Information Consumption to Constantly Release Domestic Demand Potentials</strong></td>
<td>2017-08</td>
<td>State Council</td>
<td>Encouraging financial institutions to develop more financial products and services suitable for information consumption, promote small, convenient and convenient small and micro payment methods, and reduce the cost of information consumption financial services</td>
<td>Funding and technical supporting infrastructure 4G, 5G, IoT, blockchain, cloud computing, and artificial intelligent (fintech start-ups, and technology developers, financial consumers).</td>
<td>Economic and financial policy instruments</td>
</tr>
<tr>
<td><strong>Notice on Issuing the Action Plan for Promoting Consumption and Driving Transformation and Upgrading</strong></td>
<td>2016-04</td>
<td>The National Development and Reform Commission</td>
<td>Through platform construction, environment creation, financial support, public opinion propaganda and other socialised and market-oriented means, companies are guided to improve the quality of supply, drive industrial mobile phones, expand market space, and improve profitability.</td>
<td>Funding rural infrastructure (fintech start-ups, technology developers, financial consumers) for information and consumptions.</td>
<td>Economic and financial policy instruments</td>
</tr>
<tr>
<td>Notice of the State Council on Issuing the Plan for Advancing the Development of Inclusive Finance</td>
<td>2015-12</td>
<td>State Council</td>
<td>By 2020, establishing an inclusive financial service and guarantee system that is compatible with building a well-off society in an all-round way, increase financial support for new business formats, new models and new entities, and meet the people’s growing demand for financial services.</td>
<td>Establishing regulatory institutions for inclusive finance in fintech services Such as financial consumer rights protection legal system (TFOs, fintech start-ups, financial consumers, technology developers and government)</td>
<td>Regulatory policy instruments</td>
</tr>
<tr>
<td>Guiding Opinions on Promoting the Sound Development of Internet Finance</td>
<td>2015-07</td>
<td>Ten ministries including PBC, Ministry of Industry and Information Technology and etc.</td>
<td>Proposed a series of policy measures to encourage innovation and support the steady development of Internet finance, actively encourage innovation in Internet financial platforms, products and services, encourage industry institutions to cooperate with each other, and broaden their financing channels.</td>
<td>Established the division of supervisory responsibilities (TFOs, fintech start-ups, financial consumers, technology developers and government) for fintech innovation</td>
<td>Regulatory policy instruments</td>
</tr>
</tbody>
</table>

Source: collated by author based on case data.
6.3.2 The roles on the institutions of China’s FTIS

Table 6.2 represents the representative, regulatory policy instruments and soft policy instruments at this stage and corresponding influences to the institutions of China’s FTIS. Interviewee G2 described the regulatory institution created at that time as:

“Playing an important and positive role in developing and promoting China’s fintech industry, and this should give financial consumers greater confidence to participate in the fintech industry.”

However, the large-scale financial fraud case (the 2016 Ezubao incident) caused a massive crisis of confidence at the time. Since then, a number of rectifications by government have been enacted. In March 2017, two rectifications called “Notice on Launching the Special Governance Work of Supervisory Arbitrage, Idling Arbitrage, and Related Arbitrage in the Banking Industry” and “Notice of the General Office of the China Banking Regulatory Commission on Carrying out the Special Campaign against the Violations of Laws, Regulations and Rules in the Banking Industry” were conducted. The CBRC conducted strict rectifications on violations of laws, regulations and rules and activities such as fund idling.
<table>
<thead>
<tr>
<th>Policies</th>
<th>Date</th>
<th>Issuing sectors</th>
<th>Contents</th>
<th>Influences</th>
<th>The types of policy instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Interim Measures for the Administration of Business Activities of Online Lending Information Intermediary Institutions</em></td>
<td>2016-08</td>
<td>PBC</td>
<td>It clearly requires online lending to return to the nature of intermediary, adopting the regulatory approach of the record system, and clarifying the concepts of small and decentralised online lending.</td>
<td>The record system was introduced in the fintech regulation. Educating relevant information about the record system</td>
<td>Regulatory instruments Soft instruments</td>
</tr>
<tr>
<td><em>Guiding Opinions on Promoting the Sound Development of Internet Finance</em></td>
<td>2015-07</td>
<td>Ten ministries including PBC, Ministry of Industry and Information Technology and etc.</td>
<td>It clarifies the Industry Basic Law including the definition of Internet finance and the responsibilities of fintech supervision, providing a reference basis for subsequent industry supervision.</td>
<td>Establishing and improving legal foundation of fintech industry Educating relevant information about basic laws</td>
<td>Regulatory instruments Soft instruments</td>
</tr>
<tr>
<td><em>Measures for the Administration of Credit Reporting Institutions</em></td>
<td>2013-12</td>
<td>PBC</td>
<td>It is an important supporting system of the credit reporting industry management regulations, following the core regulatory thinking of strict personal credit reporting agencies and lenient corporate credit reporting agencies.</td>
<td>Credit reporting system was introduced in the fintech regulation Promoting information about the credit reporting management</td>
<td>Regulatory instruments Soft instruments</td>
</tr>
<tr>
<td><em>Pilot Measures for the Administration of Consumer Finance Companies</em></td>
<td>2013-11</td>
<td>CBRC</td>
<td>It is the revised version of the 2009 version of Pilot Measures for the Administration of Consumer Finance Companies and it is to provide legal protection for the access, supervision and regulation of pilot consumer finance companies.</td>
<td>Raising the concept of pilot mechanism in the fintech regulation.</td>
<td>Regulatory instruments</td>
</tr>
</tbody>
</table>

Source: collated by author based on case data.
In addition, five consecutive rectification actions were executed, and the corresponding regulatory policy instruments were conducted to standardise the principles of rectifications, including “Notice of the General Office of the China Banking Regulatory Commission on Carrying out the Special Campaign against the Inappropriate Innovations, Inappropriate Transactions, Inappropriate Incentives, and Inappropriate Collection of Fees in the Banking Industry”, “Guiding Opinions of the China Banking Regulatory Commission on Enhancing the Quality and Efficiency of the Banking Sector to Serve the Real Economy”, “Notice of the China Banking Regulatory Commission on Concentrating the Rectification of Market Disorders in the Banking Industry”, “Guiding Opinions of the China Banking Regulatory Commission on Risk Prevention and Control of the Banking Sector, and “Notice of the China Banking Regulatory Commission on Effectively Covering the Supervision Shortness and Enhancing the Supervision Efficiency”. These rectifications standardised by regulatory policy instruments prevented further increasing financial frauds in China’s fintech industry and losing financial consumers’ confidence (Interviewee FS1, FS2). However, how to avoid the financial frauds like Ezubao in the future was the important issue that regulators needed to study (Interviewee G1).

To address this, government established the joint and collaboration mechanism of different China's government departments in investigation, evaluation, and rectifications on China’s fintech industry (Interviewee G4). Regulatory policies detailed how different government departments’ responsibilities on the rectifications such as “Notice of 15 Ministries and Commissions including the China Banking Regulatory Commission on Issuing the Implementation Plan for the Special Rectification of Risks concerning Online Peer-to-Peer Lending”. Interviewee G1
claimed that this mechanism reduced the risks and cost of fintech regulation and optimizing resources. In addition, Interviewees TFO2 and G2 hold the opinion that the roles of this mechanism in shortening learning process on fintech innovation and services would indeed improve efficiency on fintech regulation.

In general, interviewee G2 stated that the problematisation in the China’s fintech industry at this stage was due to ineffective regulatory policy instruments and a lack of previous oversight in the past few years. These rectification measures imposed stricter regulatory measures and systems on fintech start-ups, and TFOs. The soft policy instruments also played its roles on promoting more information to financial consumers to reduce the information asymmetry and prevent the financial frauds (Interviewee G2). Concurrently, the rapid development of China’s FTIS slowed down the increasing scale of online lending platforms (Interviewee G3). The number of new P2P online lending platforms dropped to zero in 2019 (Gao et al., 2021). In terms of the responses to problems, the government established joint and collaboration mechanisms to reduce lag time and improve the speed of reactions; these measures started to restore financial consumers’ confidence (Interviewee FC2).

6.3.3 The roles on the infrastructure of China’s FTIS

Policy instruments have always actively encouraged the development of China’s fintech infrastructure. In this period, policies stimulated and encouraged the development of fintech infrastructure by technical standardisation by regulatory policy instruments and financial support by economic and financial instruments which are similar to the first stage.
“Notice of the General Office of the CBRC on Issuing the Guidelines for the Online Lending Fund Depository Business” in 2017 provided specific standards and regulations on online lending information intermediary business and commercial bank that provides fund depository services for the online lending business. It required that the accounts of financial consumers’ funds and online lending information intermediary organisations’ funds needed to be managed separately under in-time monitoring by CBRC. The depository’s technical system for the online lending fund depository business was standardised to meet higher requirements. Interviewee G3 believed the standardisation process on online lending platforms can significantly reduce the financial frauds from a technical perspective.

In addition, demand-oriented policies for the development of social credit system began to increase during this period. For example, “Notice of the General Office of the State Council on Issues concerning Strengthening the Supervision of Shadow Banking” which was issued in 2013 strengthened the importance of constructing the social credit system. Public procurement of economic and financial instruments also stimulated the development of China’s social credit system. Another example is that the “Notice of the General Office of the State Council on Forwarding the Opinions of the Ministry of Commerce and Other Departments on Implementing Relevant Policies to Support the Cross-Border E-Commerce Retail Export” which was issued at the same year stressed the importance of establishing the e-commerce export credit system. “Guiding Opinions on Enhancing the Financial Support for New Consumption Areas” stressed the demand of personal credit information system in financial services.
In 2016, Sesame Credit (Alibaba), Tencent Credit Information Co., Ltd. and other six technology developers started to establish personal credit information system (KPMG\textsuperscript{10}, 2016). These demand-oriented policies reflected the fact that existing fintech infrastructure was demanded and inadequate to support the government’s implementation of supervision, and was not sufficiently reduce the technical, financial risks (Interviewee G2). This was possibly the main reason why the public demand and the procurement of fintech infrastructure increased significantly (Interviewee TFO1, G6, U3). Interviewee G2 believed that the development of fintech infrastructure was important to restore financial consumers’ confidence as well.

6.4 Chapter Summary

This chapter shows what structural elements of China’s FTIS and how policy instruments affect them in the Growth and Problematisation stage. The impact of policy instruments on China’s FTIS at this stage can be categorised in three aspects which can lead to the answers of the research questions. The first is directional fiscal incentives by economic and financial policy instruments and more detailed supervision by regulatory policy instruments on fintech actors and interactions, which was presented in section 6.3.1. The second is the regulatory policy instruments-led strict supervision system and particular rectification actions which was presented in section 6.3.2. At this stage, government focused more on the construction of a strict supervision system due to the problems of financials frauds and consumers’ confidence crisis. The strengthening of supervision, the needs of the collaboration between multiple departments of government and frequent rectification measures have been mentioned in the policies. This is also considered to fill up the insufficiency

\textsuperscript{10} Klynveld Peat Marwick Goerdeler
of supervision by policy instruments in the previous period. Soft policy instruments are identified which were used to educating relevant information about basic laws and promoting information about the credit reporting management to financial consumers. The last point is the economic and financial policy instruments and regulatory policy instruments on fintech infrastructure in the section 6.3.3. Policy instruments affect the demand for fintech infrastructure, thereby accelerating the development of infrastructure of China’s FTIS. Due to the emergence of problems such as the Ezubao incident, the policy instruments to stimulate the demand for regulatory infrastructure, such as record and credit system, have become more demanded than the initiation stage.
CHAPTER 7 THE IMPROVEMENT STAGE

7.1 Introduction

In this chapter, how policy instruments affected China’s FTIS at the third stage, which is called the improvement stage (2019 to present), are presented. First, the structural elements of China’s FTIS at this stage are summarised in section 7.2. Background of the China’s fintech industry at the improvement stage are introduced in section 7.2.1. Then, section 7.2.2 demonstrates the actors and interactions of China’s FTIS at the improvement stage. Next, infrastructure of China’s FTIS at the improvement stage are presented in section 7.2.3. Section 7.2.4 shows the institution of China’s FTIS at the improvement stage.

The roles of policy instruments on China’s FTIS at the improvement stage comes to the next. First, the role of policy instruments on fintech actors and interactions are summarised in section 7.3.1. The regulatory instruments on financial customers’ protection are elaborated in section 7.3.1.1 and economic and soft instruments on fintech start-ups and technology developers are detailed in section 7.3.1.2 respectively. Then, the role of regulatory instruments on institution of China’s FTIS is indicated in section 7.3.2. Then, how regulatory policy instruments further developed standardisation and information security of China’s FTIS follows in section 7.3.3. The last is a brief summary of the roles of policy instruments on China’s FTIS at the improvement stage.
7.2 The structural elements of China’s FTIS

7.2.1 Background information of the China’s fintech industry

As Fig 7.1 shows, from 2016 to 2020, the market scale of China’s fintech industry increased from 210.4 to 395.8 billion RMB (PwC, 2020). As of the first half of 2020, a total of 118 fintech companies have registered in the Shanghai and Shenzhen stock exchanges, of which 46 fintech companies have raised a total of 50.1 billion RMB. In addition, fintech start-ups, such as Kingsoft Cloud, Smart Choice Insurance, and Ebon Communications, were listed on Nasdaq in the US, and Mobile Card Technology was listed on the Hong Kong Stock Exchange. The scale and market value of China’s nine listed fintech start-ups is in Table 7.1. Increasing market scale attracted more fintech actors into China’s FTIS, and also underlines the improvements of China’s FTIS.

![Fig 7.1 Fintech Market Size in China from 2016 to 2020 (Billion yuan)](source)

*Source: adapted from PwC (2020)*
Table 7.1 Financial scale and market value of nine listed fintech companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Stock Exchange</th>
<th>Financing Scale (USD)</th>
<th>Market Value (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM Securities</td>
<td>NASDAQ</td>
<td>7.2 million</td>
<td>40 million</td>
</tr>
<tr>
<td>FUTU Holdings</td>
<td>NASDAQ</td>
<td>90 million</td>
<td>1.1 billion</td>
</tr>
<tr>
<td>Tiger Securities</td>
<td>NASDAQ</td>
<td>104 million</td>
<td>510 million</td>
</tr>
<tr>
<td>PUYI INC.</td>
<td>NASDAQ</td>
<td>26 million</td>
<td>320 million</td>
</tr>
<tr>
<td>Lakala Payment</td>
<td>SZSE</td>
<td>188 million</td>
<td>3.33 billion</td>
</tr>
<tr>
<td>Jiayin Fintech</td>
<td>NASDAQ</td>
<td>37 million</td>
<td>270 million</td>
</tr>
<tr>
<td>9fgroup.com</td>
<td>NASDAQ</td>
<td>64 million</td>
<td>1.85 billion</td>
</tr>
<tr>
<td>Canaan</td>
<td>NASDAQ</td>
<td>90 million</td>
<td>840 million</td>
</tr>
<tr>
<td>One Connect</td>
<td>NYSE</td>
<td>312 million</td>
<td>3.62 billion</td>
</tr>
</tbody>
</table>

Source: adapted from CAICT (2020).

Fintech actors continuously invest in fintech innovation and services. Table 7.2 shows the investment spent on fintech services by TFOs of China’s FTIS in 2019 (PwC, 2020). Based on the investment, fintech services were improved to include big data analysis, artificial intelligence, cloud computing and blockchain. According to the data from Financial Technology Research Institute of ICBC (2020), there were about 420 companies that were registered to provide blockchain information services in China in 2019, of which 72 companies provided fintech services using blockchain technology. Based on the increasing fintech market scale and the improved level of fintech services, institution and infrastructure of China’s FTIS were improved in this stage, which will be illustrated in section 7.2.3 and 7.2.4 respectively. Various improved fintech innovation and services also represent the improvement stage of China’s FTIS.
Table 7.2 The investment on fintech services by the five largest banks in China in 2019

<table>
<thead>
<tr>
<th>The five largest banks in China</th>
<th>Fintech investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial and Commercial Bank of China</td>
<td>16.37 billion yuan</td>
</tr>
<tr>
<td>China Construction Bank</td>
<td>17.63 billion yuan</td>
</tr>
<tr>
<td>Agricultural Bank of China</td>
<td>12.79 billion yuan</td>
</tr>
<tr>
<td>Bank of Communications</td>
<td>5.05 billion yuan</td>
</tr>
<tr>
<td>Bank of China</td>
<td>11.65 billion yuan</td>
</tr>
</tbody>
</table>

Source: adapted from PwC (2020).

