



저작자표시-비영리-변경금지 2.0 대한민국

이용자는 아래의 조건을 따르는 경우에 한하여 자유롭게

- 이 저작물을 복제, 배포, 전송, 전시, 공연 및 방송할 수 있습니다.

다음과 같은 조건을 따라야 합니다:



저작자표시. 귀하는 원저작자를 표시하여야 합니다.



비영리. 귀하는 이 저작물을 영리 목적으로 이용할 수 없습니다.



변경금지. 귀하는 이 저작물을 개작, 변형 또는 가공할 수 없습니다.

- 귀하는, 이 저작물의 재이용이나 배포의 경우, 이 저작물에 적용된 이용허락조건을 명확하게 나타내어야 합니다.
- 저작권자로부터 별도의 허가를 받으면 이러한 조건들은 적용되지 않습니다.

저작권법에 따른 이용자의 권리는 위의 내용에 의하여 영향을 받지 않습니다.

이것은 [이용허락규약\(Legal Code\)](#)을 이해하기 쉽게 요약한 것입니다.

[Disclaimer](#)

Master's Thesis of Public Administration

Determinants of FinTech Credit Expansion

핀테크 신용 팽창 결정요인

August 2018

Graduate School of Public Administration

Seoul National University

Global Public Administration Major

Kim, Yoon Hee

This work was supported by
Graduate School of Public Administration,
Seoul National University.

Abstract

Determinants of FinTech Credit Expansion

Kim, Yoon Hee

Global Public Administration Major

The Graduate School of Public Administration

Seoul National University

The objective of this study is to identify key determinants of FinTech credit expansion at the country level. Considering the data limitation on FinTech credit markets around the world, this study conducted in-depth exploratory research as well as empirical analyses. In a sample of 13 countries, OLS regression results confirm that there are four significant determinants. While the population sizes and the proportions of the younger cohorts are positive determinants, the levels of financial inclusion and administrative costs of business start-up procedures adversely affect FinTech credit expansion. Nonetheless, the regression results generally do not support a negative association between the levels of bank net interest margin (NIM) and FinTech credit expansion, indicating that the retrenchment of incumbent banks from certain market segments does not lower market entry barriers for FinTech credit platforms.

Keywords: FinTech credit, peer-to-peer (P2P) lending, marketplace lending, crowdfunding, crowdlending

Student ID: 2016-25112

Table of Contents

1. INTRODUCTION	1
2. LITERATURE REVIEW	5
2.1 Theoretical Explanations.....	5
2.2 Empirical Findings	6
3. HYPOTHESES.....	12
4. DATA AND METHODS	22
4.1 Data Collection.....	22
4.2 Variable Measurement	26
5. RESULTS AND DISCUSSIONS.....	30
5.1 Population and FinTech credit	30
5.2 Younger cohorts and FinTech credit.....	32
5.3 Financial inclusion and FinTech credit	33
5.4 Bank net interest margin and FinTech credit	34
5.5 Cost of business registration and FinTech credit	35
5.6 Robustness Test.....	35
6. CONCLUSIONS AND IMPLICATIONS.....	38
6.1 Conclusions	38
6.2 Policy Implications.....	40
REFERENCES.....	45

List of Tables

Table 1. Country Distribution of the Top 100 Banks and the FinTech100.....	4
Table 2. FinTech Ecosystem Attributes and Benchmark Factors	7
Table 3. Rank by FinTech Ecosystem Attribute	8
Table 4. Summary of Hypotheses Development.....	13
Table 5. Dataset.....	25
Table 6. Descriptive Statistics for Variables in the Analysis	28
Table 7. Variable Definitions and Data Sources	29
Table 8. OLS Regression Results.....	31
Table 9. Robustness Test Results (OLS Estimates)	37
Table 10. Strengths and Weaknesses by Jurisdiction.....	44

List of Figures

Figure 1. Intervention Interest Rates by the Main Central Banks	16
Figure 2. US Treasury Bond Yield Spread and GDP Growth.....	17
Figure 3. Changes in Interest Rates (observed) and NIMs (predicted).....	18
Figure 4. Bank Non-Performing Loans (NPLs) to Gross Loans	19

1. INTRODUCTION

The Financial Stability Board (FSB) defines “FinTech”, which is the abbreviation of the phrase *financial technology*, as technologically-enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services (Carney 2017). Examples of innovations that are central to FinTech include credit provision, equity capital raising, retail and wholesale payments, insurance, crypto-currencies and the blockchain, new digital advisory and trading systems (Philippon 2016).

The latest leading global Fintech innovators can be found in the annual ‘Fintech100’, which consists of the leading top 50 FinTech companies and the most intriguing 50 emerging companies across the globe (H2 Ventures and KPMG 2017). The Fintech100 in 2017 includes 32 lending companies, 21 payments companies, 15 transaction and capital markets, 12 insurance companies, 7 wealth companies, 6 cyber security companies, 4 blockchain and digital currencies companies, and 3 data and analytics. Considering that FinTech has an extensive spectrum of sectors which hardly share common features in common except that they emerged from technologically-enabled financial innovations, this paper focused on the most leading sector, i.e., FinTech-enabled credit provision.

“FinTech credit” refers to credit activity facilitated by electronic platforms (CGFS and FSB 2017). FinTech credit encompasses “peer-to-peer (P2P) lending”, “marketplace lending” (in the US), “loan-based crowdfunding” (in the UK), or “crowdlending”. It is common for borrowers and investors to be directly matched, although some platforms lend using their own balance sheet. FinTech credit platforms intermediate diverse forms of credit, including consumer and business lending, lending against real estate, and business invoice financing. In addition, there is also variety in the creditor base of FinTech credit platforms: some source funding mostly from retail investors, while others use significant funding from institutional investors, banks and securitization markets.

Unlike traditional financial markets, FinTech credit market has a brief history of a decade or so. The first FinTech credit lender was UK platform Zopa founded in 2005 and immediately followed by US platform Prosper founded in 2006 (Bachmann et al. 2011). At least for advanced economies such as the G20, the gap between states in terms of capital and technology is much less in recent years than in the early days of banking industry development centuries ago. However, when comparing the country distribution of the top 100 banks and the FinTech100, Korea and Japan are behind in FinTech development, while Australia is far ahead of it (Banks around the World 2018; H2 and KPMG 2017, Table 1). *From where does the development inconsistency between the traditional financial industry and the new FinTech credit industry arise? What factors do drive a thriving FinTech credit market?* Despite its simplicity, this comparison implies that FinTech development depends on various

factors apart from economic and technological factors. In this regard, this paper aims at finding key determinants of FinTech credit expansion with a primary attention on the countries from Table 1.

Considering the data limitation on FinTech credit markets around the world, this study conducted in-depth exploratory research as well as empirical analyses, and makes three sets of contributions to the literature. First, it extracts a theoretical account and empirical findings from the most recent literature regarding the country-level determinants of FinTech credit expansion. Since previous studies were conducted mainly at the individual platform level, this literature review is noteworthy to further follow-up studies on the macro-level determinants. Second, this study brings empirical evidence for four drivers of FinTech credit expansion, consistently significant to explain both the new credit volume and the number of platforms. Third, it suggests policy implications for each jurisdiction through a frame of the determinants identified.

I first review major sets of theoretical explanations and empirical findings from prior studies which started to burgeon after 2016. I develop five hypotheses based on theoretical backgrounds, and then describe the data and methods used to investigate them. After presenting empirical results, the final section concludes with policy implications.

Table 1. Country Distribution of the Top 100 Banks and the FinTech100

<u>Top 100 Banks¹</u>			<u>The FinTech100²</u>		
Rank	Number of Banks	Country	Rank	Number of Platforms	Country
1	20	China	1	19	US
2	10	US	2	10	Australia
3	9	Japan	3	9	China
4	6	UK	4	8	UK
4	6	France	5	6	Canada
4	6	Germany	6	5	France
7	5	Canada	6	5	Germany
7	5	Korea, Rep.	8	4	India
7	5	Brazil	17	1	Korea, Rep.
10	4	Australia	17	1	Japan
Others	24		Others	32	
Total	100	16	Total	100	29

Source: ¹ Banks around the World 2018.

² H2 and KPMG 2017.