The Covid-19 pandemic has slowed the growth rate. As Table 7.1 shows, although market scale is still increasing, the growth rate has been negatively affected by the pandemic. The pandemic significantly affected the actors’ interactions of China’s FTIS. The influence of covid-19 pandemic on China’s FTIS is huge but difficult to evaluate (Interviewee TFO1). The government promoted several policies to deal with the changes in the pandemic. The influences of those policy instruments on China’s FTIS during the pandemic will be considered in this chapter as well.

### 7.2.2 Actors and interactions of China’s FTIS

TFOs started to establish fintech subsidiaries to expand and improve their fintech services and compete with fintech start-ups. For example, the PBC deployed state-owned fintech start-ups in many places. As of August 2020, the PBC had deployed Shenzhen Financial Technology Co., Ltd., Yangtze River Delta Financial Technology Co., Ltd., and Chengfang Financial Technology Co., Ltd. in Shenzhen, Suzhou, Beijing as their fintech subsidiaries. These fintech subsidiaries established by PBC have advantages in fintech R&D. Furthermore, they were expected to play an important role in upgrading technology-use in regulation (regtech) and to further
promote the in-depth application of regtech (Interviewee TFO5). At the same time, PBC replanned the layout of China’s FTIS by establishing state-owned fintech start-ups to guide and lead regional fintech industries. In addition to the PBC, other TFOs redeployed their fintech strategies and became more focused on improving their own core competitiveness of as well as cooperating further with external fintech start-ups. The establishment of a fintech subsidiary has become commonplace amongst TFOs especially for large and medium-sized commercial banks. As of August 2020, the five largest state-owned banks and most joint-stock banks each had their own independent fintech subsidiaries. Table 7.4 shows the new fintech subsidiaries of China’s FTIS at the improvement stage.

Table 7.4 New fintech subsidiaries of China’s FTIS at the improvement stage

<table>
<thead>
<tr>
<th>Industry</th>
<th>TFOs</th>
<th>Fintech subsidiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank</td>
<td>Bank of China</td>
<td>BOC Fintech</td>
</tr>
<tr>
<td></td>
<td>Industrial and Commercial Bank of China</td>
<td>ICBC Technology</td>
</tr>
<tr>
<td></td>
<td>China Construction Bank</td>
<td>CCB Fintech</td>
</tr>
<tr>
<td></td>
<td>Agricultural Bank of China</td>
<td>ABC Fintech</td>
</tr>
<tr>
<td></td>
<td>Bank of Communications</td>
<td>BCM Fintech</td>
</tr>
<tr>
<td></td>
<td>China Merchants Bank</td>
<td>CMB Yunchuang Technology</td>
</tr>
<tr>
<td></td>
<td>China Everbright Bank</td>
<td>Guangda Technology</td>
</tr>
<tr>
<td></td>
<td>China Minsheng Bank</td>
<td>Minsheng Technology</td>
</tr>
<tr>
<td></td>
<td>Industrial Bank</td>
<td>CIB Fintech</td>
</tr>
<tr>
<td></td>
<td>Ping An Bank</td>
<td>One Connect</td>
</tr>
<tr>
<td></td>
<td>Huaxia Bank</td>
<td>Longyingzhida Fintech</td>
</tr>
<tr>
<td></td>
<td>Bank of Beijing</td>
<td>BOB Fintech</td>
</tr>
<tr>
<td>Insurance Company</td>
<td>PING AN Insurance Company of China</td>
<td>PAIC Technology</td>
</tr>
<tr>
<td></td>
<td>China Pacific Insurance</td>
<td>CPIC Technology</td>
</tr>
<tr>
<td></td>
<td>China Taiping Insurance</td>
<td>TPIC Technology</td>
</tr>
<tr>
<td></td>
<td>China Continent Insurance</td>
<td>CCIC Technology</td>
</tr>
<tr>
<td></td>
<td>Union Life</td>
<td>UFIC Technology</td>
</tr>
<tr>
<td></td>
<td>Zhongan Insurance</td>
<td>ZAIC Technology</td>
</tr>
<tr>
<td>Security Company</td>
<td>China International Capital</td>
<td>Jinteng Technology</td>
</tr>
<tr>
<td></td>
<td>Shanxi Securities</td>
<td>SS Technology</td>
</tr>
</tbody>
</table>

*Source: adapted from CAICT (2020)*

In addition, IT companies also optimised their organisational structures by
undertaking continuous processes of merging and building fintech subsidiaries. For example, the Baidu financial company invested 600 million RMB on Yuxin Technology in January 2020; Jinzhen Shares signed a strategic cooperation agreement with Jingdong Digital in June 2020; and Ant Financial becomes one of the shareholders of Hang Seng Electronics in March 2019 (KPMG, 2019). The competition within fintech industry has been enhanced. Table 7.5 shows the examples of fintech start-ups at the improvement stage of China’s FTIS, and their main investors which were mainly technology developers.

Table 7.5 Details of fintech start-ups at the improvement stage of China’s FTIS

<table>
<thead>
<tr>
<th>Name of the fintech start-ups</th>
<th>Business Tag</th>
<th>Amount</th>
<th>Main Investors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shuidi company</td>
<td>Insurance Tech</td>
<td>150 million USD</td>
<td>Tencent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230 million USD</td>
<td>IDG Capital, Dianliang Fund, Swiss Re-Insurance Company, Tencent</td>
</tr>
<tr>
<td>Taishan Insurance</td>
<td>Internet Insurance</td>
<td>882 million CNY</td>
<td>ERGO</td>
</tr>
<tr>
<td>Nanyan Information</td>
<td>Insurance Tech</td>
<td>250 million CNY</td>
<td>SIG, BlueRun Ventures, Qianji Capital</td>
</tr>
<tr>
<td>Fenbeitong</td>
<td>Payment</td>
<td>36 million USD</td>
<td>CreditEase, IDG</td>
</tr>
<tr>
<td>Bingjian Tech</td>
<td>Intelligent Risk Management</td>
<td>200 million CNY</td>
<td>China Creation Ventures, Guohe Investment, Huayangjinchen</td>
</tr>
<tr>
<td>Emotibot Technologies Limited</td>
<td>Intelligent Investment</td>
<td>250 million USD</td>
<td>Jiaoyin, Lingfeng Capital, Zhongyin</td>
</tr>
<tr>
<td>Jike Insurance</td>
<td>Internet Insurance</td>
<td>25 million USD</td>
<td>Yuanqi Capital</td>
</tr>
<tr>
<td>DTWAVE.COM</td>
<td>Intelligent Risk Management</td>
<td>/</td>
<td>Kingdee</td>
</tr>
<tr>
<td>EMQ</td>
<td>Payment</td>
<td>20 million USD</td>
<td>Abu Dhabi Investment Authority, App Works, WI Harper Group</td>
</tr>
<tr>
<td>HuaRui Financial</td>
<td>Big Data</td>
<td>130 million CNY</td>
<td>Jiayuan Fund, Zhaoxin</td>
</tr>
</tbody>
</table>

*Source: collated by author based on case data*
Also, the competition between TFOs and fintech start-ups has been enhanced by increasing foreign capital in China. Since 2019, the Financial Stability Commission of the State Council, CBRC, and CSRC have successively issued measures to open up the banking and insurance industry and capital markets as well as improving foreign investment access conditions and shareholding ratios. Foreign financial organisations have continuously enriched their business presence in China and expanded their business scope (CAICT, 2019). Given this it follows, *ceteris paribus*, that the penetration of international financial organisations in China's financial market is likely to continue to increase. In the field of fintech, it is foreseeable that domestic companies will also face the competitive pressure of foreign financial organisations (Interviewees TFO3, FS1, FS2, FS5, FS6). With enhanced competition, there are more improved alternative financial services for financial consumers; however, potential financial risk needs to be controlled (Interviewee FS4). In the improvement stage, regulatory institution was created for protecting financial customer,

In the Covid-19 era, zero-touch services have also accelerated the digitisation of the fintech industry, and changed the interactions of China’s FTIS. The pandemic has changed people’s lifestyles and challenged the contactless service capabilities of TFOs such as banks, insurance, and securities. Influenced by the pandemic, the branch businesses of financial organisations and other offline financial businesses has fallen sharply. In addition, difficulties associated with acquiring customers have increased significantly (Interviewee TFO3). Some business income, such as bank credit and debit card settlement and other intermediate business income and net interest margins have also been negatively affected, as noted in Table 7.1. There have also been differences in the extent to which individual firms and sectors have adapted
during the pandemic. Some TFOs or fintech start-ups which still relied on traditional offline channels faced considerable challenges during the pandemic (Interviewee G2). Those organisations which actively responded to the challenges of the pandemic were less affected in terms of the quality of user services that they offered, and the business revenues that they generate. Interviewee FS3 believes that the pandemic is a kind of test for the digitization capabilities of all fintech actors. Interviewee G1 believes that when the pandemic passes the accelerated trend of improving China’s FTIS digitalisation and transformation through zero-touch services will continue (Interviewee FS7).

### 7.2.3 The Infrastructure of China’s FTIS

China’s fintech infrastructure improved during this stage. First, PBC established a leading large and small payment clearing system; China Modern Payment System (CMPS), which is constructed, operated, and managed by the Clearing Centre of PBC. This system includes a large real-time payment system (HVPS) and an online payment interbank clearing system (IBPS), as well as a cross-border payment system (CIPS), and other associated facilities (Interviewee TD2).

Second, fintech IT infrastructure evolved into a number of diverse forms in China’s FTIS. For example, cloud technology including cloud computing technology systems and management methods, the methodology for realising cloud applications, microservices, and DevOps became widely used in many organisations in China (Interviewee FS6). From the perspective of application value, cloud-native technology has the advantages of being an agile application development, which improved delivery speed, reduced trial and error costs, improved efficient response requirements,
and enhanced user experiences. It has been used in finance, biomedicine, smart transportation, industrial Internet, and logistics applications (Interviewee TFO3).

Another example of the improved fintech IT infrastructure is the application and roll out of 5G technology. The country’s 5G network construction continued to advance, and interconnection and multi-technology integration continued to positively impact the transformation of the financial industry. The construction of 5G networks is constantly advancing in China, and the integration of interconnection and multi-technology has promoted the transformation of China’s FTIS (Interviewee TFO3, G2). Since 2020, 5G construction has benefitted from a range of policies and financial support. In the first half of 2020, the total number of 5G users worldwide reached 56.65 million; of which more than 40 million were based in China. By the end of June 2020, more than 4 million 5G base stations had been opened, and the growth rate of newly built base stations in April, May, and June increased by a factor of 25% on a month-by-month basis in those three consecutive months (CAICT, 2020). The technical features of 5G high-capacity transmission, real-time interaction, and massive terminal connections can play a prominent role in the personalisation of current front-end user interfaces, and differentiated financial services. The integration and application of technologies such as 5G and the Internet of Things has brought multi-dimensional financial data to the financial industry, improved the ability of financial institutions to manage risks, and will promote the reform and innovation of risk control models and risk products (Interviewee TD1, TD2, TD3). Such positives are subsequently discussed further with a specific focus on the exact research objectives of this thesis.
The third fintech infrastructure is the credit information system which was driven by both the government and the market. The credit investigation system has been established the PBC Credit Investigation Centre, Baixing Credit Investigation and other market-oriented credit investigation institutions). In addition, in January 2020, the central bank’s credit investigation system was officially switched to the second-generation credit investigation system, which includes, amongst other facets, a primary database of corporate credit information, as well as a basic database of personal credit information contain information covering 1.02 billion persons and 28.341 million enterprises and organisations. This makes the system amongst the most highly ranked in the world (CAICT, 2020).

More diverse, innovative and complex fintech infrastructure in this stage also reflected the positive effects of the policies from the previous years (Interviewee FS1). The challenge at that time was timely regulation and standardisation on new fintech infrastructure (Interviewee TD2).

7.2.4 The Institutions of China’s FTIS

Intelligent risk control is one of the regulation methods of China’s fintech sector and, as a concept, it refers to the process of effectively and efficiently controlling risk by using improved technology and infrastructure. The field of intelligent risk control gradually moved from its initial rough development to a detailed improvement during the improvement stage (Interviewee TFO4). Since 2019, regulatory authorities have increased their efforts to rectify intelligent risk control, especially the application of big data; an important aspect of the improvements noted.
With the promulgation of laws and regulations such as the “Cyber Security Law and Data Security Law (Draft)”, the government has become more stringent with regard to risk control of data (Interviewee G6). Due to the nature of a wide range of financial customers, a large number of financial capitals, and a high demand of cyber security and privacy protection of the fintech industry, the security and risk control of fintech data has always been essential in China’s fintech industry (Interviewee G2). Therefore, to further promote data management and the protection of financial organisations, the government adopted a measure to control: using policy instruments to develop fintech infrastructure (Interviewee G4). Again, such measures can be seen to have further entrenched issues of improvement during this stage of the development of fintech within China.

In April 2020, PBC and CBIRC, jointly proposed the “Financial Data Security Data and Security Classification Guidelines (Draft for Review)” to guide fintech actors to rationally grade and use financial data, and to implement financial data-lifecycle security management strategies to ensure the safe application of financial data. From the perspective of fintech infrastructure, the Internet of Things has also brought richer basic data resources to the fintech industry, especially the introduction of unstructured data, which has brought new data-based capabilities to financial risk control (Interviewee TD4). Under the premise of legal compliance, financial organisations can use 5G, the Internet of Things, and other technologies to obtain user data from multiple dimensions and conduct user-credit risk control assessments (Interviewee TD1). For financial consumers, such data can be combined with diversified terminals to obtain information such as individual user’s transaction habits and preferences. For entrepreneurs, it can enable them to remotely understand the true business situation of
the company and the real-time status of collaterals; thereby improving knowledge acquisition and understanding (Interviewee TD2). At the same time, it can innovatively realise remote online loan applications, video credit, post-loan management and other credit services; thereby showing how one innovation can impact a range of subsectors using the technology (Interviewee TD3). Such innovation also satisfies the demand for fintech zero-touch services in the post-pandemic.

As with previous stages of China’s FTIS, data isolation and privacy security remained as dominant challenged to conducting intelligent risk control of fintech data during the improvement stage (Interviewee G5). Under the requirements of data security and compliance, realising joint modelling and result sharing, based on data analysis results, requires the establishment and use of a joint working mechanism by different fintech actors. TFOs have a large amount of customer credit information, and data source companies (fintech start-ups such as Alibaba and Tencent) have a large volume of user behaviour data which can be a supplement to financial institutions.

“A joint working mechanism should allow data transaction between different actors and simultaneously protect the users’ privacy under the premise of legal compliance” (Interviewee G3).
7.3 The roles of policy instruments on China’s FTIS

7.3.1 The roles on actors and interactions of China’s FTIS

7.3.1.1 The roles on the protection of financial customers

At this stage, regulatory and soft policy instruments affected financial customers, especially those pertaining to information security. Interviewee TFO5 held the opinion that if policies can protect financial customers in the correct way, the demand side of financial market will increase and further stimulate the whole market indirectly. Interviewee G1 mentioned that the proliferation of financial actors and their interactions created higher demand, such as the speed of fintech infrastructure development, enhanced transparency of financial data and information, and also gave rise to heightened issues of privacy. Table 7.6 summarises the policies related to this context, as well as the contents of the individual policies. At this juncture, it is sufficed to note that most of these policies are regulatory policy instruments that improve the legal framework for customer protection. For example, “Measures for the Administration of the Handling of Banking and Insurance Consumer Complaints” officially defined the process and concept of consumer complaints in the banking and insurance industry as: “Consumers have disputes with bancassurance due to purchasing banking or insurance products or accepting banking and insurance-related services, and claiming their rights and interests”, and implemented several measures which required TFOs to set up management department and professionals specialising on dealing with consumer complaints.