¹ Top 100 Banks were ranked by total assets as of the end of FY2017. The top four largest banks are Chinese banks (Industrial and Commercial Bank of China, China Construction Bank, Agricultural Bank of China, and Bank of China) and the fifth largest bank is a Japanese bank (Mitsubishi UFJ Financial Group) (Banks around the World 2018)

² The Fintech100 were selected based on data relating to ten dimensions, including the core five factors of (i) Total capital raised, (ii) Rate of capital raising, (iii) Geographic diversity, (iv) Sectorial diversity, and (v) X-factor (degree of product, service and business model innovation: a subjective measure that is applied only with respect to companies appearing on the Emerging list) (H2 Ventures and KPMH 2017). The top three FinTech platforms are from China (Ant Financial, ZhongAn, and Qudian (or Qufenqi)), the fourth and the fifth are from the US (Oscar and Avant).

2. LITERATURE REVIEW

2.1 Theoretical Explanations

CGFS and FSB (2017) detailed supply and demand factors influencing the development of FinTech credit as below. These factors derived from logical relevance, lacking empirical evidence for each of them.

- Supply factors include technological advances in the information and communications technology (ICT) industry, ability to scale of FinTech platforms, cost advantages from regulatory arbitrage, and market barriers to new entrants.
- Demand factors include higher customer expectations of financial services, rising acceptance of new technologies of the younger cohorts, economic development and convergence factors (e.g., the rapid adoption of digital technology in some emerging market economies), consumers' more willingness to use FinTech services after the financial crisis, desire for higher returns in the face of low yields, and network externalities (i.e., the higher the investor demand to lend on platforms, the more borrowers may be attracted to use this lending).
- There may be impeding factors including competitive responses from incumbent lenders, stringent regulatory requirements, uncertainty about regulatory frameworks, and reputational risks.

2.2 Empirical Findings

Until recently, statistical studies on the determinants of FinTech credit at the country level have been retarded by the lack of reliable quantitative data. Prior studies on the determinants of FinTech credit have primarily focused on funding success and default using individual platform data (Foo et al. 2017).

FinTech credit market is characterized by information asymmetry between a lender and a borrower that is common in the loan market (Stiglitz and Weiss 1981). However, information asymmetry tends to be more severe as a result of the anonymity of the borrowers to the lenders on FinTech credit platforms (Dorfleitner et al. 2017). Scholars have shown that the “hard information”³ which FinTech credit platforms collected from online contacts with borrowers and other online sources made significant impact on the result of the loan (i.e., borrowing rate, the number of bids, and borrowing rates), and it had certain relevance with the borrower’s repayment quality (i.e., default) (Gao and Feng 2014).

The determinants studied are mostly borrower-specific variables in terms of financial information (e.g., credit ratings, detailed information on income and monthly expenses, house-ownership, or the debt to income ratio) and demographic characteristics (e.g., gender, race, and age) (Bachmann et al. 2011). Specifically,

³ Petersen (2004) defines “hard information” as quantitative, easy to store and transmit in impersonal ways, and its content is independent of the collection process.

Table 2. FinTech Ecosystem Attributes and Benchmark Factors

Attributes	Factors	Description
Talent	Talent availability	Current availability of technical, FS and entrepreneurial talent
	Talent pipeline	Availability of future talent, both domestic and foreign
Capital	Seed capital	Access to start-up capital (£0m–£5m)
	Growth capital	Growth capital Access to growth capital (£5m–£100m)
	Listed capital	Listed capital Access to the public markets
Policy	Regulatory regimes	Regulator support for new entrants and innovative business models
	Government programs	Government support for programs to open up the sector, increase competition, attract foreign FinTechs and improve cybersecurity
	Taxation policy	Availability of tax support for investors and corporates
Demand	Consumer demand	Adoption by local market consumers (B2C)
	Corporate demand	Adoption by corporates, particularly SMEs (B2B)
	Financial Institution demand	Adoption by Financial Institutions (enterprise)

Source: EY 2016.

Table 3. Rank by FinTech Ecosystem Attribute

Region	Market size (£ Billions, estimate)	Rank by ecosystem attribute				
		Total	Talent	Capital	Policy	Demand
UK	6.6	9	2	3	1	3
New York	5.6	10	1	1	6	2
California	4.7	13	3	2	7	1
Germany	1.8	19	4	7	2	6
Australia	0.7	20	6	4	5	5
Hong Kong	0.6	20	5	5	3	7
Singapore	0.6	21	7	6	4	4

Source: EY 2016. Relative rank: 1 (highest) – 7 (lowest).

compared to the base group of 35–60-years-old, those who are younger than 35 have a predicted rate of funding that is between 0.4 and 0.9 percentage points higher, while those over 60 years old are between 1.1 and 2.3 percentage points less likely to succeed in acquiring a loan (Pope and Sydnor 2011).

As aggregated FinTech credit market data in each country have become available gradually, studies trying to find macroeconomic predictors at the macro level have substantially increased as well. The dependent variable was measured by

the market volume (EY 2016; Rau 2017), the number of market participants (Haddad and Hornuf 2018), or market price (i.e., interest rate, Foo et al. 2017).

EY (2016), commissioned by Her Majesty's Treasury of the UK, identified four core FinTech ecosystem attributes as talent, capital, policy, and demand (Table 2), and demonstrated that the final rankings by total points of ecosystem attributes fit well the rankings by the market size (Table 3). This research made extensive and intensive efforts to address the whole of FinTech industry at the country level. Nonetheless, it contains multiple limitations mainly caused by subjective judgement. New York and California were assessed separately despite being part of the same US market, and China, known to be one of the biggest FinTech credit markets, was not included in study regions. On top of that, all references to the market size were estimates because of the data unavailability, and the final rankings were calculated by using a simple, non-weighted addition of rankings in each attribute.

Rau (2017) analyzed the global determinants of crowdfunding⁴ using a unique hand-collected sample of crowdfunding volume obtained by surveying 1,362 crowdfunding platforms in 152 countries. Barriers to entry (measured by ease of doing business rank) and potential financial depth (measured by how much you trust people you meet for the first time) were significant in determining the volume of crowdfunding, however, the financial profitability of extant intermediaries (measured

⁴ Rau (2017) classified crowdfunding into four types of online marketplace lending, equity, reward, and donation based crowdfunding. Among them, online marketplace lending corresponds to FinTech credit in this paper.

by bank return on assets (after tax)) and the extant financial depth of the market (measured by domestic credit to private sector by banks) were insignificant (Rau 2017). The rule of law (measured by both the control of corruption and the quality of regulation) also appeared to be significant in explaining financing volume across a number of specifications (Rau 2017).

Haddad and Hornuf (2018) studied economic and technological determinants of the global FinTech⁵ start-up formations (measured by the number of start-ups founded by year and country), and found that countries witness more FinTech start-up formations when the economy has high GDP per capita and venture capital is readily available as for the financing-type FinTech⁶ which includes FinTech credit. Furthermore, the number of secure internet servers, mobile telephone subscriptions, the available labor force, the rule of law, and ease of access to loans had a positive impact on the development of the financing-type FinTech (Haddad and Hornuf 2018). Notably, the severity of the last financial crisis, measured by the equally weighted average of 2008–2009 period MSCI returns at the country level, was significant only in the financing-type FinTech (Haddad and Hornuf 2018). The authors did not provide any detailed discussions for this result, however, it may indicate that the

⁵ Haddad and Hornuf (2018) categorized FinTechs into nine different types of start-ups: those that engage in financing, payment, asset management, insurance (insurtechs), loyalty programs, risk management, exchanges, regulatory technology (regtech), and other business activities.

⁶ The category ‘financing’ entails, for example, start-ups that provide crowdfunding, crowdlending, microcredit, and factoring solutions (Haddad and Hornuf 2018). FinTech credit in this paper corresponds to crowdlending in the category financing.

demand for FinTech credit was generally higher in countries which have more extensively suffered from the financial crisis since incumbent lenders and investors retrenched certain market segments in the post-crisis period.

With regard to the association between aggregated P2P interest rates and the general economy, Foo et al. (2017) showed that the variation in P2P interest rates across grade types are determined by three macroeconomic latent factors as follows:

- Macro non-default factor: strongly correlated with economic indicators of economic expansion such as increased inflation, reduced unemployment and reduced household debt.
- Market uncertainty factor: positively correlated with the slope of the risk-free rate (the difference between the 10-year Treasury bill rate and the 1-year Treasury bill rate; r_f -slope) and equity volatility.
- Fundamental value of the equity market factor: positively correlated to the spread in returns between value and growth stocks.