To be specific, Article 22 of “Measures for the Administration of the Handling of Banking and Insurance Consumer Complaints” regulates when TFOs or fintech start-
ups are handling financial consumer’ complaints, bancassurance organisations shall verify the identity of the complainant, and protect the information security of the complainants, and protect personal privacy in accordance with the law. Information security and personal privacy started to be raised at this stage; requiring further input and oversight by both the sector and the government (Interviewee G5).

From a regulatory instrument perspective, this was also the period in which the legal framework of consumer protection for TFOs was established. Article 40 authorised CBIRC (government) that can conduct rectifications if TFOs have major consumer complaints, such as more than 20 complainants used face-to-face interviews to submit group complaints as joint consumer complaints. From a soft instrument perspective, this policy indirectly improved the self-regulation by stressing the importance of financial consumers’ protection as well as their information security. Interviewee G1 stated that this kind of policy can lower the potential risks like the P2P financial fraud in the years ago.
Table 7.6 Examples of policies for the financial customers’ protection and data privacy at the improvement stage in China

<table>
<thead>
<tr>
<th>Policies</th>
<th>Time</th>
<th>Sectors</th>
<th>Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guiding Opinions of the China Banking and Insurance Regulatory Commission on Promoting the High-quality Development of Banking and Insurance Industries</td>
<td>2020-01</td>
<td>CBIRC</td>
<td>Banking and insurance institutions should take the initiative to assume responsibility, evaluate and supervise mechanisms, optimize consumer complaint handling procedures, and actively participate in the diversified settlement of financial disputes. They should improve the traceability system and fully disclose financial products and service information and should strengthen publicity and education.</td>
</tr>
<tr>
<td>Measures for the Administration of the Handling of Banking and Insurance Consumer Complaints</td>
<td>2020-01</td>
<td>CBIRC</td>
<td>Clarifying the specific issues of organisation and management, consumer complaint handling rules in the banking and insurance industry, working systems and supervision mechanism.</td>
</tr>
</tbody>
</table>
| Letter of the General Office of the State Council on agreeing to adjust and improve the inter-ministerial joint conference system for the protection of consumer rights and interests | 2020-04| State Council | 1. Adjusting and improving the inter-ministerial joint conference system for the protection of consumer rights and interests  
2. Strengthening the organisation and leadership of consumer rights protection  
3. Coordinating and resolve major issues and major consumption incidents in the protection of consumer rights across the country,  
4. Increasing laws and regulations on consumer rights protection and policy promotion and popularization |
| Notice by the China Banking and Insurance Regulatory Commission of Regulating the Traceable Management of Internet Insurance Sales | 2020-06| CBIRC   | Regulating and strengthening the retrospective management of Internet insurance sales, protect consumers’ basic rights such as the right to know, the right to choose, and the right to fair transactions, and promoting the healthy development of the Internet insurance business. |
| Implementation Measures of the People's Bank of China for Protecting Financial Consumers' Rights and Interests | 2020-09| PBC     | 1. Regulating the behaviour of banks and payment institutions and protecting consumer financial information.  
2. Banks and payment institutions shall follow the principles of voluntariness, equality, fairness, honesty and credibility in providing financial products or services to financial consumers  
3. financial consumers shall conduct financial consumption in a civilised and rational manner.  
4. Improving self-protection of legitimate rights and interests according to law. |
| Reminder on Preventing Risks Related to Financial                          | 2020-10| CBIRC   | Consumers are reminded to improve risk prevention awareness from three aspects:  
1. Identifying the qualifications of live |
### Live Marketing

2. Clarifying the live broadcast content;
3. Understanding the risks of financial consumption or investment.

It also pointed out that the current financial live broadcast marketing has two main risks:
1. The main financial live broadcast marketing is chaotic.
2. There is a risk of misleading sales in the live marketing behaviour.

### Measures for the Regulation of the Internet Insurance Business

<table>
<thead>
<tr>
<th>Year</th>
<th>Regulatory Authority</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020-12</td>
<td>CBIRC</td>
<td>Improving the full-process service system of pre-sales, in-sales and after-sales to protect consumers' right to know, claim compensation and information security rights according to law</td>
</tr>
</tbody>
</table>

### Notice of Issues Concerning Regulating the Short-term Health Insurance Business

<table>
<thead>
<tr>
<th>Year</th>
<th>Regulatory Authority</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021-01</td>
<td>CBIRC</td>
<td>Standardising the presentation of insurance clauses to avoid ambiguity. Protecting consumers' right to know, to choose, and to seek compensation in accordance with the law.</td>
</tr>
</tbody>
</table>

### Notice by the General Office of the China Banking and Insurance Regulatory Commission and the General Office of the People's Bank of China on Issues Concerning Regulating the Personal Deposit Services Provided by Commercial Banks on the Internet

<table>
<thead>
<tr>
<th>Year</th>
<th>Regulatory Authority</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021-01</td>
<td>CBIRC PBC</td>
<td>Strengthening sales management and network security protection, and effectively protecting consumers' right to know, independent choice, information security and other rights. Depositing business through the Internet should strictly abide by the relevant regulations on bank account management and anti-money laundering.</td>
</tr>
</tbody>
</table>

*Source: collated by author based on case data.*
7.3.1.2 The roles on the fintech start-ups and technology developers

Economic and financial policy instruments played a crucial role on the fintech start-ups and technology developers at this stage. “Notice by the China Banking and Insurance Regulatory Commission, the Ministry of Industry and Information Technology, the National Development and Reform Commission, and Other Departments of Further Regulating Charges for Credit Financing and Reducing the Comprehensive Financing Costs of Enterprises” and “Guiding Opinions of the People’s Bank of China, the China Banking and Insurance Regulatory Commission, the National Development and Reform Commission and Other Departments on Further Strengthening the Financial Services for Micro, Small and Medium-Sized Enterprises” cancelled the expenses of credit management and improved the credit review process to reduce the financing cost for fintech start-ups and technology developers. To be specific, expenses on credit fund management were cancelled. For SME’s financing, it is not allowed in the loan contract to stipulate early repayment or late payment liquidated damages and cancel the overdraft commitment fee for the legal person account and the credit standing certification fee. The banks were not allowed to stipulate early repayment or late payment penalty in the loan contract. Fintech start-ups and technology developers were benefited from these policies and further reduced the costs. Interviewee G2 believed these two policies also played important roles on supporting fintech start-ups and technology developers to reduce the cost through the Covid-19 pandemic.

There were also a range of policies unveiled during the pandemic to help SMEs; these also impacted on fintech actors and interactions of China’s FTIS. For example,
“Notice by the General Office of the China Banking and Insurance Regulatory Commission regarding Strengthening Financial Services in the Banking and Insurance Industry and Cooperating with the Prevention and Control of the Outbreak of the Novel Coronavirus Pneumonia” was promulgated by CBIRC in January 2020. Article 3 exempted the management and handling fee to pandemic areas which had the effect of fiscal support on fintech actors and technology developers.

In addition, “The Notice by the People’s Bank of China, the Ministry of Finance, the China Banking and Insurance Regulatory Commission, and Other Departments of Further Strengthening Financial Support for the Prevention and Control of the Epidemic of Novel Coronavirus Pneumonia” reduced part of the cost of listing for companies in severely immunized areas. One example of an effect of this was that the 2020 annual listing fee was exempted for the fintech start-ups in Hubei province. Interviewee FS5 stated that the policy helped them prevented further losses through the pandemic. This indicates the fiscal support effects of policy instruments on fintech start-ups. In addition, the “Notice by the General Office of the China Banking and Insurance Regulatory Commission of Further Effectively Providing Financial Services concerning the Epidemic Prevention and Control” increased the first loan rate of SMEs and the proportion of credit loans to further reduce the overall financing costs of small and micro enterprises during pandemic. These also affected the fintech start-ups and technology developers of China’s FTIS during the pandemic from financing aspect.

Soft instruments were also supplemented to empower industry integration and strengthen the exchange and sharing of industrial and financial information. For
example, “Notice by the General Office of the Ministry of Industry and Information Technology of Issuing the Special Action Plan for Digitalised Empowerment of Small and Medium-sized Enterprises” established a digital credible service provider for fintech start-ups and technology developers, and an evaluation system for excellent digital products and services.

7.3.2 The roles on institutions of China’s FTIS

During the improvement stage it was also the case that fintech regulation became stricter and more detailed. For example, based on the “Cyber Security Law of the People's Republic of China”, and the standards referring from “Mobile Financial Client Application Software Security Management Specification”, “Personal Financial Information Protection Technical Specification”, “Commercial Bank Application Program Interface Security Management Specification”, “Mobile Finance Based on Voiceprint Recognition Security Application Technical Specification”, “General Specification for Information Security of Online Banking System”, PBC proposed “Notice on Carrying out the Special Research on Risks of Financial Technology Application”. The special research which was mentioned in the policy refers that the branches of PBC selected 30% of fintech actors or TFOs registered in their jurisdiction to evaluate the personal financial information protection, transaction security, the security of technology use, and risk management on their mobile financial client application software, application programming interface, and information system. TFO3 stated that the scale of the specific research that time was not common and also represents the cautious attitude and stricter regulation in China’s fintech regulation.
Two significant influences of regulatory instruments on the institution of China’s FTIS at the improvement stage were identified from the data collected by this research; illustrating, once more, how this work adds to existing understanding and furthers academic knowledge; thereby making a unique contribution to the furtherance to both. The first relates to those instruments that changed the structure of the regulatory institution of China’s FTIS. In March 2018, CBRC and CIRC were emerged as CBIRC by the “Decision of the First Session of the Thirteenth National People’s Congress on the State Council Institutional Reform Proposal”. This change significantly influenced the China’s FTIS. Interviewee G1 believed that it is conducive to centralising and integrating regulatory resources and professional advantages. Interviewee TFO1 stated:

“On the one hand banks and insurance have similarities in supervisory concepts, rules, and tools, and have similar requirements for supervisory resources and professional supervisory capabilities. For example, the insurance industry’s China’s second-generation solvency regulatory system (Second-generation solvency) is risk-oriented and formulates capital requirements for different risk businesses, which are similar to the regulatory requirements for bank capital adequacy in bank supervision. On the other hand, in the context of my country’s financial supervision resources and professional talents being in short supply, especially the shortage of insurance supervision talents at the local level, unified supervision is conducive to synergies, centralised and integrated supervision resources, and full use of the professional capabilities of supervision professionals. It definitely improves the quality of supervision”.
In like manner, and therefore further commenting on how regulatory policy instruments affect institution of China’s FTIS. Interviewee TFO3 noted that the changes to the regulatory institution often encounter massive resistance to personnel adjustments, and that this was especially the case when it came to the withdrawal and merger of institutions. However, unlike the branch offices of CBRC that extend to prefecture-level cities, CIRC has only five prefectural and city-level branches; are all at the provincial level. There are relatively few regulators compared to CBRC, so there are few obstacles to personnel issues when promoting departmental adjustments. The cost of changes was not higher than expected (Interviewee G2). By this way, the regulatory policy instruments can further strengthen the regulatory capability with low cost. In addition, it is also the case that the integration of CBRC and CIRC will make the coordination of banking and insurance supervision and break the barrier between them (Interviewee G4). PBC is currently responsible for prudential supervision, which will bring the insurance industry and the banking industry into compliance with the same regulatory standards. If the insurance industry is supervised according to bank standards, it will be beneficial to the long-term stability of the development of the insurance industry (Interviewee TFO3, TFO7). Once more, therefore, this consolidation will benefit to the efficiency of regulation.

The second influence is on the legal foundations for the standardisation of fintech as a means by which to control associated aspects of risk. This influence also directly impacted the infrastructure of China’s FTIS, with specific policies pertaining to the same being elaborated upon in Section 7.3.3 of this chapter. First, the technical standards surrounding the application of cloud computing, artificial intelligence, big data, blockchain, mobile internet and other technologies in the financial field were
constantly detailed and improved. Various regulatory supporting measures such as fintech product testing, certification and filing management also constantly improved; thereby standardisation process of fintech infrastructure as well. Secondly, the application of regtech achieved greater penetration of the regulatory institution. The regtech was applied in many aspects such as financial anti-fraud, anti-money laundering, and investigating and dealing with false information of listed companies (Interviewee G3). Cumulatively, the detailed technical standard by policies provided a legal base for continuously funding fintech start-ups and TFOs through economic and financing policy instruments, and also helped to further develop the institution of China’s FTIS during the improvement stage.

7.3.3 The roles on infrastructure of China’s FTIS

Regulatory policy instruments at this stage standardised fintech infrastructure. Since 2019, PBC, CBIRC, and CSRC have issued a series of fintech technical standards, business norms, risk management, and control policies. Through fintech product certification and filing management, combined with the construction of fintech-product certification management platform, the effective regulation of the technology, business and products of fintech have been continuously strengthened. Fintech security has become one of the most mentioned aspects in regulatory policies, including financial information and data security, internet security, mobile application security, platform security, and business security (Interviewee G7). Combined with the rich experience and mature mechanism of particular actions, including research, examination, and rectification from the last stage of China’s FTIS, fintech standardisation and safety of fintech were improved by the regulatory policy instruments. Table 7.7 shows the specific policies related to the context.
Table 7.7 Examples of standardisation of policies on infrastructure at the improvement stage

<table>
<thead>
<tr>
<th>Policies</th>
<th>Time</th>
<th>Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures for the Administration of Information Technology Management of Securities Fund Trading Institutions</td>
<td>2018-12</td>
<td>CSRC</td>
</tr>
<tr>
<td>Notice by the People’s Bank of China of Issuing the Financial Industry Standard to Strengthen the Commercial Bank Application Programming Interface Secure Management</td>
<td>2019-09</td>
<td>PBC</td>
</tr>
<tr>
<td>Industry Standard of Software Testing Specifications for the Securities and Futures Industry</td>
<td>2019-09</td>
<td>CSRC</td>
</tr>
<tr>
<td>Certification Catalogue of Fintech Products (First Group) and the Certification Rules for Fintech Products</td>
<td>2019-10</td>
<td>PBC</td>
</tr>
<tr>
<td>Provisions on the Calculation Basis for Risk Control Indicators of Securities Companies</td>
<td>2020-01</td>
<td>CSRC</td>
</tr>
<tr>
<td>Issuance of a Financial Industry Standard and Effective Technological Management of Personal Financial Information Protection</td>
<td>2020-02</td>
<td>PBC</td>
</tr>
<tr>
<td>Notice by the People’s Bank of China of Issuing the Financial Industry Standard to Strengthen the Commercial Bank Application Programming Interface Secure Management</td>
<td>2020-02</td>
<td>PBC</td>
</tr>
<tr>
<td>Issuing the Industry Standard—General Specification of Information Security for Internet Banking System</td>
<td>2020-02</td>
<td>PBC</td>
</tr>
<tr>
<td>Six Standards for the Financial Industry Including the Contents and Formats of Data on Investors’ Rights and Interests in the Securities and Futures Industry</td>
<td>2020-02</td>
<td>CSRC</td>
</tr>
<tr>
<td>Interim Provisions of the China Securities Regulatory Commission on Strengthening the Supervision over Securities Investment Consulting Services Using “Stock Picking Software”</td>
<td>2020-03</td>
<td>CSRC</td>
</tr>
<tr>
<td>Notice on Carrying out the Special Work for Financial Technology Application Risks</td>
<td>2020-04</td>
<td>PBC</td>
</tr>
<tr>
<td>Interim Measures for the Administration of Internet Loans of Commercial Banks</td>
<td>2020-07</td>
<td>CBIRC</td>
</tr>
<tr>
<td>Provisions on the Administration of Recordation of Securities Service Institutions Engaging in Securities Services</td>
<td>2020-07</td>
<td>CSRC</td>
</tr>
<tr>
<td>Provisions on the Administration of Securities Companies Leasing Third-Party Online Platforms to Carry out Securities Business Activities (for Trial Implementation)</td>
<td>2020-08</td>
<td>CSRC</td>
</tr>
<tr>
<td>Notice by the General Office of the China Banking and Insurance Regulatory Commission of Further Regulating the Internet Loan Business of Commercial Banks</td>
<td>2021-02</td>
<td>CBIRC</td>
</tr>
</tbody>
</table>

Source: collated by author based on case data.
As evidenced in the Table 7.6, “Measures for the Administration of Information Technology Management of Securities Fund Trading Institutions” required the standardisation of the information technology in securities services in China from information technology governance, information technology compliance and risk management, information system security, information technology service agency and the regulation. For example, in terms of information system security standardisation, regulatory policies standardised the levels of back-up system maintaining the data in the securities industry. The example of standardisation process is shown in the Table 7.8 and real-time information system refers to an information system that requires high operation continuity. A short pause or a severe drop in performance of real-time information system in securities and futures market will severely damage the investors’ rights and interests (Interviewee TD1). These policies show the further improving standardisation effect of regulatory policy instruments on the infrastructure.

Table 7.8 An example of standardisation process in China’s securities industry

<table>
<thead>
<tr>
<th>Standards of back-up information system</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) The data backup capability of real-time information systems and non-real-time information systems should reach the first level (data is backed up once a day, and the backup medium is stored in the same city and in different places, and the validity is verified every quarter);</td>
</tr>
<tr>
<td>(2) The failure response capability of the non-real-time information system should reach the second level (RTO\textsuperscript{11}&lt;1 hour, RPO\textsuperscript{12}&lt;5 minutes);</td>
</tr>
<tr>
<td>(3) The fault response capability of the real-time information system of a securities company should reach level 4 (RTO&lt;5 minutes, RPO&lt;30 seconds), and the fault response capability of the real-time information system of a fund management company should reach level 3 (RTO&lt;30 minutes, RPO&lt;1 minute);</td>
</tr>
<tr>
<td>(4) Real-time information systems and non-real-time information systems should have disaster and major disaster response capabilities, and relevant technical indicators should respectively reach the fifth level of disaster response capabilities (RTO&lt;12 hours, RPO&lt;5 minutes) and the sixth level of major disaster response capabilities. Level (RTO&lt;7 days, RPO&lt;12 hours);</td>
</tr>
<tr>
<td>(5) Disaster response capability can be reflected by major disaster response capability, but the relevant technical indicators of major disaster response capability should reach the fifth level of disaster response capability (RTO&lt;12 hours, RPO&lt;5 minutes).</td>
</tr>
</tbody>
</table>

\textit{Source: Standardisation Administration of China GB/T 20988—2007.}

\textsuperscript{11} RTO: Recovery time objective: Service recovery time  
\textsuperscript{12} RPO: Recovery point objective: System recovery time
7.4 Chapter Summary

Due to the expansion of the market and cumulative increases in complexity, the impact of policy instruments was more prominent and significantly influential during the development stage (the improvement stage) of China’s FTIS. As this chapter has demonstrated through its discussion and analysis of various factors and how they impacted upon the key concerns of this thesis, regulatory instruments pertaining to financial customers protections, economic and financing instruments on fintech actors and technology developers during the pandemic, as well soft instruments relating to strengthening information sharing between different actors were identified from data as having occurred during this key stage of development. Second, regulatory policy instruments became more powerful as tools of supervision that were focused upon issues of reducing and controlling risks creating a strong supervision environment. At the same time, however, it remained the case that more resources were (and are) required to ensure high-intensity supervision capabilities, especially when it comes to issues of coordinating supervision forces and professional advantages. Regulatory policy instruments also change the institution of China’s FTIS through the merger of two government departments CBRC and CIRC) to form CBIRC. Third, more underlying technical risks accompanied the creation of a more advanced fintech infrastructure during this stage of fintech’s development. Regulatory policy instruments further standardised the infrastructure of China’s FTIS. During this stage, China’s fintech infrastructure was more advanced than before. Formally under the guarantee of a robust fintech infrastructure, regulatory policy instruments implemented more powerful supervision and standardisation methods to reduce and control risks and thus created a strong supervision environment.
CHAPTER 8 DISCUSSION

8.1 Introduction

In this chapter, the research findings are discussed. Section 8.2 reviews case study by analysing each actor and integrating the three stages of fintech development. Based on the structural elements and the promulgated fintech-related policies which were identified in case study, the changes due to policy effects and its timeline of each structural element of FTIS will be summarised. Then, what and how structural elements of FTIS were changed and affected by fintech-related policies are discussed and SQ1 is then answered. Thereafter, the chapter further addresses how those fintech-related policies and its effects to the specific types of policy instruments and their roles. How three types of policy instruments, including economic and financing instruments, regulatory instruments, and soft instruments affected the four structural elements in China’s FTIS will be discussed and summarised from section 8.3 to 8.5, which leads to the answers SQ2. Subsequently, Section 8.6 summarises the roles of these policy instruments, thereby answering the thesis’ main research question. Comparison of case results and the existing studies in term of the policy instruments’ roles on fintech industry are discussed in section 8.7. By considering all four structural elements, there were different findings between case study results and the existing findings from literature. Section 8.8 summaries the content of this chapter.

8.2 The timeline of each structural element of FTIS

8.2.1 Actors of China’s FTIS

As noted, the first stage of China’s FTIS was from 2003 to 2012; the initiation stage. During this stage, the effects of policies on China’s FTIS are divided into three
categories: establishing the initial regulatory system, fiscal incentives and entrepreneurship policies, and technical support to technology developers. First of the three, the polices targeted on establishing China’s initial regulatory system. In addition to PBC, government established three more major regulatory agencies: CBRC, CSRC, and CIRC to regulatory institution. Due to the different sub-industries (banks, securities, insurance) in Fintech, the requirements of regulations became very different. Then, the influence of policies was also directly beneficial to fintech start-ups and technology developers. Whether it was fiscal incentives, entrepreneurship policies, and technical support to fintech infrastructure, it provided fintech start-ups and technology developers with funding, investment, and reduced tax rate to develop themselves. Taking TPPs represented by Alibaba as an example, many fintech start-ups and technology developers have been developed at the initial stage.

The second stage of China’s FTIS was from 2013 to 2018, called the growth and problematisation stage. In this period, policies implementing directional fiscal incentives and more detailed supervision, developing strict supervision system and conducting special rectification actions, and public procurement of fintech infrastructure were the main three effects of policies on the actors of China’s FTIS.

The fintech market has raised higher demands for higher regulatory power. For the government, during this period, it was still continuously adjusting its governance methods by policies such as regulatory systems, regulatory methods, and the allocation of regulatory responsibilities to cope with the ever-changing fintech market in China. New regulatory departments or working groups for rectification, investigation, special research was also constantly formed.
For fintech start-ups and technology developers, according to the different fintech services, the level of funding and support received by fintech-related policies has also changed. For example, the supervision on fintech, such as TPP and P2P lending platforms, was much higher at the second stage than that of fintech, which was technologically innovative such as big data and cloud computing. In this case, TPP and P2P lending platforms were more mentioned in policies and by interviewees than others. This was also determined by the size and importance of the users. The illegal fintech start-ups were also severely rectified at this stage and were withdrawn from China’s FTIS. Due to the proliferation of the user scale at the growth and problematisation stage of China’s FTIS, TFOs’ services activities were subject to be under stricter and more detailed supervision to prevent financial risks. Even so, the scale of commercial banks has increased dramatically compared with previous years. The securities industry and the insurance industry have achieved unprecedented development due to the convenience of the mobile Internet and the increase in the scale of users.

The third stage of China’s FTIS was from 2019 to the present, called the improvement stage. In this period, fintech-related policies were designed for integrating different government departments, improving fintech standardisation, and protecting financial customers and data privacy, and supporting the entrepreneurs under the pandemic. Regulatory agencies began to be integrated. CBRC and CIRC were integrated into CBIRC, and PBC became responsible for macro-prudential supervision. Local regulatory authorities began to assume responsibility for pilot innovation. Regulatory power also shifted from the central government to local authorities in response to the China’s fintech market at the third stage. Technology developer from the very first
stage of China’s FTIS to the last stage, overall, has been positively stimulated by the policies through all the three stages. At the third stage, the requirement from the fintech-related policies as standardisation and security brought particular challenges to technology developers. However, this transformational challenge guided the development of technology developers well, the same for their fintech start-ups and TFOs (also mentioned in the actors’ interaction below) and for the development of fintech infrastructure. For financial consumers, due to the substantial financial losses in the second stage, the protections of financial consumers and data security became the critical objects of policies at the third stage. Fintech-related policies required higher supervision of these two points, and public propaganda of financial consumers and popularization of financial knowledge to reduce the financial risks of financial consumers and increase the confidence of financial consumers to further participate in fintech business. For fintech start-ups and TFOs, fintech-related policies were improving them at this stage.

8.2.2 Interactions of China’s FTIS

In the first stage, the actors’ interactions of China’s FTIS revolved around interactions between TFOs, fintech start-ups and governments (Interviewee TFO1, G3). As the development of fintech was still in its infancy, fintech start-ups received comparatively less supervision by policies. As a result, China’s fintech development was promoted at the first stage. In contrast, the government strictly supervised TFOs. The imbalance in the supervision of different actors changed TFOs and fintech start-ups from simple cooperative interactions to more complex interactions where cooperation and competition existed simultaneously (e.g., The licensing of TPP). The competition between TPP and TFOs was that of a market. At this stage, the
directionality of fintech-related policies led to changes in interactions which gradually shifted the market share of future fintech from TFOs to fintech start-ups (Shim and Shin, 2016).

This also indirectly affected other interactions. TFOs and fintech start-ups received different levels of supervision and support, leading to gradual changes in the interactions between financial customers and them. Financial consumers could choose from a greater array of types and sources of financial services, and there were more interactions with fintech start-ups. However, compared with TFOs, the growth of interactions between financial customers and fintech start-ups was subject to lower levels of supervision which led to an increase in systemic financial risks. This is was one of the reasons for the problematisation of China’s FTIS in the second stage (Interviewee TFO4, FS1).

Technology developers got direct benefits from the fiscal incentives of policies and these also had indirect impacts on the interactions of TFOs and fintech start-ups. Technology developers were highly interacted with most fintech organisations, and even some fintech start-ups have technical backgrounds. The fintech-related policies in the first stage of China’s FTIS were more cautious for TFOs; therefore, the technological development of TFOs and governments (such as regtech) lagged behind the technological development driven by fintech start-ups (such as TPP, Platform, Cloud computing). This caused, the imbalanced development between different types of fintech and potentially increased the financial risks from a technical point of view.

In the second stage, and due to the proliferation of fintech services and the emergence
of financial problems, actors’ interactions gradually changed from TFOs, fintech start-ups, and government as the main body to complicated interactions involving all fintech actors. In response to complex interactions, fintech-related policies adopted more directional fiscal expenditures and detailed supervision and also adopted specific measures such as new organisations’ formation, and investigations and rectification to deal with illegal fintech services, such as the P2P lending platform (interactions between fintech start-ups and financial consumers). Although issues of illegality were solved, most financial consumers’ trust in fintech start-ups and the industry were damaged.

The proliferation of fintech services, the rectification crises of trust, and other more complex actors’ interactions required the government to have higher interdisciplinary and complex problem-solving capabilities and supervisory capabilities. This also led the government to make changes on its own. Fintech-related policies required the government to conduct multi-departmental collaboration, and set up working groups and so on However, multi-sectoral collaboration, cross-industry, and different actors’ interactions required government departments to have a high learning abilities and adaptabilities to shorten the cycle of issuing fintech-related policies in response to the quick pace and high-frequency of fintech incidents.

Starting from the second stage, the complication of actors’ interactions accelerated; in part caused by the high-frequency implementation of fintech-related policies. Interviewee (G3) believes that if financial problems caused by systemic risks arise, relying on fintech-related policies can solve the most serious problems such as P2P, but they cannot prevent the complicated nature of interactions.
In addition to existing interactions, policies paid more attention to the interactions between financial consumers and other actors during the improvement stage. In the purpose of a whole raft of policies was to reduce financial risks to financial consumers as well as the systemic risks of fintech itself. Financial consumers' legitimate rights and interests became more protected. The standardisation process of TFOs, fintech start-ups, and technology developers were stimulated by policies, such as the establishment of the credit system, the security guidelines of the personal information database, and so on. These fintech-related policies also played a role in strengthening market self-regulation in the fintech industry. Market self-regulation institution also promoted the development of fintech infrastructure, and accelerated the digital transformation of fintech start-ups – a process further impacted by the outbreak of the Covid-19 pandemic.

8.2.3 The Institution of FTIS

During the initial stage, fintech-related policies worked to establish a regulatory institution for FTIS; fundamental financial institutions, specific banking industry institutions, foreign investment institutions, securities industry institutions, and so on. One of the most important institutions of the FTIS compared to the other stages was establishing an initial regulatory system. Especially for fintech industry, financial policies (which did not directly mention the term fintech) made up for the industry’s lack of institution and detailed standards. Compensating for the missing institution was one of the critical functions of policy instruments (Meyer 2012; Spruyt 2001). The establishment of the early institution influenced the fintech start-ups of China’s FTIS at the first stage like TPP.
Due to the fact that fintech start-ups were relatively new to the industry, the proportion of the contents of policies related to fintech start-ups was relatively less compared with TFOs. Therefore, even if the establishment of the early regulatory institutions made up for the lack of fintech institution, the non-uniformity of the supervision standards led to different policy effects for fintech start-ups and TFOs. For example, at the initial stage, fintech start-ups received less regulation than TFOs. This also indirectly led to regulatory arbitrage (Interviewee G3).

At the second stage, due to the changes in the structural elements of FTIS compared to the first stage, the impacts of fintech-related policies on institutions of FTIS were also differentiated. Due to the fact that there was a general absence (though not entirely) of regulatory policies that supplied regulations and standardisations at the first stage, fintech-related policies detailed the institutions of FTIS at this stage to more-readily establish a sustainable and ingrained process of standardisation which, to some extent, made up for the weak institutional problems left over from the previous stage (Garcia et al., 2005). However, when financial frauds emerged during this stage policies established a strong regulatory environment for FTIS by regulating fintech start-ups. In addition, and in response to the regulatory demands, several fintech-related policies were issued which, cumulatively, established a robust framework of learning and collaboration for the government. This framework acted, in the context of the time, as a guide by which to make specific investigations, investigations, and rectification actions in specific fintech fields. Furthermore, it allowed multiple government departments to conduct joint actions with a clear division of responsibilities. The establishment of strong regulatory institutions and
more standardised technical standards further promoted the development of fintech infrastructure. While the fintech-related policies implement strong supervision, they also showed the demand for technology in fintech regulation, such as communication technology, detection capabilities, and so on.

During the third stage, there were two main aspects of how fintech-related policies influenced the institutions of FTIS. The first was changing the regulatory institution’s structure to deal with the higher demands of fintech regulation. Fintech services were much improved and became far more complicated during this stage (Interviewee FS2), with the result that uncertainties and potential risks increased. The government departments were changed to respond to the demands of regulatory; the most obvious and pertinent example from the period being the noted merger of the CBRC and the CIRC to form the CBIRC. The second aspect which further reduced potential risks was that higher technical security standards were further supplemented; this played an important role in data and information system security and financial consumers’ protection. Such measures may also be seen to have assisted in the gradual restoration of consumer confidence in the system which had previously been rocked by fraud scandals and so on.

8.2.4 The Infrastructure of FTIS

In the development process, fintech infrastructure was one of the most critical elements of China’s FTIS. For the development of fintech infrastructure, stimulus policies were actively encouraged to fintech infrastructure, including fiscal incentives, technical support, standardisation implementation, and so on.
During the initiation stage, the financial market in China was gradually opened up which allowed technology-based companies represented by TPP to enter China’s financial industry one after another. The policies adopted at that time showed that the government was beginning to open up to technology companies outside the industry, and some domestic technology companies obtained financial licenses; previously such licenses had only been available to TFOs. The infrastructure standards used by the emerging technology companies were generally lower than those of TFOs.