3. HYPOTHESES

Drawing on the literature reviewed, the determinants of FinTech credit market are divided into five categories: (1) demographic characteristics (Bachmann et al. 2011; Pope and Sydnor 2011), (2) financial market conditions (Gao and Feng 2014; EY 2016; Rau 2017), (3) institutional settings (EY 2016; Rau 2017), (4) macroeconomic circumstances (Foo et al. 2017; Haddad and Hornuf 2018), and (5) technological advancement (EY 2016; Haddad and Hornuf 2018). I confine my attention to the first three factors to focus on policy implications from the financial perspective. In this regard, I establish five hypotheses.

In overview, the five hypotheses were formulated from the perspective of demographics, financial market, and institution (Table 4). Two hypotheses which are related with demographics, the sizes of population and the proportion of the younger cohorts, were conjectured positive association with FinTech credit expansion considering conducive effects on both supply and demand side. Two hypotheses regarding financial market, the levels of financial inclusion and the levels of bank net interest margin, as well as one hypothesis regarding institution, administrative costs of starting a business, were established negative association with FinTech credit expansion considering their deterrent effects on market entry barriers.

Table 4. Summary of Hypotheses Development

Category	Hypothesis	Association with FinTech credit expansion	
		Supply	Demand
Demographics	<i>H1.</i> the sizes of population	Positive (more entrepreneurs)	Positive (more potential consumers)
	<i>H2.</i> the proportions of the younger cohorts	Positive (more entrepreneurs, higher success rate in funding)	Positive (higher adoption of innovation)
Financial market	<i>H3.</i> the levels of financial inclusion	-	Negative (less needs for alternative financing)
	<i>H4.</i> the levels of bank net interest margin	Negative (business retrenchment of incumbent banks)	-
Institution	<i>H5.</i> administrative costs of starting a business	Negative (unfavorable for ease of doing business)	-

In general, the larger the population in a region, the more heterogeneity in supply and demand for a certain good or service in the region reflecting varying degrees of individual preference and cost function. Higher population density means more potential customers and higher demand in the region thus has a positive impact on the expected returns to a new business (Wagner and Sternberg 2004). Empirical evidence supports the view that the population is positively correlated with entrepreneurial supply in the region, for example, higher values of population density and growth have a positive impact on the probability to become a nascent entrepreneur other things being equal, i.e., for a given set of personal characteristics and attitudes (Wagner and Sternberg 2004). Taking into account the effects of the population on demand of new financial services of FinTech credit and supply of FinTech credit platform entrepreneurs, I conjectured the following hypothesis.

Hypothesis 1: The population sizes are positively associated with expansion in FinTech credit market.

As reviewed earlier, CGFS and FSB (2017) argued that the younger cohorts are more likely to adopt FinTech. EY (2016) bolsters this perspective by stating that FinTech adoption is skewed towards younger, high-income groups across all study regions. Pope and Sydnor (2011) also found that the group of under the age of 35 has a higher funding success rate.

Hypothesis 2: Higher proportions of the younger cohorts under the age of 35 are positively associated with expansion in FinTech credit market.

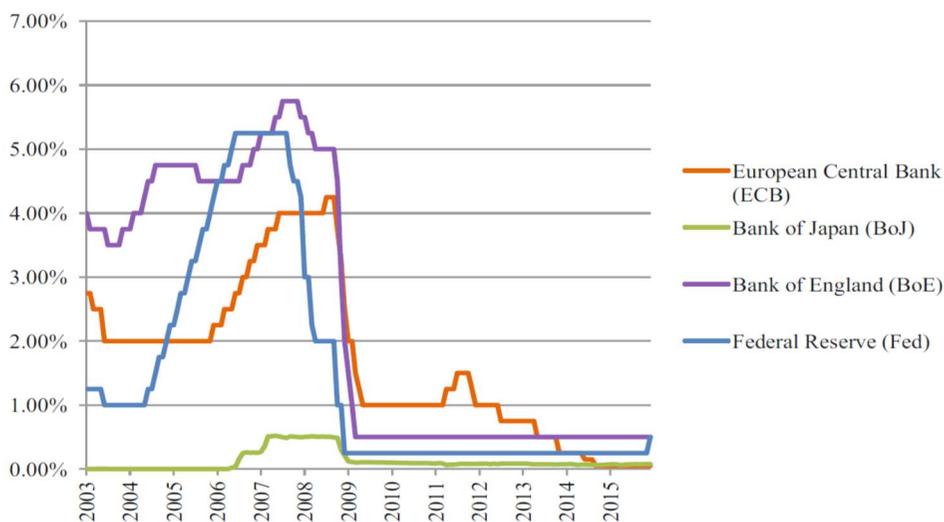
FinTech, along with the global spread of mobile phones, has facilitated expanding access to financial services to hard-to-reach populations and small businesses at low cost and risk since greater availability of customer data allows providers to design digital financial products that better fit the needs of unbanked individuals (World Bank 2018b). In a less developed region in terms of financial inclusion⁷, i.e., where the percentage of financial institution account holders is lower, the demand for FinTech credit can be expected to be higher as it being an alternative source of financing to existing financial institutions.

Hypothesis 3: The levels of financial inclusion are negatively associated with expansion in FinTech credit market.

After the financial crisis in 2007–2008, central banks in the major economies have adopted an expansionary monetary policy so as to stimulate aggregate demand by reducing the cost of funding and increasing the availability of credit (Cruz-García et al. 2017, Figure 1). As short-term policy rates approached zero percent, deposit rates and lending rates have been lowered accordingly. Lenders on FinTech credit platforms have achieved substantially better returns than could have been obtained from investing their money in conventional bank savings deposits (Milne and Parboteeah 2016). Facing low deposit rates at banks, higher returns of investments in

⁷ World Bank (2018) defines “financial inclusion” as that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way.

Figure 1. Intervention Interest Rates by the Main Central Banks

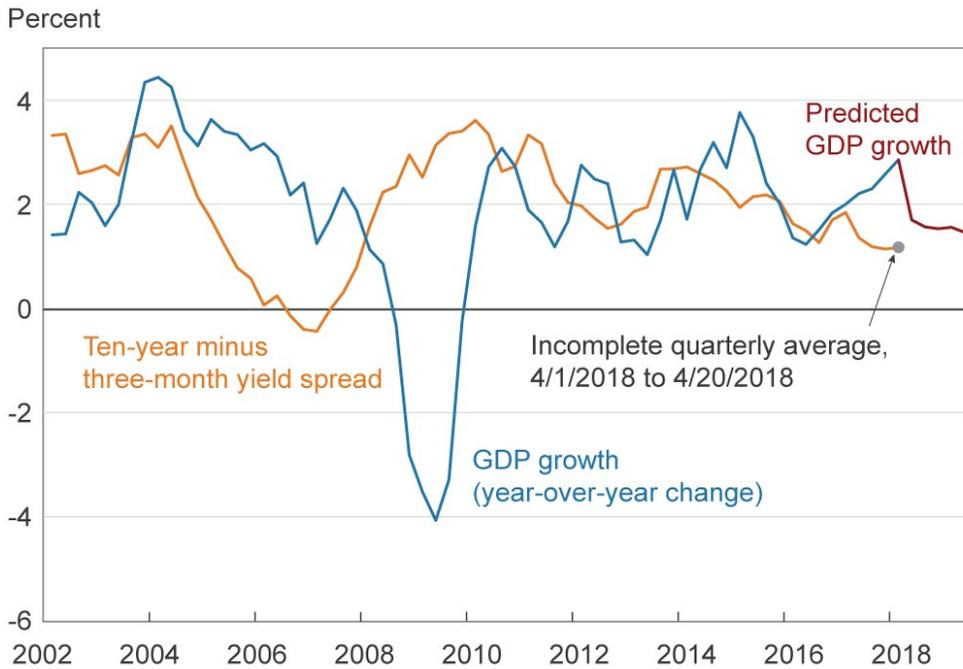


Source: Cruz-García et al. 2017.

FinTech credit may attract bank deposit holders (CGFS and FSB 2017).

The net interest margin (NIM) refers to a measure of the difference between the interest income earned and the interest paid out to their lenders (e.g. deposit holders) by a bank or financial institution relative to its interest-earning assets (Bitner and Goddard 1992). A prolonged period of reduced interest rates can impair bank net interest margins, given the existence of a floor in deposit interest rates, since it is difficult for banks to pass on the drop in interest rates to the deposits interest rates, as well as a narrowing of the yield spread which has taken place with the falling interest rates (Cruz-García et al. 2017; Federal Reserve Bank of Cleveland 2018, Figure 2).

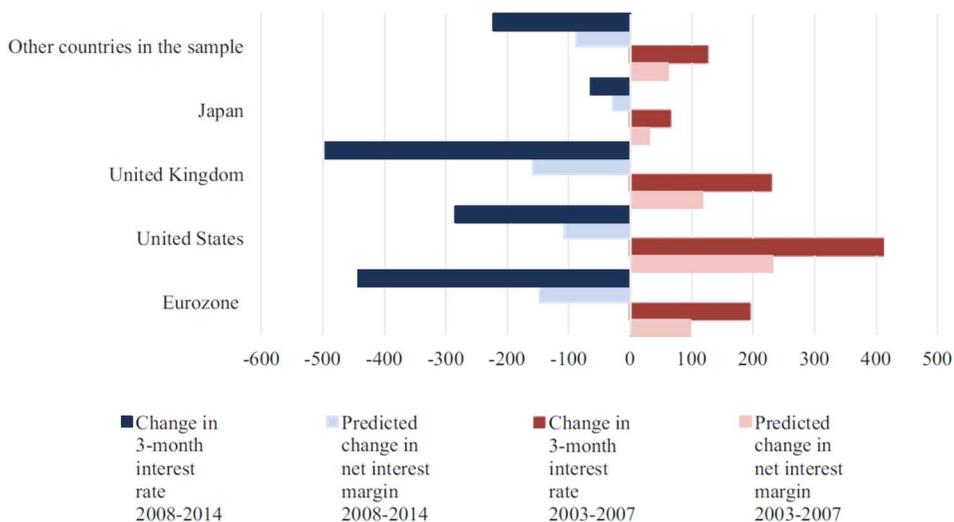
Figure 2. US Treasury Bond Yield Spread and GDP Growth



Source: Federal Reserve Bank of Cleveland 2018.

From the conventional view among financial market observers including scholars, bank net interest margins are expected to be higher when the yield curve is steeper for a sustained period because, once assets and liabilities have repriced, a steeper yield curve implies higher rates on assets relative to those on liabilities (English 2002). In this view, returns on bank liabilities are thought to be relatively closely tied to short-term rates, and to adjust to changes in short-term rates relatively

Figure 3. Changes in Interest Rates (observed) and NIMs (predicted) (bps)



Source: Cruz-García et al. 2017.

quickly, while returns on bank assets (ROA)⁸ are seen as more closely tied to longer-term rates and slower to adjust to changes in market rates (English 2002).

According to this view, a flattening of the yield curve, i.e., the overall downward trend of the yield spread after the global financial crisis (Figure 2), would have caused decrease in bank net interest margins. This prediction is consistent with the work of Cruz-García et al. (2017) in that during the post-crisis periods of 2008–

⁸ Unlike the return on asset, the net interest margin does not account for fees and non-interest incomes that financial institutions generate through services related to brokerage and deposit accounts thus should not be confused with profitability.

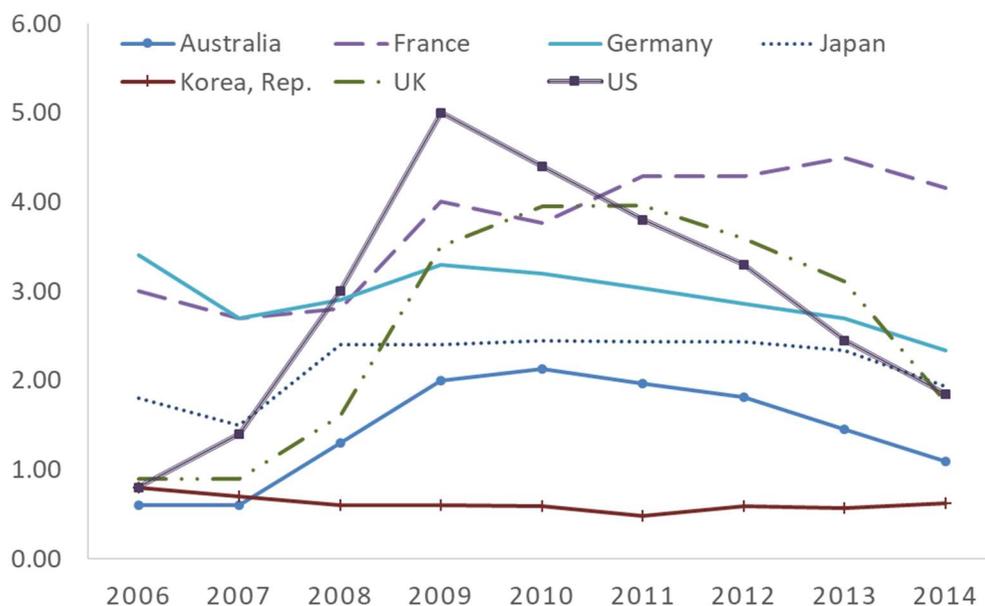
2014, lowered interest rates led to a fall in the net interest margin of 147 basis points (bps) in the Eurozone, 107 bps in the US, 158 bps in the UK, 28 bps in Japan and 87 bps in the other countries in the sample (Figure 3).⁹

On the other hand, the decline in the net interest margin may reflect the increase in the non-performing loans (NPLs), as observed in the post-crisis periods due to the economic recession (Figure 4). If the non-performing loans are rising, the interest earned would fall and the net interest margin will decline (Bitner and Goddard 1992). In this case, banks would strengthen risk management thus withdraw from certain market segments, such as micro business loans (CGFS and FSB 2017). The retrenchment of incumbent lenders can provide business opportunities for new lending market entrants like FinTech credit platforms.

Overall, given that FinTech credit and banking being substitute markets, prolonged low interest rates may have a positive effect on FinTech credit expansion since (1) low deposit rates synchronized with low policy rates can shift demand of bank deposits to FinTech credit market to a certain extent, and (2) a flattening of the yield curve and/or the increase in the ratio of non-performing loans can result in the decline in bank net interest margins, and consequently, the retrenchment from certain

⁹ The sample used includes financial institutions (banks, savings banks, credit unions and other types of banks) from 32 OECD countries (Australia, Austria, Belgium, Canada, Colombia, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Rep. Korea, Latvia, Netherlands, New Zealand, Norway, Poland, Portugal, Russian Federation, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, UK and US) (Cruz-García et al. 2017).

Figure 4. Bank Non-Performing Loans (NPLs) to Gross Loans (%)¹⁰



Source: Global Financial Development Database, World Bank.

market segments, lowering barriers for FinTech credit platforms to enter the lending market. Considering that deposit interest rates are not much differentiated within the Eurozone as the policy rate is the same across the region being set by the European Central Bank (ECB), I formulated my hypothesis using the net interest margin.

Hypothesis 4: The levels of bank net interest margin are negatively associated with expansion in FinTech credit market.

¹⁰ China is excluded because of its unique pattern caused by bank restructuring, through the cleaning-up of non-performing loans (NPLs) and public capital injections, started in December 2003 (García-Herrero et al. 2006).

From the perspective of institutional settings, lighter administrative burden of starting a new business is likely to lead to thriving entrepreneurs in FinTech credit market. This general argument is supported by Rau (2017), which found that barriers to entry, measured by ease of doing business ranks¹¹, was significant in determining the volume of crowdfunding. I posited the height of market entry barriers from a point of administrative costs to register a start-up business (ratio scales) rather than of the ranks (ordinal scales) because (1) ordinal scales cannot quantify the difference between each value, and (2) the former focuses on start-up companies while the latter does not.

Hypothesis 5: Administrative costs of starting a business are negatively associated with expansion in FinTech credit market.