These technology companies used their technological advantages pertaining to infrastructure to start to increase their market share of fintech market. This caused TFOs to encounter challenges from emerging technology companies and fintech start-ups. Despite the large-scale introduction of the internet and digital technologies in China’s financial industry, the technological innovation process in the traditional financial industry was still relatively slow due to the limitations of policies and standards.

However, new financial technology companies which applied infrastructure to their operations gained competitive advantages by lower standards and advanced technology of mobile technology, platform and database construction. For example, the transfer of payment tools to smartphones allowed underlying fintech to be closely integrated with people’s daily work and life; thereby directly improving users’ experiences. In the same way, companies that used transaction data for their e-commerce platforms managed to use a large amount of user data to develop small and micro loan services, and through so doing enhanced the inclusiveness of financial services, and so on.
Nevertheless, the lack of detailed standards, especially for technology companies engaged in the financial industry, negatively affected China’s FTIS during the second stage of the sector’s development. During the second phase, public procurement of infrastructure increased markedly. The fintech infrastructure, including but not limited to, the securities trading platform of the stock exchange, the bank's credit investigation system and personal database was highly demanded by TFOs and government. Therefore, the policies had been actively supporting fintech infrastructure from economic and financing perspective.

At the same time, technical standards and the supervision of fintech infrastructure by enterprises was further strengthened. For example, in 2014, the Payment and Settlement Department of PBC issued an official letter to suspend virtual QR code payments; this effective memorandum significantly impacted related institutions in the industry. In general, the development of mobile payments based on smartphones was unstoppable at that time. Efficiency and convenience considerations exceeded the security concerns, and the mobile payment industry has become a standard payment method for daily consumption and even more significant expenditures (Interviewee FS6, FC3).

In order to achieve the goal of fintech regulation, regulatory technology similar to the network in the central clearing system was introduced. This allowed, through a series of innovations and mechanisms, capital flow information to be garnered alongside the construction of various software and hardware. Concurrently, a range of managerial issues were also addressed showing the interdependent nature of innovation and regulation in the sector at this time.
During the improvement stage, the primary purpose of regulation and innovation was to lower the financial risks associated with fintech services; a consequence of their having become more complex as they had developed in the second stage. This was achieved by, for example, using corporate and/or personal information obtained in various scenarios, using specific algorithms and machine learning, big data being accumulated and utilised to determine transaction feasibility and the further automation of transaction conditions. Financial transactions driven by new technologies became, at this juncture in time, the norm in China's FTIS. In addition to using traditional tools to process credit evaluations and transaction decisions, a large amount of analysis on financial customers' behaviours also needs to be added in the fintech infrastructure. This analysis detailed individual user’s behaviour preferences, such as whether loan application forms were written correctly. Algorithm analysis based on big data required the support of new kinds of fintech infrastructure (Interviewee G5); these were also developed at this time.

The policies enacted during this period started to improve (and redress issues previous raised) the security standards of fintech infrastructure. This process, of itself, also further stimulated the demand for fintech infrastructure within the country. In banking, securities, insurance, trusts, funds or other financial industries, the benefits and risks brought by fintech infrastructure were positively correlated; and this, in turn, stimulated yet further demand. In terms of demand, therefore, a virtuous circle of win-win was created whilst steps were also taken to further safeguard the interests of financial consumers through enhanced regulation and oversight. Through these various processes, the regulation of security standards for fintech infrastructure became the main aspect of fintech-related policies that were enacted at this time (2019
8.3 The role of regulatory instruments in FTIS

The first type of policy instruments that are discussed is the regulatory instruments. Two types of regulatory instruments roles were indicated from the case study: establishing and developing the fintech regulatory institutions, and standardising fintech infrastructure.

8.3.1 Establishing and developing the fintech regulatory institution

During the initiation stage, the fintech regulatory institution were initially established and were based on the China’s financial regulation and supervision system in 2012. “The notice on Adjusting the Party’s Leadership System of Financial Regulatory Institutions” established the CBRC (China Bank Regulation Commission), CSRC and the CIRC to regulate the China’s financial industry. At that time, the term of fintech was not commonly used in China; but specific responsibilities for the regulation on online financial services was identified in data. PBC, CBRC, CSRC, and CIRC formed an initial fintech regulatory institution in China. This regulatory institution was applied to the China’s fintech industry until the establishment of CBIRC during the third stage of development.

During the second stage, regulatory instruments further developed the collaboration working mechanisms of fintech regulation in China. For example, “The Notice of 15 Ministries and Commissions including the China Banking Regulatory Commission on Issuing the Implementation Plan for the Special Rectification of Risks concerning Online Peer-to-Peer Lending” specified the responsibilities of 15 departments in
terms of the rectification act to P2P online lending financial frauds. During the third stage, regulatory policy instruments established a legal protection framework for consumers under the terms of the “Cyber Security Law of the People’s Republic of China”.

The purpose of establishing and developing the fintech regulatory institution noted in this work supports the views advanced in existing literature. Borras and Edquist (2013) defined the roles of regulatory instruments as being to regulate social and market interactions by legal tools such as laws, rules, and regulation. Ho and O’Sullivan (2019) summarised the roles of regulatory policy instruments in establishing legal framework in standardisation. The purpose of this kind of regulatory policy instruments is to establish rules that innovation actors are obligate to follow (Borras and Edquist, 2013).

However, at the second stage of the development of fintech in China, financial fraud emerged and financial consumers suffered from huge financial losses; as exemplified by the Ezubao crisis. Interviewee G2 concluded that a reason for the emergence financial problems was ineffective regulatory policy instruments and a lack of previous oversight. Existing literature also noted this phenomenon. Buchak et al., (2018) noted that regulatory arbitrage and the emergence of shadow banks led to potential risks in the fintech industry. Shadow banks are active when traditional financial organisations are heavily regulated. In 2016, the scale of shadow bank in China was large and their market scale exceeded over 90 trillion yuan13. Cumming and Schwienbacher (2018) stated that a way of reducing the adverse effects of

regulatory arbitrage is to strengthen the implementation of regulatory standards and rules. As evidenced through the data collected for this study, regulatory policy instruments were implemented to develop pilot, joint and collaboration mechanism to strengthen fintech regulations for dealing with existing financial fraud in China’s FTIS, (e.g., “Notice of the General Office of the State Council on Issues concerning Strengthening the Supervision of Shadow Banking” in 2013); therefore, the findings of this research support the arguments hitherto advanced by Buchak et al., (2018), and Cumming and Schwienbacher’s (2018).

It is important to note that how regulatory instruments of changing the structures of fintech regulatory institution, such as how establishing CBRC, CBIRC influence the fintech industry is still missing in the existing literature. The merger of two regulatory authorities and the roles needs to be explored in fintech studies.

### 8.3.2 Standardising fintech infrastructure

The second role of regulatory policy instruments within FTIS is to standardise fintech infrastructure. As this thesis has discussed at the initial stage of China’s FTIS, “Some Opinions of the People’s Bank of China, the National Reform and Development Commission, the Ministry of Public Security, the Ministry of Finance, the Ministry of Information Industry, the Ministry of Commerce, the Station Administration of Taxation, China Banking Regulatory Commission and the State Administration of Foreign Exchange on Promoting the Development of Bankcard Industry” and “China Financial Integrated Circuit (IC) Card Specifications” standardised the use of IC card; these promoted China’s online sales and the development of fintech start-ups and technology developers. During the third stage of China’s FTIS, the regulatory policy
instruments focused upon standardising fintech infrastructure became significant, due to the demand for reducing risks associated with financial consumers’ protection.

From this case, the importance of standardisation in the fintech industry was further stressed. The lack of standardisation could lead to the potential financial risks by the information system crash or financial frauds by online lending platform and other innovative fintech services. This case also indicates the importance of information update in fintech infrastructure and fintech services, which is supported by Farrell and Saloner (1985), Swann (2010), and Tassey’s (1982, 2000, 2017) studies, and reveals the policy instruments roles on improving information update in the fintech industry’s context.

8.4 The role of economic and financing instruments on FTIS

The second type of policy instrument that affected on FTIS is economic and financing instruments. Two types of economic and financing instruments roles on FTIS were revealed in this thesis: those that provide financial and technical support to fintech actors, and those that public procurement within fintech infrastructure.

8.4.1 Providing financial and technical support

With regard to the first of these, the economic and financing instruments’ role on FTIS is providing financial support to fintech start-ups, technology developers and TFOs. Both methods of providing financial and technical support are included in twelve policy instruments categorisation by Borras (2013), and this case supports existing literature with many examples and data that verified the economic and financing instruments’ roles in the fintech industry’s context. For instance, the loan
limit for SMEs was lowered by the “Some Opinions of the People’s Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission and the China Insurance Regulatory Commission on the Financial Support for Accelerating the Development of the Service Sector” which stimulated fintech start-ups financing during the initial stage of China’s FTIS. In similar manner, “Opinions on Further Deepening the Financial Services for Micro and Small-Sized Enterprises” increased funding to SMEs (Fintech actors) as a total of 150 billion yuan for refinancing and rediscounting, and decreased SME’s (Fintech actors) refinancing interest rate by 0.5%.

In addition to financial support, technology developers also received technical support from economic and financing instruments. For example, during the second stage of China’s FTIS, “Guiding Opinions on Further Expanding and Upgrading Information Consumption to Constantly Release Domestic Demand Potentials” provided both funding (Implement preferential tax policies deductions for corporate R&D expenses) and technical support (decreasing Communication, logistics cost of fintech infrastructure of 4G, 5G, IoT, blockchain, cloud computing, and artificial intelligent) to technology developers. These suggested the role of economic and financing policy instruments roles on fintech actors of FTIS.

8.4.2 Increasing public procurement

The second role of economic and financing instruments in relation to FTIS is, as noted, the public procurement of fintech infrastructure. Public procurement represents, as noted in the literature review of this thesis, the demand side of policy instruments (Edler and Fagerberg, 2017) and has the purpose of increasing R&D and enhancing
demand for innovation. This thesis revealed that fintech infrastructure has always been demanded by government. Policies, through the periods of development addressed by this work, have strengthened the importance of developing this technology for use in financial services and regulation. As noted, within the second stage of China’s FTIS, and due to the problems, that arose within the fintech industry, the importance of constructing the social credit system was strengthened through the “Notice of the General Office of the State Council on Issues concerning Strengthening the Supervision of Shadow Banking”, and “Guiding Opinions on Enhancing the Financial Support for New Consumption Areas”. In 2016, eight technology developers (including Sesame Credit Alibaba, and Tencent Credit Information Co., Ltd.) started to research and develop a personal credit information system (KPMG, 2016).

There is, as noted in this study’s literature review chapter, little existing research on fintech infrastructure and economic and financing policy instruments from the demand perspective. Most research on fintech infrastructure is focused on the fintech innovation field instead of the fintech industry and fintech regulation fields. For instance, Pasquale (2019) and Packin, (2018) focused on how to improve regtech by increasing its accuracy in regulation, whilst Helleringer, (2019) identified the use of digital reporting in decision-making and regulation. This research supplements existent academic knowledge from industry’s perspective. Shim and Shin (2016) pointed out that the insufficient fintech infrastructure in China and commonplace financial fraud were the reasons of a major obstacle to financial transaction. They concluded that the government intervention roles in technology development, but do not generalise what kinds of policy instruments affected the fintech infrastructure
development. This research can provide new understanding to this point that the specific government intervention could be the demand-side economic and financial policy instruments on fintech infrastructure.

8.5 The role of soft instruments on FTIS

The third type of policy instruments is soft instruments. In innovation policy literature, Borras and Edquist (2013) highlighted the importance of soft instruments in addressing problems that cannot be replaced by regulatory and economic instruments because of the complex nature of innovation. Ho and O'Sullivan (2019)’s research supported the importance of the use of soft instruments in addressing increasing interaction and infrastructural problems associated with standardisation problems. The research undertaken by this research and the findings that has emanated from it supplements this existent corpus of knowledge. Two types of soft instruments’ roles on FTIS have been identified by this research: promoting and sharing industrial information, and strengthening the self-regulation.

8.5.1 Promoting and sharing industrial information

With regards to FTIS, the first role of soft instruments was promoting and sharing industrial information. During the second stage of China’s FTIS, the frequency of fintech-related policies increased and the communication and information between different organisations was highlighted in each policy (Interviewee G1, G2, G3). For example, Article 19 of “Guiding Opinions on Promoting the Sound Development of Internet Finance” stresses the importance of promoting fintech regulation information to the public. During the third stage, more industrial and financial information was shared as one of the consequences of soft instruments. For example, “Notice by the
General Office of the Ministry of Industry and Information Technology of Issuing the Special Action Plan for Digitalised Empowerment of Small and Medium-sized Enterprises” established a credible services provider and an evaluation system of product and service to fintech start-ups and technology developers. Based on this, information exchange within fintech industry become more frequent and transparent which could reduce the financial risks. These suggested that soft policy instruments can play an important role in fintech industry by promoting and sharing industrial information.

Within existent literature there are some examples of soft instruments being used for promoting and educating information. For example, Ho and O’Sullivan (2019) identified that the use of soft policy instruments in promoting information about economic and regulatory information to the public can increase the entrepreneurs’ confidence in the quality and reliability of standards and infrastructure. In the fintech area, sharing information can reduce financial risks by information asymmetry (Hilary, 2006). The findings of this research support the idea that the promotion of regulation information and sharing industrial information can address financial fraud such as P2P by reducing the phenomena of insufficient information and information asymmetry.

8.5.2 Strengthening the self-regulation

The second role of soft instrument within the FTIS context is strengthening self-regulation. During the second stage of China’s FTIS, self-regulation started to be strengthened in fintech industry. “Guiding Opinions on Promoting the Sound Development of Internet Finance” established the financial regulatory organisation NIFA which sought to strengthen self-regulation in China’s FTIS. Ng and Kwok
(2017) indicated that the importance of self-regulation in financial consumers’ protection. Xiang et al., (2017) identified the importance of NIFA in China’s fintech self-regulation by analysing its roles in building an industry-wide self-regulatory system, pushing forward the building of internet finance standards, providing internet finance training and education, and enhancing theoretical and empirical studies on internet finance. Their recommendations for China’s fintech development by understanding self-regulation centred upon optimizing policy environment, enhancing support for innovation, improving the governance system, improving infrastructure, and strengthening financial consumer protection. This research supports their arguments and supplements their findings with regards to the roles of self-regulation in fintech regulation from a soft policy instruments’ perspective.

8.6 How policy instruments dynamically affect the fintech industry

This section answers the research question: How do policy instruments dynamically affect the fintech industry? The research question is addressed by answering two sub-research questions: SQ1. What are the fintech actors, fintech interactions, fintech institutions, and fintech infrastructure? and SQ2. How do policy instruments dynamically affect them? Specific actors, actors’ interactions, institutions and infrastructure in each development stage were identified in the case study. The structural elements of China’s FTIS and the policy effects on them are summarised in section 8.2. Integrating the contents from section 8.2.1 to 8.2.4, the specific structural elements of China’s FTIS and the dynamic changes during the three development stages are identified which leads to the answer of SQ1. Then, the effects of fintech-related policies are generalised to policy instruments roles on the structural elements as the regulatory policy instrument, economic and financing instruments, and soft
instruments. Section 8.3 to 8.5 revealed how different types of policy instruments affect China’s FTIS at different stages, which leads to the answers of SQ2.
Table 8.1 How policy instruments dynamically affect the China’s FTIS at each stage

<table>
<thead>
<tr>
<th>Policy instruments (What)</th>
<th>The Policy instruments’ roles on China’s FTIS (How)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stages</strong></td>
<td><strong>The Initiation stage</strong></td>
</tr>
<tr>
<td>Regulatory instruments</td>
<td>Establishing the initial fintech institution</td>
</tr>
<tr>
<td></td>
<td>Changing structures of the financial regulatory institution</td>
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<tr>
<td></td>
<td>Establishing initial standards of fintech infrastructure</td>
</tr>
<tr>
<td>Economic and financial instruments</td>
<td>Positive financial incentives on TFOs, fintech start-ups and technology developers.</td>
</tr>
<tr>
<td></td>
<td>Technical supports on technology developers, and infrastructure</td>
</tr>
<tr>
<td>Soft instruments</td>
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*Source: edited by author.*
By integrating the answers of SQ1 and SQ2, what and how policy instruments dynamically affect the FTIS are identified as Table 8.1 shows. Then, the Table 8.2 is developed to summarise six policy instruments roles in fintech industry leading to the answer of the main research question: 1. establishing and developing the fintech regulatory institution and 2. standardising fintech infrastructure as regulatory policy instruments, 3. providing financial and technical support to fintech actors and 4. public procurement on fintech infrastructure as economic and financing policy instruments, and 5. promoting and sharing industrial information and 6. strengthening the self-regulation as soft policy instruments. In the next section, the six identified policy instruments are further discussed by comparing to existing fintech studies for contributions.