¹¹ Ease of doing business ranks economies from 1 to 190, with first place having the best regulatory environment conducive to business operation. The index averages the country's percentile rankings on 10 topics covered in the World Bank's Doing Business. The ranking on each topic is the simple average of the percentile rankings on its component indicators. Data are collected with a standardized survey that uses a simple business case to ensure comparability across economies and over time. (Metadata of Series IC.BUS.EASE.XQ, World Bank World Development Indicators)

4. DATA AND METHODS

4.1 Data Collection

I used five data sources to explore the association between the hypothetical determinants and FinTech credit market expansion—CGFS and FSB (2017), the World Bank Population estimates and projections, the World Bank Global Findex database, the World Bank World Development Indicators, and the World Bank Global Finance Development.

Absence of official aggregate data regarding FinTech credit was the biggest challenge for this research. In many countries, FinTech platforms are not yet obligated to submit a regular report to the financial authorities on their soundness and business performance since FinTech is not fully incorporated into law or regulation. If anything, there are no international official data that aggregate national statistics. As a result, the preponderance of prior studies used data on specific platforms or certain nations.

Most recently, a few studies based on private market surveys worldwide came out. For instance, Rau (2017) obtained data from the annual survey conducted by the Cambridge Centre for Alternative Finance (CCAF) hosted at the University of Cambridge. These surveys collected data on both transaction and model-specific volumes based upon information provided by individual platforms worldwide. The

data is scheduled to be published on the *CCAF-World Bank Global Marketplace and Alternative Finance (Market Volume) Data* website in 2018 (Rau 2017), however, unavailable to obtain at this point.

I selected CGFS and FSB (2017) as a data source since it is the most reliable among accessible data. CGFS and FSB (2017) publicized the volume of new FinTech credit and the number of platforms by jurisdiction drawing on multiple sources including the CCAF and national responses to CCFS-FSB survey on FinTech credit. The sample used in this paper consists of 15 countries¹² which have both figures regarding the volume of new credit and the number of platforms. Nevertheless, this data limited me to perform single-year analysis because CGFS and FSB (2017) contained the data of new credit volume for two years only, i.e., the year of 2013 and 2015, and even the volume of new credit in four countries was zero in 2013. In addition, the data for the number of platforms only existed for one latest year, i.e., the year of 2015 or later, depending on the original data source.

Hence, the dataset is composed of 15 countries for the year of 2015 with a few exceptions of the year of 2016 for the number of platforms (Table 5). Considering the research question stated in the beginning and country characteristics, 15 countries can be divided into three groups as follows:

¹² 15 countries are formed of Australia, Canada, China, France, Germany, India, Italy, Japan, Rep. Korea, Netherlands, Russian Federation, Singapore, Spain, UK, and US.

- (1) Ten countries with a competent banking industry base, which refers to having banks listed in the top 100 largest banks by total assets,¹³
- (2) Three countries with a population smaller than the median,¹⁴
- (3) Two countries with an extremely low level of financial inclusion, which indicates under-developed financial industry as a whole.¹⁵

Three countries ((2)) and two countries ((3)) share a common feature of having values equivalent to or lower than the median of both the volume of new credit and the number of platforms. Instead of using control variables, I analyzed separately for three sets of samples of 10 countries ((1)), 13 countries ((1)+(2)), and 15 countries ((1)+(2)+(3)).

¹³ 10 countries included are G7 (Canada, France, Germany, Italy, Japan, UK, and US) and three Asia-pacific countries (Australia, China, and Rep. Korea). This list is consistent with a list of the top 10 countries in banking except Brazil (Table 1). Not being included in the data from CGFS and FSB (2017), Brazil was replaced by Italy.

¹⁴ Netherlands, Singapore, and Spain (Table 5).

¹⁵ India and Russian Federation (Table 5).

Table 5. Dataset

Variable	Dependent variables		Independent Variables				
	Volume of new credit	Number of platforms	ln Population	Population ages 20-34	Financial institution account	Bank net interest margin (NIM)	Cost of business start-up procedures
(Unit)	(USD billions)	(platforms)	(natural log of total population)	(% of total population)	(% age 15+)	(%)	(% of GNI per capita)
1 Australia	0.28	29	16.99	21.76	98.86	1.65	0.7
2 Canada	0.07	23	17.39	20.79	99.10	1.59	0.4
3 China	99.72	356	21.04	23.85	78.85	2.75	0.7
4 France	0.20	53	18.01	18.10	96.58	0.93	0.8
5 Germany	0.21	34	18.22	18.17	98.76	1.09	1.8
6 Italy	0.02	8	17.92	15.64	87.33	1.56	13.8
7 Japan	0.33	11	18.66	16.02	96.65	0.98	7.5
8 Korea, Rep.	0.04	34	17.75	20.99	94.36	1.71	14.5
9 United Kingdom	4.13	53	17.99	19.93	98.93	1.39	0.1
10 United States	34.32	67	19.59	20.83	93.58	3.19	1.1
11 Netherlands	0.09	25	16.65	18.55	99.30	1.54	4.6
12 Singapore	0.02	14	15.53	20.32	96.35	1.59	0.6
13 Spain	0.03	10	17.65	16.78	97.58	2.13	5.2
14 India	0.02	15	20.99	25.61	52.75	2.85	13.5
15 Russian Federation	0.01	4	18.79	23.24	67.38	2.65	1.1
Q1 - 1.5 IQR	-0.39	-34	15.73	13.26	77.93	0.08	-7.8
Q2 (Median)	0.09	25	17.99	20.32	96.58	1.59	1.1
Q3 + 1.5 IQR	0.71	90	20.52	26.24	111.34	3.78	14.8

Note. Observations that fall below Q1 - 1.5 IQR or above Q3 + 1.5 IQR (IQR = Q3 - Q1).

4.2 Variable Measurement

Table 6 reports descriptive statistics of means and standard deviations for the variables used. These figures reflect the criteria for classifying countries. The two dependent variables show lower values as a sample size grows, since all of the additional five countries have values equivalent to or lower than the median for both variables. While the mean of *ln Population* is the lowest in a sample of 13 countries as three additional countries have a population smaller than the median, the mean of *Financial institution account* drops notably in a sample of 15 countries as two additional countries have an extremely low level of financial inclusion. Variable definitions and data sources for all of the variables are detailed in Table 7.

Dependent variables

I used two dependent variables to gauge the degree of expansion in FinTech credit market in terms of the new volume generated per year and the number of players:

Volume of new credit. The absolute volume of new lending facilitated by FinTech credit platforms. Denominated in USD billions (CGFS and FSB 2017).

Number of platforms. The number of FinTech credit platforms (CGFS and FSB 2017). In the case of the UK, I used the sum of 21 platforms with full regulatory authorization and 32 platforms with an interim permission (i.e., 53 platforms in total) (CGFS and FSB 2017).

Independent variables

As for the measures of five independent variables, one for each hypothesis, I used four databases from the World Bank:

ln Population. The natural log of the population. The population counts all residents regardless of legal status of citizenship (the World Bank Population estimates and projects).

Population ages 20–34. The percentage of population between the ages 20 to 34. I calculated the percentage dividing the sum of female and male population between the ages 20 to 34 by total population in each country (the World Bank Population estimates and projects).

Financial institution account. The percentage of respondents who report having an account (by themselves or together with someone else) at a bank or another type of financial institution (the World Bank Global Findex database).

Bank net interest margin. The share of accounting value of bank's net interest revenue from its average interest-bearing (total earning) assets. (the World Bank Global Financial Development).

Cost of business start-up procedures. The normalized cost to register a business as a percentage of gross national income (GNI) per capita (the World Bank World Development Indicators).

Table 6. Descriptive Statistics for Variables in the Analysis

	<u>Mean</u>		<u>Standard Deviation</u>			
Dependent Variable						
<i>Volume of new credit</i>	13.931	10.727	9.298	31.971	28.349	26.516
<i>Number of platforms</i>	66.800	55.154	49.067	103.327	92.234	86.915
Independent Variables						
<i>ln Population</i>	18.356	17.953	18.211	1.175	1.346	1.480
<i>Population ages 20–34</i>	19.608	19.364	20.038	2.592	2.404	2.884
<i>Financial institution account</i>	94.301	95.095	90.425	6.528	5.883	13.755
<i>Bank net interest margin (NIM)</i>	1.684	1.700	1.840	0.740	0.656	0.712
<i>Cost of business start-up procedures</i>	4.140	3.985	4.427	5.694	5.044	5.354
N	10 ¹	13 ²	15 ³	10 ¹	13 ²	15 ³

Note: ¹ Countries with a competent banking industry base (Australia, Canada, China, France, Germany, Italy, Japan, Rep. Korea, UK, and US). ² Added are three countries with a population smaller than the median (Netherlands, Singapore, and Spain). ³ Added are two countries with an extremely low level of financial inclusion (India and Russian Federation).