Table 8.2 The policy instruments roles in the fintech industry

<table>
<thead>
<tr>
<th>Types</th>
<th>Roles in fintech industry</th>
<th>Associated fintech elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory policy instruments</td>
<td>Establishing and developing the fintech regulatory institution</td>
<td>Actors, Interactions, Institutions</td>
</tr>
<tr>
<td></td>
<td>Standardising fintech infrastructure</td>
<td>Institutions, Infrastructure</td>
</tr>
<tr>
<td>Economic and financing policy instruments</td>
<td>Providing financial and technical support</td>
<td>Actors, Interactions</td>
</tr>
<tr>
<td></td>
<td>Public procurement on fintech infrastructure</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>Soft policy instruments</td>
<td>Promoting and sharing industrial information</td>
<td>Institutions</td>
</tr>
<tr>
<td></td>
<td>Strengthening the self-regulation</td>
<td>Actors, Interactions, Institutions, Infrastructure</td>
</tr>
</tbody>
</table>

Source: edited by author.

8.7 Comparing the findings with existing fintech studies

In this section, the existing fintech literature and the findings of policy instruments’ roles in FTIS from this research are discussed. It was mentioned in the previous literature review that fintech research could be divided into three areas, namely
fintech innovation, fintech industry, and fintech regulation. Each field has its unique theories and topics. Through the further review of research findings, it was found that research findings have three additional aspects of contributions and arguments for the fintech industry and fintech regulation studies in the fintech literature.

There are three aspects of fintech studies that will be discussed, namely section 8.7.2 the policy instruments’ role in fintech deregulation and regulation, section 8.7.3 the policy instruments’ role in adjusting the actors’ interactions, section 8.7.4 the policy instruments’ role in decentralising and centralising process of fintech industry. The three aspects of fintech studies are reviewed with the identified policy instruments’ roles on FTIS from the case.

8.7.1 The policy instruments’ role in fintech deregulation

The deregulation and regulation effects of policy instruments on FTIS are firstly discussed. Whether to adopt deregulation or regulation is essential for the development of fintech. The literature has proved the importance of regulation by regulatory policies for the fintech industry as literature review discussed (Kim et al., 2016; Seo, 2016; Teigland et al., 2018). Through the literature review, the following concepts about deregulation related to fintech research can be summarised. First is the significant importance of deregulation to fintech industry. Lemma (2018) and Navaretti et al., (2018) both mentioned the importance of deregulation to the banking industry and how deregulated banks improved from the follow-up case analysis. In addition to the banking industry, Schulz et al., (2016) also proposed the importance of deregulation in firm entry for entrepreneurs. They mentioned that simplifying and reducing the time needed to register firms or offer advice on business registration. In
addition, public funding to those new entrepreneurs is important ways of deregulating entrepreneurs. From this point, the deregulation roles could be possibly applied into fintech industry such as deregulating fintech actors.

Second, Kim et al., (2016) mentioned the benefits of deregulation on fintech services to adopt certain types of payment services in their conclusion. They claimed government deregulation and stronger security are influential variables in promotion of payment types of fintech services, convenience, and usefulness from an institutional aspect. The findings of this research support their arguments with regards to the positive roles that economic and regulatory policy instruments have in stimulating fintech actors’ development at the initial stage. In addition, Chen (2020) mentioned that deregulation and the opening of new banks could promote various financial services in competitive financial services. However, their research are limited to the specific fintech innovation or a specific fintech actor, which is hard to generalise to the whole fintech industry and fintech regulation. Most research related to deregulation and fintech tends to analyse the role of deregulation without dynamically considering all the elements of FTIS. Therefore, based on the above three points, this research findings can supplement this knowledge gap.

Through the different levels of institution of FTIS in each stage, how technology development, fintech start-ups, and TFO received the different levels of deregulation in each stage from the case are demonstrated as Fig 8.2 shows. Several arguments from this research to existing fintech studies can be made from fintech deregulation perspective.
Deregulation is influential as the policy instruments’ roles in fintech actors, but the effects on different actors differentiated and can be the potential factor to boost the fintech actors’ development. This thesis revealed the role of establishing regulatory institution of regulatory policy instruments in China’s FTIS at the initiation stage. The established regulatory institution includes PBC, CBRC, CSRC and CIRC, and their own regulation responsibilities were superficially redefined, which were mostly targeting on regulating TFOs. Then, this thesis also identified that technology developers and fintech start-ups received less regulation than TFOs, and received relatively more fiscal incentives and technical support than TFOs by policy instruments. This means that the deregulation levels of technology developers and fintech start-ups were higher than the deregulation levels of TFOs at the first stage, which cause the rise of fintech start-ups such as the TPP in China’s fintech industry.

In addition, this thesis revealed that deregulation is influential in shaping the nature of competition between fintech start-ups and TFOs. When performing higher level of deregulation on fintech start-ups than TFOs, policy instruments may give fintech start-ups a competitive advantage against TFOs and boost fintech start-ups and technology developments’ development in the short term. From the case, it was found that the fintech start-ups and technology developments’ growth at the second stage was highly-related to the development of TPPs (who competed with TFOs at the initiation stage) in China. However, this will cause potentially correspond financial risks to fintech industry especially for fintech consumers. Wat the problematisation at the second stage of China’s FTIS, the evidence shows that the financial fraud was probably caused by the over deregulation on fintech start-ups and the weak regulatory institution.
Decreasing the deregulation level of fintech start-ups at this point can address the financial problems and further improve the fintech industry. As can be seen from Fig 8.1, the deregulation level of fintech start-ups decreased during the second stage of China’s FTIS. Conducting strong supervisions and rectifications were used as the important regulatory instruments by government of China’s FTIS.

![Graph showing the level of deregulation](image)

**Fig 8.1** How technology developers, fintech start-ups and TFOs received the different levels of deregulation in China’s FTIS in each stage

*Source: edited by author based on research findings.*

In terms of technology developers, deregulation for them in the fintech industry can continuously promote the development of fintech industry which is different from the other structural elements. Cases show that in the whole fintech development stages, fintech infrastructure is benefited by policy instruments by economic and financing policy instruments of public procurement and regulatory instruments of standardising. Until the third stage, due to the security requirements such as protecting consumer
benefits and interests, the deregulation level of technology development was lower than previous two stages, but still higher than fintech start-ups and TFOs (Interviewee TFO4). There are two reasons why technology developers received high level of deregulation. The first, the development of technology developers and fintech infrastructure provides higher efficiency in fintech services. For example, the application of blockchain in a P2P lending platform can make it faster to access funds without encountering complicated and expensive banking procedures Gonzalez (2019). The second, fintech infrastructure can be used in regulation, such as recording and credit system, regtech, and etc. Therefore, there were public procurement of economic and financing policy instruments on fintech infrastructure demanded by government at the second stage of China’s FTIS, which maintains the high deregulation level on technology developers.

8.7.2 The role of policy instruments in adjusting fintech actors’ interactions

As this study’s case study has revealed, policy instruments including economic and financing, regulatory, and soft policy instruments can influence fintech actors’ interactions. In existing literature, scholars have also identified the effects of policies on actors’ interaction. For example, Isaksen and Trippl (2017) emphasised the importance of using policy instruments to promote regional innovation system cooperation. However, as noted, studies on how policy instruments influence actors’ interactions in the fintech industry are relatively scarce. From a business ecosystem theory’s perspective, this research findings can contribute that policy instruments have a profound effect on actors’ interactions in this case.

Through this study’s work on China, it was indicated that the co-petitions between
fintech start-ups, technology developers and TFOs are influenced by all three types of policy instruments: regulatory policy instruments, economic and financing policy instruments and soft policy instruments. For example, and as previously noted, the economic and financing, and regulatory policy instruments deregulated fintech start-ups at the initial stage of China’s FTIS, which led to their competitive advantages against TFOs. During the second and third stages, it was also noted that soft instruments were used to promote and provide educational information as well as acting as a mechanism by which to strengthening the self-regulation. This, in turn, led to co-opetition between TFOs and fintech start-ups which can be proved by the cases of huge investment on fintech start-ups by TFOs at the third stage.

Comparing with the existing studies, the reason as to why policy instruments were implemented to adjust actors’ interactions can be explained: integrating three types of policy instruments on adjusting fintech actors’ interactions can lead to co-evolutions between fintech actors. Co-evolution refers to those actors can improve each other and many scholars have identified that cooperation and competition relationships can lead to actors’ co-evolutions (Shi et al., 2005; Jenkins and Floyd, 2001; Arize et al., 2018). This research provided much evidence that, in fintech context, co-evolution in actors’ interactions can be significantly impacted by the policy instruments. For example, combining standardisation and strengthening self-regulation can drive co-evolution between fintech start-ups and TFOs. In governance theory, non-government actors have common characteristics: their willingness to control their own business (Tosun et al., 2016). This premise can explain why Alibaba (within the TPP industry) acted as a participant and as an industry standard-setter simultaneously. This also, as noted, caused a strong reaction from TFOs. It is also the case that all actors have a
certain degree of self-regulation (Colebatch, 2014; Howlett and Ramesh, 2014). From this it can be concluded that the role of policy instruments in adjusting the interactions between fintech start-ups and TFOs also link to improving fintech standardisation and self-regulation.

The positioning of policy instruments is still neglected in research applying ecosystem theory. The power of enterprises and ecosystems has been paid more attention in this type of research than the policy instruments’ roles. For example, Power and Jerjian (2001) believe that the four stakeholders that companies should consider are: communities of shareholders, employees, businesses and customers. Iansiti and Levien (2004) believe that actors are intelligent and are capable of planning and seeing the future. However, it is a policy instrument that often provides specific strategic industry planning for the fintech industry. Therefore, it is the contention of this thesis (in furthering academic debate) that the ecosystem theory seems to need to clarify the positioning of the government and policy instruments in the ecosystem, as well as how to use ecological terms to describe the roles of policy instruments in adjusting the actors’ interactions. This is also a field that would, in the future, benefit from further academic research and is one that could use the findings presented within this work as a basis upon which to build.

8.7.3 The role of policy instruments in centralising and decentralising fintech regulatory institutions

The third point is that regulatory and soft policy instruments play an essential role in the decentralisation and centralisation of the regulatory institution. Regulatory policy instruments are constantly developing the fintech regulatory institution by changing the regulatory responsibilities of existing regulatory agencies and establishing new
regulatory agencies to decentralise or centralise the regulatory institution. For example, and as illustrated in the case study, PBC was responsible for supervising China's FTIS at the early development stage. Then, three regulatory agencies were separated to regulate the banking, securities, and insurance industries respectively in the second stage. Thereafter, and during the third stage, the regulatory agencies of the banking industry and the insurance industry were merged. During these processes, policy instruments constantly play a role in decentralising and centralising the regulatory institution of China's FTIS.

By the decentralisation and centralisation of regulatory institutions, the deregulation and regulation methods have been constantly changed affected, and other actors' interactions have been adjusted. The changes of regulatory institution have significant impact fintech industry. This point can be supported from existing studies. For example, actors tend to play a part in the government's functions of self-regulation and being part of the industry supervision responsibilities (Tosun et al., 2016). The decentralisation of regulatory power can enhance the industry's self-regulation ability (Salmon, 1987; Kjellberg, 2009). In this case, in terms of regulation and self-regulation, TFOs and fintech start-ups also play a part of governments’ roles in fintech industry, and the degree of self-regulation in fintech industry is likely to be greatly affected by the policy instruments.

This can be seen (from this thesis’ review of literature and its analysis of the case study) to be somewhat akin to the governance theory. In literature, many scholars provided an opinion that decentralisation can stimulate the local interactions which can play a crucial role in self-organisation, and important to create a new order and
coherence in a complex system (Kauffman, 1993; Mitleton-Kelly, 2003). However, as noted from this case, excessive decentralisation of policy power can also cause unknown risks in reality, so centralisation of regulatory power by regulatory policy instruments is also needed, especially in fintech industry. For instance, at the growth and problematisation stage of China’s FTIS, regulatory policy instruments developed a joint and collaborative mechanism by which the government could address the phenomenon of financial fraud (such as the Ezubao case) by centralising regulatory institutions. At the improvement stage of China’s FTIS, CBRC and CSRC merged to form CBIRC; thereby developing regulatory institution and controlling the financial risks that had previously emerged in the second stage of China’s FTIS. The roles of regulation and soft instruments in decentralising and centralising fintech regulatory institution noted and revealed in this thesis evidently add to the existing corpus of academic knowledge on the subject and through so doing illustrate how this thesis, once more, makes a unique contribution to the furtherance of academic understanding.

8.8 Chapter Summary

To understand how policy instruments dynamically affect the fintech industry (RQ), this research developed the FTIS framework and conducted a case study on China’s fintech industry. The main research question was addressed in this chapter by answering two sub-research questions: SQ1. what are the fintech actors, fintech interactions, fintech institutions, and fintech infrastructure? and SQ2. how do policy instruments dynamically affect fintech actors, fintech interactions, fintech institutions, and fintech infrastructure? This chapter discuss the case study findings from four aspects.
First, the case study is reviewed to identify how the structural elements of FTIS, including actors, interactions, institutions, and infrastructure, were changed and dynamically affected by fintech-related policies in three development stages of China’s FTIS in section 8.2. It revealed the specific effects of fintech-related policies on the structural elements of China’s FTIS. By combined with the specific structural elements identified in case study, the structural elements and their change during three development stages were clarified which leads to the answer of SQ1. Second, to identify how do policy instruments dynamically affect those structural elements of China’s FTIS (SQ2), the effects of fintech related policies on the structural elements of China’s FTIS were generalised to the six roles of policy instruments. The first is the regulatory policy instruments that played roles in establishing and developing the fintech regulatory institution, and standardising fintech infrastructure. The second is the economic and financing policy instruments that provides financial and technical supports to fintech actors, and public procurement on fintech infrastructure. The third is the soft policy instruments that affect the fintech institution by promoting and sharing industrial information and strengthening the self-regulation. From section 8.3 to 8.5 answered the second sub-research question. Third, in section 8.6, the answers of SQ1 and SQ2 were integrated and the main research question was answered by identifying six policy instruments roles on the fintech industry from this research. Fourth, in section 8.7, the research findings were further compared with the existing fintech literature in three aspects. First, it is clarified that the use of policy instruments on the fintech industry influence the deregulation level of fintech actors in the fintech industry. Second, how actors’ interactions are influenced by policy instruments was discussed with the existing literature. Policy instruments can influence the co-opetition between fintech actors and also strengthening the self-regulation by the
actors’ co-evolution. Third, the policy instruments’ roles in decentralising and centralising the regulatory institution of the fintech industry was identified, which supplemented current fintech studies.
CHAPTER 9 CONCLUSION

This thesis has focused on the effects of policy instruments on fintech industry. In so doing it posed a series of inter-related research objectives and questions which have been continually discussed throughout the main body of the work, synthesised with existent literature, and further interrogated through the use of the case study.

In this conclusion, this research is reviewed firstly and then a summary of the primary research findings are presented; the answers to the research questions are given; limitations and weaknesses of the thesis are noted; and avenues for future research are proffered. Through so doing, the chapter illustrates and summarises the ways in which this thesis has built upon existing knowledge, provided fresh insights into fintech studies, and also acts as a potential launch pad for future research.

9.1 Research Review

In this section, this research will be reviewed through the research objectives and questions from literature review, research design and case study.

This thesis focuses on fintech research that are divided into three categories in the existing literature: fintech innovation, the fintech industry and fintech regulation studies. Through reading the fintech literature, there is a lack of an understanding of fintech from the dynamic perspective from the entire fintech industry. Therefore, the focus of this thesis is on the research of the fintech industry and fintech regulation. By further reviewing the fintech industry studies, three topics of fintech industry literature were summarised: fintech market scale, enhanced competition, and the risks in the fintech industry. There are four components or structural elements can be
summarised from those fintech industry studies: fintech actors, interactions, institutions, and infrastructure. Then, each structural element in the fintech industry studies were further clarified. Fintech regulations are highly related to each topic and structural elements in fintech industry studies; therefore, the fintech regulations studies were reviewed by following the four structural elements of fintech industry, and knowledge gaps were identified.

To understand the fintech regulation, the concepts of fintech regulation were firstly introduced. It was found that there are relations between fintech regulation and policy instruments. Borras and Edquist (2013) stated that policy instrument is one of the effective methods of regulation. Gozman et al., (2018) confirmed the significant impact of policy instruments in the development of online payment (fintech innovation) and fintech start-ups (one of the structural elements of the fintech industry). Edler and Georghiou (2007) also stated the potential of policy instruments in fintech innovation.

The concepts of policy instruments in fintech regulation research needs to be further clarified; therefore, the concepts of policy instruments were introduced then. Three types of policy instruments proposed by Borras and Edquist (2013) will be applied in this research to understand the fintech regulation: as regulatory policy instruments, economic and financing policy instruments, and soft policy instruments.

Thereafter, the arguments related to policy instruments and the structural elements of the fintech industry in fintech research were summarised and synthesised. It was found that existing literature mainly focuses on the impacts of the single or countable policy instruments on specific innovations or single structural element of the fintech
industry: fintech actors, fintech interactions, fintech institutions, or fintech infrastructure. There is still limited research focusing on the policy instruments on the fintech industry simultaneously considering all four structural elements of the fintech industry, which could lead to a lack of understanding.

The fintech studies related to policy instruments and each structural element were summarised. To understand how policy instruments dynamically affect the fintech industry simultaneously considering the four structural elements, the research question of how policy instruments dynamically affect the fintech industry were developed which remains unexplored in the existing fintech studies.

Chapter 3 develops analytical framework to answer the research question. To provide dynamic perspective, the development stages of the fintech industry were defined through literature to identify its changes and the roles of policy instruments. In this research, fintech development stages were divided into: the initiation stage, the growth and problematisation stage, the improvement stage. Then the Fintech innovation system (FTIS) framework was developed which is adapted from the System of innovation (SI) framework (Ho and O’Sullivan, 2019). FTIS framework is able to consider all the components of the fintech industry together, including fintech actors, fintech interactions, fintech institutions, and fintech infrastructure, and guides to understand how the policy instruments dynamically affect those elements. This framework also guides to conduct of the research and lead to the answers to the research question.

The methodology of this research was introduced in chapter 4. Critical realism is
applied as the research approach, and retroduction is used as the research strategy. The specific concepts of Critical realism and retroduction were elaborated in chapter 4. Compared to other methodology, critical realism and retroduction are suitable to identify and analyse the dynamic process and mechanism to answer the research question. The research method was an in-depth case study due to its advantages to identify the research question of how, and the investigator has no control over behavioural events (Yin, 2009). China’s fintech industry is selected as the case because it is a critical, unique, extreme, and revelatory case (Yin, 2013). Then, data collection and data analysis were conducted.

The results of the data were shown from chapter 5 to chapter 7. The changes of structural elements of the fintech industry and different implemented policies at each stage of China’s fintech development were identified. Then, the related fintech elements, the issued policies, and corresponding effects at each stage were presented. Next, what kinds of policy instruments were implemented were analysed and elaborated how they affected those fintech structural elements at each stage. The summary of research findings and the answers of the research questions were discussed in chapter 8. Next section is summary of the research findings.

9.2 Summary of research findings

This thesis focused on an in-depth case study of China’s fintech industry to identify how policy instruments affect the four structural elements of the fintech industry: actors, interactions, institutions, and infrastructure. In undertaking that case study what structural elements existed and how they were influenced by fintech-related policies were identified and analysed.
This study has revealed that, during the initiation stage of the China’s FTIS, (and viewed from the perspective of fintech actors), policies tended to fiscally encourage fintech start-ups and that there was also a high degree of regulation of TFOs. Simultaneously, technology developers received fiscal incentives and technical support from many policies to develop themselves. This can be seen to have created a dynamic imbalance between new actors and the TFOs. The thesis also noted how, in terms of their interactions at the initiation stage, the competition between fintech start-ups and TFOs intensified; especially with regard to issues of market share and customer acquisitions. It was also noted that market scale expanded rapidly, and that the use of fintech infrastructure increased. Cumulatively, the interactions of these various factors illustrate that technology developers benefited from the interactions between other fintech actors.

Moving forward, the thesis also identified the roles of policy instruments to fintech institutions, and commented on the plethora of new regulatory departments that were established at this time. There were policies advanced, as detailed in Chapter 5, for establishing initial fintech regulation institutions and fundamental laws and standardisations. In addition, and as Chapter 5 discussed, initial fintech institutions were inclined to the development of fintech start-ups and technology developers and encouraged financial consumers to engage in financial activities. For fintech infrastructure, policies tended to lower the industry access and limitations to technology developers for developing fintech infrastructure.

During the growth and problematisation stage, many fintech start-ups and diversified
fintech services emerged in the fintech industry; as discussed in Chapter 6. The relatively weak regulation implemented on fintech start-up compared to the TFOs in the first stage brought considerable risks in the second stage. Due to the lack of fintech institutions on fintech start-ups, new forms of fintech services, such as platforms, P2P lending and blockchains, brought considerable losses to financial customers and there was also financial fraud. Ezubao was a representative case of financial problems in the China’s fintech industry at this stage (as noted in Chapter 6). To reduce the risks and prevent further financial problems, the frequency of policy initiatives focused upon fintech regulation increased between 2013 and 2017. Fintech start-ups started to be more strictly regulated, and financial customers started to be protected by a series of ‘customer protection’ policies. Policies were established and new departments established that were both explicitly charged with dealing with fintech issues via the medium of rectifications. For example, the NIFA which sought to strengthen self-regulation was established jointly by PBC, CBRC, CSRC, and CIRC. The development of technology developers was still encouraged due to the demand for fintech infrastructure; especially via regulations advanced by governments. For fintech interactions, policies tend to prevent ‘problematic’ interactions, such as the financial fraud on illegal online lending platform between fintech start-ups and financial customers which had not only been observed by government but also led to a declining faith in the industry by customers. Policy started to strengthen collaborative networks between different government departments when it came to their need to jointly deal with the financial frauds that had occurred during the second stage of the fintech industry’s development. Although some particular regulations such as “Notice of the Office of the Leading Group for the Special Campaign against Internet Financial Risks and the Office of the Leading
Group for the Special Campaign against Peer-to-peer Lending Risks on the Regulation and Rectification of the Cash Loan Business’’ might hamper the development of key aspects of the fintech services at the short term (such as the online platforms), the development of fintech infrastructure in China was exceptional and constantly stimulated by policies.

During the improvement stage, financial customers’ protection was more focused than had hitherto been the case. This thesis identified the policies that were enacted at this stage and concluded that they were highly related to the financial protection of customers. The interviewees who were questioned for this research all agreed to define it as the huge improvement for the China’s fintech industry. For the government, the significant event was the merger of the CBRC and the CIRC to create the CBIRC. The functions and organisational structures of government was adjusted by policies. The standards of fintech infrastructure were required improved by the policies enacted in this stage of fintech’s development.

Chapter 8 subsequently generalised the policy impacts and effects of the structural elements of the fintech industry. Then, the thesis noted the results of how policy instruments affect four elements of the fintech industry at each stage. Six roles from three policy instruments: regulatory policy instruments, economic and financing instruments, and soft instruments were identified and leads to the answer of main research questions.

In terms, therefore, of explicitly answering the research questions of this thesis, the following answers are given. Policy instruments dynamically affect the fintech
industry by providing financial and technical support to fintech actors, establishing and developing the fintech regulatory institution, standardising and increasing public procurement the fintech infrastructure, sharing industrial information, and strengthening self-regulation.

Synthesising existent literature, the documentary evidence acquired by the research, and the opinions voiced by the interviews, this thesis subsequently, in Chapter 8, commented on three additional roles of policy instruments in the context of the fintech industry and regulation studies.

The first role of policy instruments was deregulation. This research revealed that this is an essential role of combining different policy instruments. Through this research, it was also revealed three findings to the fintech studies from the perspective of the different levels of deregulation. The findings of this thesis with regard to these specific points are as follows. Deregulation on different fintech actors differentiated in most situations. The imbalanced nature of deregulation between different actors (such as that between fintech start-ups and TFOs at during the first stage) cause potential financial risks to fintech industry, especially for fintech consumers. In addition, decreasing the deregulation level of fintech start-ups by economic and financing, and regulatory policy instruments can lead to reduce financial frauds. The last, the high-level deregulation on technology developers is regarded as an important factor to promote the entire fintech industry.

The second role of policy instruments revealed by this thesis was their role in adjusting actors’ interactions. This role of policy instruments is rarely mentioned in
the policies, despite the fact that the impact of the same is significant in the fintech industry. There are new generalised findings regarding how policy instruments affect fintech actors’ co-opetition. First, policy instruments can adjust the nature of co-opetition relationships between fintech start-ups and TFOs. In China’s FTIS, during the first stage, this occurred through the deregulation of fintech start-ups and the regulation of TFOs; the result was that fintech start-ups gained a competitive advantage in payment services. This thesis also indicated that continuous standardisation and strengthening self-regulation fintech by regulatory policy instruments and soft policy instruments can stimulate the co-evolution between different fintech actors.

The third is the policy instruments’ role in decentralising and centralising regulatory institution. To be specific, the fintech regulatory institution were developed by constantly adjusting the regulatory responsibilities of existing regulatory agencies and sometimes establishing new regulatory agencies. The regulatory and soft policy instruments roles in decentralising regulatory institution can strengthen the self-regulation of the fintech industry. However, in fintech industry, over decentralisation of regulatory institution could lead to the financial risks.

9.3 Theoretical contributions of this study

In addition to answering the explicit research questions of this thesis, this study has also made a number of theoretical contributions to existent academic understanding.

This study considered four structural elements simultaneously in the fintech industry: actors, interactions, institutions, and infrastructure, and analysed how policy
instruments dynamically affect the four structural elements simultaneously. Then, this study reveals six roles of policy instruments that affected the fintech industry: establishing and developing the fintech regulatory institution, standardising and increasing public procurement the fintech infrastructure, sharing industrial information, and strengthening self-regulation, and three additional roles were discussed with the existing literature: deregulation, adjusting actors’ interactions, and decentralising and centralising. These research findings develop theoretical contributions from three perspectives.

The first theoretical contribution of this research is filling the knowledge gap in the fintech industry research. There are few fintech industry studies that can simultaneously consider the four essential elements contained in the fintech industry. Therefore, this research provides a new lens to understand how different structural elements changes in the fintech industry. In terms of controlling risks in the fintech industry studies, this research made contributions by indicating the relationship between policy instruments’ roles and controlling financial risks. This research, therefore, validates several existing theories. Namely, that applying a broader range of fintech will increase the industry's risks (Lai and Order, 2017; Campbell and Frei, 2010). The reasons for the risks, such as the enhanced competition between TFOs and fintech start-ups, the protections and confidence of financial consumers, and so on, are described in case study. This research showed that the government used the three kinds of policy instruments on the four structural elements to address the financial risks emerged at the growth and problematisation stage of China’s FTIS. In addition to the regulatory policy instruments and soft policy instruments which were noted by many scholars in literature, the thesis also found that increasing public procurement
on fintech infrastructure by economic and financing policy instruments also can lead to the improvement of fintech regulation and control the risks by using technology. These are important considerations for the future development of the industry because the significance relationship between technology and regulation is identified, but the roles of policy instruments on improving technology (such as regtech) are regarded as the key of the fintech regulation.

The second theoretical contribution point is in fintech regulation research. Fintech regulation research is still an emerging field and many studies focus on developing or regulating fintech innovation instead of the industry's perspective. Considering the four elements of the fintech industry simultaneously in studying the dynamic impact of policy instruments on them is scarce in fintech regulation studies. The research findings supplement the most research on analysing how the specific policy instruments affected on single structural elements. The research findings fill this knowledge gap.

This thesis made contribution to the existing fintech regulation by identifying the importance of improving fintech infrastructure in fintech regulation. By dynamically analysing the four structural elements simultaneously, the roles of fintech infrastructure in fintech regulation were increasing, which can be seen from the increasing demand-oriented policy instruments on fintech infrastructure. This contribution also supplements Shim and Shin’s (2016) work by further introducing the concept of policy instruments and considering fintech infrastructure. This research has further deepened understanding of the policy instruments’ roles in fintech infrastructure, which was considered as the key factor in the rapid growth of the
Chinese financial sector.

There are additional arguments to some existing fintech regulation related to policy instruments and the policy instruments’ roles in actors’ interaction of the fintech industry. Chiu (2016) identified the policies providing R&D, training and skills, technical services and advice can affect the interactions between actors to achieve policy objectives. The interactions between fintech start-ups, TFOs, and the market scale were clarified by Tassey, (1982), Wang and Kim, (2007), Wolfond, (2017). However, they were unable to reveal the potential negative influence by the economic and financing, and regulatory policy instruments on the relationship between fintech start-ups and TFOs. This research reveals that using the economic and financing instruments and regulatory instruments can adjust the competition between fintech start-ups and TFOs, which support their research. However, the over deregulation on fintech start-ups than TFOs will potentially cause financial risks in the long term of fintech development (such as the financial frauds in the growth and problematisation stage of China’s FTIS). Therefore, those policies such as providing R&D could possibly be unable to meet the policy objectives. The further analysis of actors’ interactions is needed.

The third contribution is the FTIS framework to the fintech research. The FTIS framework was developed from Ho and O’Sullivan’s (2017) SI framework. It consists of all four elements actors, interactions, institutions, and infrastructure and is first introduced into fintech research. The FTIS framework provides an innovation system perspective to fintech research and opportunities to comprehensively understand what structural elements exist in the fintech industry. The FTIS framework can be widely
applied in the fintech industry and regulation research in the future. For one additional comment, the part of the structural elements of FTIS where can be potentially modified is the interactions. The ecosystem term of interaction was used to describe the different types of interaction such as competition cooperation and co-opetition in this research. Applying different terms to describe the different types of interactions, and considering actors, institutions, and infrastructure together have its potential to contribute to different findings and further improving FTIS framework in the future fintech studies.

9.4 Practical implications of the findings of this study

Three practical implications for policy-makers and practitioners in financial industry can be drawn from this research: Appropriate choice of policy instruments in different stages, in-time evaluating the policy instruments’ roles on different fintech actors, and the benefits of improving fintech infrastructure by policy instruments to the fintech industry’s development.

This research divided the fintech development stage into the three stages for dynamically analysing the fintech industry: the initial stage, the growth and problematisation stage, and the improvement stage. The division in this study can be a reference for fintech actors, especially for policy-makers, to understand the choice of policy instruments. For example, in this case, the fintech institution established in the initiation stages of the fintech industry development profoundly affect all three development stages. Different regulatory policy instruments can establish strong or weak regulatory institution to affect fintech actors. In the case study, at the initiation stage of the fintech industry, the scale of the fintech market was still at the infant stage.
The policy objective was to demand more fintech actors to engage in the fintech industry and increase the market scale; therefore, the relaxed regulatory institution was implemented for developing fintech start-ups and the fintech market overall. However, as well as from the deregulation level’s perspective, it will bring potential risks which could lead to financial frauds in the fintech industry. On the contrary, the strong supervision at the initiation stage probably could prevent the risks behind, but it also could delay the proliferation of the fintech industry. The Chinese government chose the first path. It also shows the importance of policy instruments to the fintech industry in establishing the initial regulatory institution. In practice, policymakers need to understand the pros and cons of policy instruments in different development stages.