Table 7. Variable Definitions and Data Sources

Variable	Definition	Code	Source
Dependent variables			
Volume of new credit to GDP (bp)	The share of volume of new credit from GDP.	-	-
Volume of new credit (USD billions)	The absolute volume of new lending intermediated by FinTech credit platforms.	-	CGFS and FSB (2017)
GDP (current USD)	Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates.	NY.GDP.MKTP.CD	World Development Indicators, World Bank DataBank
Number of platforms	The number of FinTech credit platforms.	-	CGFS and FSB (2017)
Independent variables			
In Population			
Population, total	The natural log of the total population. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.	SP.POP.TOTL	Population estimates and projections, World Bank DataBank
Population ages 20-34 (%)			
Population ages 20-24, female	The percentage of population between the ages 20 to 34. Female population between the ages 20 to 24.	SP.POP.2024.FE	Population estimates and projections, World Bank DataBank
Population ages 25-29, female	Female population between the ages 25 to 29.	SP.POP.2529.FE	
Population ages 30-34, female	Female population between the ages 30 to 34.	SP.POP.3034.FE	
Population ages 20-24, male	Male population between the ages 20 to 24.	SP.POP.2024.MA	
Population ages 25-29, male	Male population between the ages 25 to 29.	SP.POP.2529.MA	
Population ages 30-34, male	Male population between the ages 30 to 34.	SP.POP.3034.MA	
Financial institution account (% age 15+)	The percentage of respondents who report having an account (by themselves or together with someone else) at a bank or another type of financial institution.	fin1.t.a	Global Findex database, World Bank DataBank
Cost of business start-up procedures (% of GNI per capita)	The normalized cost to register a business as a percentage of gross national income (GNI) per capita.	IC.REG.COST.PC.ZS	World Development Indicators, World Bank DataBank
Bank net interest margin (%)	The share of accounting value of bank's net interest revenue from its average interest-bearing (total earning) assets.	GFDD.EI.01	Global Financial Development, World Bank DataBank

5. RESULTS AND DISCUSSIONS

I tested five hypotheses using a pooled OLS regression model. Table 8 presents the estimation results of the five determinants of FinTech credit expansion for the two dependent variables, analyzed separately for the three samples of 10 countries, 13 countries, and 15 countries.

5.1 Population and FinTech credit

The empirical results demonstrate the powerful effects of the population sizes on FinTech credit expansion as a positive determinant. Regardless of the sample size, the estimates are significant for both the volume of new credit and the number of platforms at a significance level of 10 percent at least. Nonetheless, the significance of *ln Population* becomes higher in 10 countries, in particular for the number of platforms being significant at the 0.1 percent level. This result can be interpreted by the work of Wagner and Sternberg (2004), which found empirical evidence supporting that the population is positively correlated with entrepreneurial supply in the region for a given set of personal characteristics and attitudes.

Table 8. OLS Regression Results

<u>Dependent Variables</u>	<u>(1) Volume of new credit</u>			<u>(2) Number of platforms</u>		
Independent Variables						
<i>In Population</i>	12.630** (1.607)	6.172* (2.351)	13.775* (5.480)	39.674*** (2.440)	20.987* (10.152)	47.913* (19.878)
<i>Population ages 20–34</i>	3.790** (0.551)	2.294† (1.231)	1.607 (3.186)	21.059*** (0.837)	13.023* (5.318)	10.595 (11.558)
<i>Financial institution account</i>	-2.224** (0.278)	-2.722** (0.588)	1.145 (0.787)	-9.453*** (0.423)	-9.967** (2.538)	3.728 (2.854)
<i>Bank net interest margin (NIM)</i>	-2.254 (2.114)	4.653 (4.475)	11.525 (11.899)	-60.238*** (3.209)	-25.010 (19.328)	-0.690 (43.165)
<i>Cost of business start-up procedures</i>	-0.950* (0.237)	-1.465* (0.542)	-0.916 (1.269)	-3.384*** (0.360)	-4.818* (2.341)	-2.869 (4.605)
R ²	0.997	0.960	0.613	0.999	0.929	0.526
Adjusted R ²	0.993	0.931	0.398	0.998	0.878	0.262
N	10 ¹	13 ²	15 ³	10 ¹	13 ²	15 ³

Note: ¹ Countries with a competent banking industry base (Australia, Canada, China, France, Germany, Italy, Japan, Rep. Korea, UK, and US). ² Added are three countries with a population smaller than the median (Netherlands, Singapore, and Spain). ³ Added are two countries with an extremely low level of financial inclusion (India and Russian Federation). Standard errors are presented in parentheses and the levels of statistical significance are denoted as follows: * $p < .1$, ** $p < 0.01$, *** $p < .001$, † $p = .105$.

5.2 Younger cohorts and FinTech credit

The regression results generally support that the percentages of population between the ages 20 to 34 are positively associated with FinTech credit expansion at a significance level of 10 percent at least in the two samples of 10 countries and 13 countries. Although the estimated coefficient for the volume of new credit in 13 countries is insignificant, its p -value (.105) is only slightly higher than a significance level of 10 percent. Parallel to the population sizes, the significance of *Population ages 20–34* is higher for the number of platforms than for the volume of new credit. This result along with the result of the population sizes indicate that demographic characteristics play a more important role in forming supply rather than demand in FinTech credit market.

The varying degrees of significance mainly come from three countries (Singapore, India, and Russian Federation) which are excluded in 10 countries. Observations for *Population ages 20–34* in these three countries are not extreme but sufficiently higher than the sample mean of 10 countries, while their values for the two dependent variables are nearly negligible, particularly for the volume of new credit (Table 5).

This result conforms to the work of CGFS and FSB (2017). As identifying the younger cohorts as one of the demand factors for FinTech credit, CGFS and FSB (2017) also cautioned against over-emphasizing of this variable. While the younger cohorts use FinTech more widely than other generational cohorts, US credit bureau

data show that majority of FinTech credit borrowers were actually Generation X and baby boomers rather than millennials (CGFS and FSB 2017).¹⁶

5.3 Financial inclusion and FinTech credit

When the two countries with extreme values being excluded in a sample, the empirical results confirm that the percentages of financial institution account holders are negatively related to FinTech credit expansion at a significance level of 1 percent at least. As in a case study of China, where 21% of the population over the age of 15 are unbanked with no credit history and limited access to traditional banking, FinTechs can effectively provide this cohort with alternative financial services solutions and thereby help to drive financial inclusion (EY 2016).

For FinTech credit being a more convenient and affordable substitute for existing banking, the policy focus has been placed on digital financial inclusion led by the G20 countries (GPFI 2016). The World Bank (2018a) attributed the recent progress in financial inclusion to digital financial services since 1.7 billion adults remain unbanked globally, yet two-thirds of them own a mobile phone that could help them access financial services. Between 2014 and 2017, this has contributed to a rise in the share of account owners sending or receiving payments digitally from 67

¹⁶ “Millennials” are generally defined as the generational cohort born between the early 1980s and late 1990s, following “Generation X” (born between the mid-1960s and early 1980s) and the “baby boomers” (born between the 1940s and 1960s) (CGFS and FSB 2017).

percent to 76 percent globally, and in the developing world from 57 percent to 70 percent (World Bank 2018a).

When the two outlier countries are added in a sample, the estimated coefficients are insignificant with the converted relation direction in 15 countries. In India and Russian Federation, all of the observations for the two dependent variables and the independent variable under consideration, *Financial institution account*, located far below sample means thus contributed to showing a positive relation (Table 5). This may be a temporary distortion given that FinTech credit market is in the nascent stages of development in these two countries.

5.4 Bank net interest margin and FinTech credit

I hardly found empirical evidence with regard to a negative relation between the levels of bank net interest margin and FinTech credit expansion. As for the number of platforms, this relation is proved to be highly significant at the 0.1 percent level in 10 countries, but insignificant in other two samples despite the negative estimated coefficients. As for the volume of new credit, this hypothesized negative relation turns out to be weaker, having two insignificant positive coefficients in 13 countries and 15 countries. However, this result suggests that *Bank net interest margin* has an impact on market entry barriers to a certain extent, notwithstanding insignificant in general, since it explains the number of platforms better than the volume of new credit.

Intriguingly, Rau (2017) hypothesized that the economic rents such as the net interest margin¹⁷ drive FinTech credit entry, which is contrary to *Hypothesis 4*, but found no empirical results supporting that either.

5.5 Cost of business registration and FinTech credit

With the exception of the two countries, the empirical results support a negative relation between the normalized costs to register a business as a percentage of gross national income (GNI) per capita and FinTech credit expansion at a significance level of 10 percent at least. When India and Russian Federation are added in a sample of 15 countries, *Financial institution account* loses its significance as a determinant on FinTech credit mainly due to Russian Federation, whose observation value is considerably small although not extreme (Table 5).

5.6 Robustness Test

I conducted further robustness checks as in (1) normalizing *Volume of new credit* to GDP and (2) excluding China along with India and Russian Federation due to the extreme values in observations. Table 9 presents the estimation results of this

¹⁷ “Rent variables for financial institutions include measures such as the net interest margin, non-interest income to total income, and return on assets. Since these variables are highly correlated, in the tests, I report only results with bank return on assets, though the results are qualitatively similar with the other variables.” (Rau 2017).

robustness checks for the three samples of 10 countries, 12 countries (where China is additionally excluded), and 15 countries.

To be specific, as for the first sample (10 countries), the robustness test confirms all of the five hypotheses since *Bank net interest margin* turns from an insignificant determinant of *Volume of new credit* in the original test into a significant determinant of *Volume of new credit to GDP* in the robustness test. Although *Cost of business start-up procedures* lost its significance for *Volume of new credit to GDP*, its p-value is 0.127, not far exceeding the significance level of 10 percent. The biggest difference in results was observed in the second sample (12 countries) as the both modifications of a normalization and a country exclusion being applied. Due to China's distinct presence in the two dependent variables and a smaller sample size, only demographic characteristics were proven statistically significant when China was excluded. However, in case of the third sample (15 countries), there was no difference in results as both original and robustness test produced one statistically significant determinant (*ln Population*).

To sum up, the robustness test demonstrates that this study's findings are robust. Despite a slightly decreased level of significance across the estimated coefficients, there was no single change of direction in each coefficient (Table 8 and Table 9).

Table 9. Robustness Test Results (OLS Estimates)

<u>Dependent Variables</u>	<u>(1) Volume of new credit to GDP</u>			<u>(2) Number of platforms</u>		
Independent Variables						
<i>In Population</i>	10.592* (3.386)	3.030* (1.530)	12.141* (5.197)	39.674*** (2.440)	12.676* (4.503)	47.913* (19.878)
<i>Population ages 20–34</i>	4.540* (1.162)	0.743 (0.876)	2.011 (3.021)	21.059*** (0.837)	5.611* (2.576)	10.595 (11.558)
<i>Financial institution account</i>	-2.359* (0.587)	-0.384 (0.627)	0.921 (0.746)	-9.453*** (0.423)	-1.247 (1.845)	3.728 (2.854)
<i>Bank net interest margin (NIM)</i>	-10.116* (4.455)	3.296 (2.992)	4.582 (11.285)	-60.238*** (3.209)	-5.417 (8.802)	-0.690 (43.165)
<i>Cost of business start-up procedures</i>	-0.959† (0.499)	-0.545 (0.386)	-0.891 (1.204)	-3.384*** (0.360)	-1.538 (1.136)	-2.869 (4.605)
R ²	0.981	0.707	0.546	0.999	0.727	0.526
Adjusted R ²	0.957	0.463	0.294	0.998	0.499	0.262
N	10 ¹	12 ²	15 ³	10 ¹	12 ²	15 ³

Note: ¹ Countries with a competent banking industry base (Australia, Canada, China, France, Germany, Italy, Japan, Rep. Korea, UK, and US). ² Excluding three countries with far extreme values (China, India, and Russian Federation) from the sample. ³ Entire countries in the sample (10 countries + India, Netherlands, Singapore, Spain, and Russian Federation). Standard errors are presented in parentheses and the levels of statistical significance are denoted as follows: * $p < .1$, ** $p < 0.01$, *** $p < .001$, † $p = .127$.

6. CONCLUSIONS AND IMPLICATIONS

6.1 Conclusions

This research started from the key question regarding the discrepancies in development between the traditional financial industry and the new FinTech credit industry. Considering the data limitation on FinTech credit markets around the world, this study conducted in-depth exploratory research as well as empirical analyses. To seek answers to the research question, I examined prior studies conducted at the country level, mostly published over the last two years, and established five hypotheses. Empirical evidence supports four of them when excluding the two countries (India and Russian Federation) with an extremely low level of financial inclusion from a sample of 15 countries. To be specific, OLS regression results confirm that there are two positive determinants and two negative determinants of FinTech credit expansion as follows:

- (1) the population sizes (positive, *Hypothesis 1*),
- (2) the proportions of the younger cohorts between the ages 20 to 34 (positive, *Hypothesis 2*),
- (3) the levels of financial inclusion measured by the percentages of financial institution account holders (negative, *Hypothesis 3*),
- (4) administrative costs of business start-up procedures (negative, *Hypothesis 5*).

Nonetheless, the regression results generally do not support a negative association between the levels of bank net interest margin and FinTech credit expansion (*Hypothesis 4*), indicating that the retrenchment of incumbent banks from certain market segments does not lower market entry barriers for FinTech credit platforms.

The four significant determinants consistently show better performances to explain the number of platforms (i.e., the supply side) than the volume of new credit (i.e., the market equilibrium decided by supply and demand). The demographic characteristics ((1) and (2)) affect both supply and demand, while the degree of financial inclusion ((3)) is primarily related to demand and administrative costs ((4)) are directly linked to supply. Taken all things into account, this study indicates that the demographic characteristics are more significant as a supply-side factor.

The goodness-of-fit of regression models and the significance of determinants increase as a sample size becomes smaller. In particular, for the number of platforms in a sample of 10 countries, all of the five independent variables are significant at the 0.1 percent level, and four variables except *Cost of business start-up procedures* are highly significant at the 0.01 percent level. When using a sample of 15 countries, however, only the population sizes ((1)) is significant at the 10 percent level. In other cases, four independent variables are significant at the 10 percent level at least as discussed earlier. This is to a large part due to extreme values observed in three countries (Singapore, India, and Russia). Singapore has one extremely low value of the population size, while its two dependent variables are not

the lowest. India has two extreme values, a large population size and a low degree of financial inclusion, which both are conducive to FinTech credit, but its dependent variables show negligible figures. Russian Federation has one extreme value of a low degree of financial inclusion, and one other sufficiently low value of administrative costs. These two factors proved to be favorable for FinTech credit in 13 countries, however, Russian FinTech credit market is negligible yet. In addition, the proportions of the younger cohorts are not extreme but sufficiently high in these two countries, causing another distortion.

Nevertheless, it is expected that empirical results may support those determinants in a sample of 15 countries as well in the future when accumulated multi-year data become available. Given that FinTech credit market is in the nascent stages of development in India and Russian Federation, this study implies that both countries have enormous potential for FinTech credit expansion since they have favorable figures in the two most significant determinants (*In Population and Financial institution inclusion*).

6.2 Policy Implications

Applying the framework of this study, I identified strengths and weakness of each jurisdiction in a sample of 10 countries which demonstrated the most significant results (Table 10).

China and the US, notwithstanding the enormous gap between the two, are overwhelmingly ranked among the 10 countries. Compared to the US, China shows more conducive figures to FinTech credit expansion for all of the five independent variables. With the exception of *Bank net interest margin*, both countries have more favorable values than sample means for the other four determinants.¹⁸ Assuming other things being equal, if the levels of bank net interest margin decline owing to various reasons including an expansionary monetary policy, FinTech credit may further expand in the two countries. However, the inverse proposition does not hold in public policies. That is to say, reducing the levels of bank net interest margin to induce FinTech credit expansion is not an acceptable policy recommendation since the net interest margin is closely correlated to the profitability of a bank.