The second point is to evaluate the policy instruments’ roles on different fintech actors in time. There are always gaps between policy objectives and policy implementations which could lead to potential policy failure (Hudson et al., 2019). This case studies revealed the different deregulation levels that fintech actors and TFOs received leading to the increasing financial risks at the growth and problematisation stage of China’s FTIS. The regulatory and economic and financing policy instruments related to this were to improve the fintech industry; however, there were gaps between reality. In fintech studies, there are four structural elements in the fintech industry and received different policy instruments roles. How to take into account all structural elements is a significant step in the process of choosing policy instruments. To consider all structural elements needs policy-makers’ reacting time for evaluating the fintech industry. Nevertheless, in practice, it is often urgent to formulate a policy in the fintech industry, and there is not enough time to evaluate all structural elements.
Therefore, to shorten the evaluating process for efficiently designing and implementing policies, regulatory policy instruments introducing pilot test or collaboration working mechanism to develop regulatory institutions for government need to be considered in practice.

The third point is that continuous economic and financing policy instruments support for fintech infrastructure is an essential factor in the development of the fintech industry. In the case studies, fintech infrastructure has always been supported by economic and financing policy instruments in all three stages. Although at each stage, the specific recipients of this support are slightly different. For instance, at the initiation stage of China’s FTIS, economic and financing policy instruments supported the development of communication and computer hardware technology support, which TPP mainly used. At the second stage, policy instruments supported platform and network construction and cloud services infrastructure. The third stage was for data monitoring, big data and Internet of Things related technical support to financial services. Except for the strong regulations on the P2P platforms from the second stage, in general, most of the fintech infrastructure has been subject to continuous policy instruments’ support from economic and financial policy instruments from the first stage to the third stage.

This study found that policy instruments to stimulate the development of fintech infrastructure often receive better returns in practice. First, the development of fintech infrastructure also benefits the development of regtech such as reporting and credit system, big data analysis and thus improves the fintech regulation. Second, combining with the regulatory policy instruments in standardising, the development of fintech
infrastructure can also promote digitization of financial industry, help the government better monitor industry financial data, and avoid potential risks. The digitization process can also drive the industry enhance its capabilities to avoid financial risks caused by unexpected factors such as Covid-19 pandemic.

9.5 Limitations and future research

There are some limitations of this research and the directions of future research.

First, the data collection only covers the period up to the end of 2021. Future research could, therefore, seek to bring the data herein analysed ‘up to date’ by analysing the period from the end of 2020 to the present day.

Second, in terms of the fieldwork, due to the limited time and resources, only five cities were picked from which to find interviewees; Beijing, Shanghai, Shenzhen, Xi’an, and Dandong. Data bias is inevitable, and more sample cities represent the different levels of local financial institutions that will promote the accuracy of the data results. In the future, more cities could be included to improve the research.

Whilst this research has provided a detailed case study examination of China, it could be suggested that a limitation of this work is that it does not provide detailed international comparisons. It is also the case, given the uniqueness of China’s regulatory institutions’ structure noted in this study may not be as generalisable or transferrable to other countries which possess different structures of regulatory institution, to overcome this limitation, and also further cement the centrality of this work in enhancing global understanding of the development of fintech across the
globe, future research should include comparative examples and analysis of additional counties. Finally, whilst this study developed the FTIS framework and firstly attempted to apply it to fintech research, the research only focused on four elements: fintech actors, fintech interactions, fintech institutions, and fintech infrastructure to the fintech industry and fintech regulations research. However, this study cannot confirm at this moment whether there will be a fifth important structural element in the fintech industry. With a more comprehensive understanding of the fintech industry and fintech regulation in the future, the FTIS framework has the potential to be reframed and framed.
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258


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APPENDIX 1 GUIDELINE FOR SEMI-STRUCTURED INTERVIEWS

Part 1. General Questions for all interviewees

1. Personal information (roles and work experiences).

2. How do you understand the development of China’s fintech industry?

3. What are the factors driving the development of China’s fintech industry?

4. What problems does the Chinese fintech industry have?

5. When did these problems occur?

6. How do you think the roles of policies in the development of China’s fintech industry?

7. What policies do you think have played an important role in China's fintech development?

8. What are the effects of these policies to you?

Part 2. Specific questions for different groups of informants

Specific questions for informants from fintech start-ups, technology developers, traditional financial organisations

1. Briefly describe your organisations.

2. What activities are your organisations mainly engaged in and what role does it play in China’s fintech industry?
3. How does your organisation cooperate with other organisations in China’s fintech industry?

4. How does your organisation compete with other organisations in China’s fintech industry?

5. What are the common goals and interests in the cooperation or competition?

6. What specific policies do you think have a significant impact on your organisation?

7. What specific policies do you think have a significant impact on the interactions with other organisations in China’s fintech industry?

8. Which specific regulations do you think are influencing your organisation?

9. How do these regulations impact your organisation?

10. Which specific policies do you think influence the fintech infrastructure of your organisation?

11. How do these policies impact on the fintech infrastructure of your organisation?

Specific questions for informants from government

1. Briefly describe your organisations.

2. What activities are your organisations mainly engaged in and what role does it play in China’s fintech industry?

3. What were the significant strategic changes of issuing policies in the development of China’s fintech industry?

4. How do you understand policy instruments and its roles in the development of
China’s fintech industry?

5. Which policies do you think have a significant impact on the China’s fintech industry?

6. How do these policies impact on the China’s fintech industry?

Specific questions for informants from financial consumers

1. Briefly describe your experience in participating fintech.

2. Which types of problems are you worrying in terms of fintech services?

3. What are the significant changes of the experience in last twenty years?

4. Do you have any comments on those fintech services provided by financial organisations?

Part 3: Ending question

1. How do you expect the development of China’s fintech industry?

2. What kinds of policies do you expect in the future?

3. Is there anything you would like to share in terms of policy and China’s fintech industry?
APPENDIX 2 EXAMPLE OF DATA CATEGORISING AND CODING

Example of concept-driven data categorising and coding

Data:
“Notice of the China Banking Regulatory Commission and the People's Bank of China on Strengthening the Administration of Cooperative Business between Commercial Banks and Third-party Payment Institutions” impressed me at that time. When this policy was issued, as a banker, we needed to re-evaluate our bank's business models, and conduct financial services under the clear principles that were provided. They recommended several technical methods to us to guarantee the security. The interactions with Banks and TPPs were very complicated and being differentiated. I think government was considering that the TPPs was too risky at that time in terms of financial customer protection. The regulation on TPP was relatively scarce. To me, It can be said that this policy can represent that China's fintech industry at that stage has truly realised the seriousness of fintech risks.

(Answer of question “What policies do you think have played an important role in China's fintech development?” from interviewee TFOS)

Relevant Policy or events:
Notice of the China Banking Regulatory Commission and the People's Bank of China on Strengthening the Administration of Cooperative Business between Commercial Banks and Third-party Payment Institutions (No. 10 [2014] of the China Banking Regulatory Commission). All local offices of the China Banking Regulatory Commission (“CBRC”); Shanghai Headquarters of the People’s Bank of China (“PBC”), all branches and business management departments of the PBC, and all central sub-branches of the PBC in capital cities of provinces (autonomous regions) and sub-provincial cities; all state-owned commercial banks and joint-stock commercial banks; postal savings banks; and trust companies, enterprise group finance companies and financial leasing companies under the direct supervision of the CBRC:

In order to effectively protect the client information safety of commercial banks, guarantee the security of funds and bank accounts of clients, safeguard the lawful rights and interests of clients, and strengthen the administration of cooperative businesses between commercial banks and third-party payment institutions, the requirements for the establishment of business relevancy between commercial banks and third-party payment institutions are hereby raised as follows:

Commercial banks shall, according to the requirements of the relevant laws and regulations, effectively conduct the work of client information safety and confidentiality. When a commercial bank and a third-party payment institution cooperatively develop various businesses, where the administration of client financial information is involved, the commercial bank and the third-party payment institution shall strictly observe the provisions of the relevant laws, regulations, and regulatory systems and make payment in strict compliance with clients' will and instructions, and may not disclose any client financial information in violation of laws and regulations.

A commercial bank shall assess the technical risk tolerance of a client and such decision-making requirements as the account relevancy between the client and a third-party payment institution, the business type, and the trading limit shall be consistent with the technical risk tolerance of the client.

When the bank account of a client establishes business relevancy with a third-party payment institution for the first time, duel authentication shall be required, that is, when a client passes the authentication of the third-party payment institution, it also needs to pass the client identity authentication of the commercial bank. The bank that has opened the bank account shall directly verify the client identity through physical outlets, e-channels, or other effective methods, and
specify the rights and obligations of both parties.  
When authenticating and verifying a client identity through e-channels, a commercial bank shall verify the client identity by means of dual (multiple)-factor authentication. For a client who does not satisfy the conditions for dual (multiple)-factor authentication, no account of the client may establish business relevancy with a third-party payment institution.  
A commercial bank shall open at least one technical method for instant notification of changes in the account that has established business relevancy with a third-party payment institution. For any client who fails to satisfy the conditions for instant notification, he or she may not establish the business partnership with a third-party payment intuition through a bank, in which multiple payments are made upon contract-signing for once.

18. Banks should build secure network channels (such as dedicated line connections, VPN channels, etc.) and designate security boundaries (such as deploying firewalls, DMZ isolation areas, etc.) to prevent third-party payment institutions from accessing beyond the boundary.

19. Commercial banks shall, in accordance with the requirements of this Circular, effectively conduct the revision of corresponding systems and contracts. The relevant work should be completed by June 30, 2014 at the latest.

20. Other banking financial organisations shall refer to this notice when conducting relevant business.

CBRC  
PBC  
04-03-2014

<table>
<thead>
<tr>
<th>Actors</th>
<th>Interactions</th>
<th>Institutions</th>
<th>Infrastructure</th>
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</thead>
</table>
| TPP and commercial banks (TFI, TD and FS) are more regulated by G in terms of FC’s information safety. | Clear principles of interactions between TPP and commercial banks which is more regulated by G. | Clarified customer’s (FC) personal information protection rules. | Infrastructure: 
  “Banks shall build safe network channels (for instance, dedicated connection and Virtual Private Network (VPN) channels), designate security boundary (for instance, deployment of firewalls and Demilitarized Zone (DMZ)), and prevent third-party payment institutions from cross-boundary accessing.” (TD) Article 17 More demand of fintech infrastructure |
APPENDIX 3. PARTICIPANT INFORMATION SHEET

Understanding how policy instruments dynamically affect the fintech industry: A case study of China

Participant Information Sheet

Thank you for taking time to read this Participant Information Sheet regarding the study that you are invited to participate, as part of my doctoral research study at The University of Manchester. Your contribution to this study is highly significant and deeply anticipated. However, before deciding whether to participate, it is important that you fully comprehend what the study involve and what it may entail. For this reason, please take your time to read the following information. Should there be any issue or concern which you wish to raise, please do not hesitate to ask me for more information.

WHO WILL CONDUCT THE RESEARCH?

Name of researcher: Kaiyu Xu

TITLE OF THE RESEARCH

Understanding how policy instruments dynamically affect the fintech industry: A case study of China

WHAT IS THE AIM OF THE RESEARCH?

This research aims to identify how policy instruments affect China’s fintech system by using System of Innovation framework which specifies that innovation system includes Actors, Interactions, Institutions, and Infrastructure. This study will use case study to demonstrate SI of China’s fintech firstly, and then analyse how policy instruments affect four elements of China’s fintech system.

WHY HAVE I BEEN CHOSEN?

Based on the aim and objectives as well as the research methods, the study intends to select participants based on five groups.

- Government
- Financial consumers
- Fintech start-ups
- Technology developers
- Traditional financial organisations

It is considered that you are one of the key actors in China’s Fintech industry. Thus, I am interested in your aspirations, views, attitudes and specific roles in China’s Fintech industry.

**WHAT WOULD I BE ASKED TO DO IF I TOOK PART?**

By participating in this study, you will be invited to engage in an online semi-structured interview where the researcher will ask a series of open-ended questions. The interview is intended to be an interactive process through which you are encouraged to express your practical experience and opinions about how policy instruments affect each element in Fintech system in China. Each interview will last approximately 1 to 1.5 hours. The interviews will be audio-taped if you are consent to do so.

**WHAT HAPPENS TO THE DATA COLLECTED?**

All interviews will be collected and analysed by the researcher. The data gathered from the interview will be collated, analysed and presented in a doctoral thesis. No part of the data reported will refer to any person openly without their prior consent. Summaries of this report may be forwarded to participants for further discussion and consultation. The final report or a summary of findings of the study will be made available to participants.

Any parts of the findings emerging from the study may be published in academic peer review journals, book chapters, professional magazines or blogs in the future, as a contribution to building knowledge in the area of policy and Fintech development.

**HOW IS CONFIDENTIALITY MAINTAINED?**

Admittance to all data generated through this research process will be limited to the researcher. No other persons will have access to data in part or as a whole. All responses will be kept under lock and all digital or voice data will be stored in a
computer under a password, kept by the researcher. Once the research process has been completed, all data will be destroyed.

The identities of the interviewees will be kept anonymous, which means the real name will be replaced by pseudonym in the interview transcript. No identify of interviewees will be identifiable in any publications.

**WHAT HAPPENS IF I DO NOT WANT TO TAKE PART OR IF I CHANGE MY MIND?**

It is up to you to decide whether or not to take part. If you do decide to take part in the interview, you will be given this information sheet to keep and be asked to sign a consent form. You are still free to withdraw at any time without giving a reason.

**WILL I BE PAID FOR PARTICIPATING IN THE RESEARCH?**

No, all participants will not be paid for participating in the research.

**WHAT IS THE DURATION OF THE RESEARCH?**

The duration of data collection for this research will take place between February and April 2020. Each participant will be asked to involve in an online semi-structured interview. Each interview session is estimated to last about 1 to 1.5 hours.

**WHERE WILL THE RESEARCH BE CONDUCTED?**

The research will be conducted online.

**WILL THE OUTCOMES OF THE RESEARCH BE PUBLISHED?**

The outcomes of the research will be mainly used for the purpose of completing my PhD thesis. In addition, they are also anticipated to be used in the following ways:

- Peer reviewed journal articles
- Conference presentation

**WHO HAS REVIEWED THE RESEARCH PROJECT?**

This research has been reviewed by the Research Ethics Committee in the School of Environment, Education and Development
CONTACT FOR FURTHER INFORMATION

Researcher contact details:

Address:
Quad C of First Floor, Arthur Lewis Building
The School of Environment and Development
University of Manchester
Manchester, M13 9PL
United Kingdom
Email address: Kaiyu.xu@manchester.ac.uk
Mobile number: +44 7305 968855
+86 13261779317

Supervisor contact details:

Email address: Ping.Gao@manchester.ac.uk

WHAT IF SOMETHING GOES WRONG?

If a participant wants to make a formal complaint about the conduct of the research they should contact the Postgraduate Research Office in the School of Environment, Education and Development by either writing to pgr-seed@manchester.ac.uk or visiting Arthur Lewis Building, University of Manchester, Oxford Road, Manchester, M13 9PL, United Kingdom.
APPENDIX 4. CONSENT FORM

Understanding how policy instruments dynamically affect the fintech industry: A case study of China

Consent Form

If you are happy to participate, please complete and sign the consent form below.

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<table>
<thead>
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<tr>
<td>1. I confirm that I have read the attached information sheet on the above project and have had the opportunity to consider the information and ask questions and had these answered satisfactorily.</td>
<td>Please Initial box</td>
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<tr>
<td>2. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to my treatment/service/self.</td>
<td></td>
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<td>3. I understand that my data will remain confidential.</td>
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<td>4. I understand that the interviews will be audio-recorded.</td>
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<td>5. I agree to the use of anonymous quotes.</td>
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<tr>
<td>6. I agree to receive a non-technical summary of the research results after the completion of the research.</td>
<td></td>
</tr>
</tbody>
</table>

I agree to take part in the above project.

______________________________  _____________________  _____________________
Name of participant                Date                      Signature

______________________________  _____________________  _____________________
Name of researcher                 Date                      Signature