The following two nations, the UK and Australia, along with Canada, have similar patterns in common; favorable three variables (*Population ages 20–34*, *Bank net interest margin*, and *Cost of business start-up procedures*) and unfavorable two variables (*In Population* and *Financial institution inclusion*) compared to a sample mean of each variable. On top of that, all of the three countries are ranked in the top three in *Financial institution inclusion*, approximately 99% with a slight difference from each other. Yet again, this does not indicate that they should reduce the percentages of financial institution account holders because it may seriously impair financial accessibility, starting with the most vulnerable financial consumers. On the

¹⁸ This may be one of the reasons that *Bank net interest margin* is generally insignificant from the regression results (Table 8).

other hand, policy efforts to increase population is worth considering depending on the demographic structure of the nation under consideration. As Australia has long been committed to increasing its population through immigration policies, these policies can lead to a further FinTech credit expansion in Australia, holding other things being equal.

When comparing Australia, Canada, and Korea, which are the three countries with similar GDP, Korea has only one favorable driver (*Population ages 20–34*). In particular, *Cost of business start-up procedures* of Korea is the remarkably highest, 14.5% of GNI per capita, not only in 10 countries on focus but also in 15 countries.¹⁹ On the contrary, the UK has the lowest cost at 0.1% of GNI per capita, and the costs of all other four countries mentioned above (China, the US, Australia, and Canada) range from 0.4 to 0.8% of GNI per capita. As discussed earlier, lowering either *Bank net interest margin* or *Financial institution account* is not a viable policy option to consider. In order to promote the expansion of FinTech credit market in Korea, this study suggests that the Korean government should put forth more fundamental plans to reduce *Cost of business start-up procedures* while working in parallel to increase population in terms of the absolute number as well as the proportion of the younger cohorts in their 20s and 30s.

¹⁹ Two other extreme values are of Italy and India (13.8 and 13.5% of GNI per capita, respectively). The sample mean is 4.14% of GNI per capita.

Interestingly, as for the two countries, India and Russian Federation, excluded in discussions in most cases because of their extreme values of *Financial institution inclusion*, their FinTech credit markets have vast potential to expand driven by the same reason as *Financial institution inclusion* is the most significant determinant (Table 5). These two countries also have favorably large figures of *ln Population* which is again significant to FinTech credit expansion. The pursuit of *universal* digital financial inclusion, recently put forth by the international community (GPII 2016; World Bank 2018a), might be an opportune policy stream for both countries.

Table 10. Strengths and Weaknesses by Jurisdiction

Variable	GDP (current)	Dependent variables		Independent Variables					
		Volume of new credit	Number of platforms	In Population	Population ages 20-34	Financial institution account	Bank net interest margin (NIM)	Cost of business start-up procedures	
(Unit)	(USD billions)	(USD billions)	(platforms)	(natural log of total population)	(% of total population)	(% age 15+)	(%)	(% of GNI per capita)	
Data Source	World Bank, World Development Indicators	CGFS-FSB (2017)	CGFS-FSB (2017)	World Bank, Population estimates and projections	World Bank, Population estimates and projections	World Bank, Global Findex database	World Bank, Global Finance Development	World Bank, World Development Indicators	
As of	2016	2015	latest year	2015	2015	2014	2015	2015	
Relation				Positive	Positive	Negative	Negative	Negative	
Rank	Sample mean	4,938	13.931	66.800	18.356	19.608	94.301	1.684	4.140
	Standard dev.	5,651	31.971	103.327	1.175	2.592	6.528	0.740	5.694
1	China	11,199	99.72	356	21.04	23.85	78.85	2.75	0.7
2	United States	18,624	34.32	67	19.59	20.83	93.58	3.19	1.1
3	United Kingdom	2,651	4.13	53	17.99	19.93	98.93	1.39	0.1
4	Australia	1,205	0.28	29	16.99	21.76	98.86	1.65	0.7
5	Japan	4,949	0.33	11	18.66	16.02	96.65	0.98	7.5
6	France	2,465	0.20	53	18.01	18.10	96.58	0.93	0.8
7	Germany	3,478	0.21	34	18.22	18.17	98.76	1.09	1.8
8	Canada	1,536	0.07	23	17.39	20.79	99.10	1.59	0.4
9	Korea, Rep.	1,411	0.04	34	17.75	20.99	94.36	1.71	14.5
10	Italy	1,859	0.02	8	17.92	15.64	87.33	1.56	13.8

Note. Rank : Author's own calculation using Volume of new credit as the primary indicator and Number of platforms as the supplementary indicator.

: Figures that are more conducive to FinTech credit expansion than the sample mean.

: Countries with similar GDP (Australia, Canada, and Korea, Rep.)

REFERENCES

- Bachmann, A. et al. 2011. "Online Peer-to-Peer lending – A Literature Review." *Journal of Internet Banking and Commerce* 16 (2). August.
- Banks around the World. *Top 100 Banks in the World*. Last Updated: April 2, 2018. Retrieved from: <https://www.relbanks.com/worlds-top-banks/assets>.
- Bitner, J. W. and Goddard, R. A. 1992. *Successful Bank Asset/Liability Management: A Guide to the Future Beyond Gap*. New York, US: Wiley.
- Carney, M. 2017. "The promise of FinTech – something new under the sun?" Speech at the Deutsche Bundesbank G20 Conference on *Digitising finance, financial inclusion and financial literacy*. Wiesbaden. January 25.
- Committee on the Global Financial System (CGFS) and Financial Stability Board (FSB). 2017. *FinTech credit: Market structure, business models and financial stability implications*. May 22.
- Cruz-García, P., Fernández de Guevara, J., and Maudos, J. 2017. "Interest Rates and Net Interest Margins: The Impact of Monetary Policy." *The Business of Banking*. [Chesini, G., Giaretta, E. and Paltrinieri, A. (eds)] Ch. 2. Palgrave Macmillan.
- Dorfleitner, G., Hornuf, L, Schmitt, M. and Weber, M. 2017. *FinTech in Germany*. Springer.
- English, W. B. 2002. "Interest Rate Risk and Bank Net Interest Margins." *BIS Quarterly Review*. December.
- Ernst and Young (EY). 2016. *UK Fintech: On the cutting edge, Ernst and Young Report*. Commissioned by Her Majesty's Treasury, the UK.

- Federal Reserve Bank of Cleveland. 2018. "Yield Curve and Predicted GDP Growth." Retrieved from: <https://www.clevelandfed.org/en/our-research/indicators-and-data/yield-curve-and-gdp-growth.aspx>. April 30.
- Foo, J., Lim, L., and Wong, K. 2017. "Macroeconomics and FinTech: Uncovering Latent Macroeconomic effects on Peer-to-Peer Lending." *University of Chicago Working Paper*. November 1.
- Gao, R. and Feng, J. 2014. "An Overview Study on P2P Lending." *International Business and Management* 8 (2):14-18.
- García-Herrero, A., Gavilány, S., and Santabarbara, D. 2006. "China's Banking Reform: An Assessment of its Evolution and Possible Impact." *CESifo Economic Studies* 52 (2): 304–363. Oxford University Press.
- Global Partnership for Financial Inclusion (GPII). 2016. *G20 High-Level Principles for Digital Financial Inclusion*.
- Haddad, C. and Hornuf, L. 2018. "The emergence of the global fintech market: economic and technological determinants." *Small Business Economics*. March.
- H2 Ventures and KPMG. 2017. *2017 Fintech100: Leading Global Fintech Innovators*. November 14.
- Milne, A. and Parboteeah, P. 2016. "The Business Models and Economics of Peer-to-Peer Lending." *European Credit Research Institute (ECRI) Research Report* No 17. May.
- Petersen, M. 2004. "Information: Hard and Soft." *NBER Working Papers*. July.
- Philippon, T. 2016. "The Fintech Opportunity." *BIS Working Papers* No 655. *NBER Working Papers* No 22476. August.
- Pope, D. G. and Sydnor, J. R. 2011. "What's in a Picture? Evidence of Discrimination from Prosper. com." *Journal of Human Resources* 46 (1): 53-92. January.

- Rau, P. R. 2017. "Law, Trust, and the Development of Crowdfunding." *University of Cambridge Working Paper*. July.
- Stern, C., Makinen, M., and Zian, Z. 2017. "FinTechs in China – with a special focus on peer to peer lending." *Journal of Chinese Economic and Foreign Trade Studies* 10 (3): 215-228.
- Stiglitz, J. and Weiss, A. 1981. "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71 (3): 393-410. June.
- Wagner, J. and Sternberg, R. 2004. "Start-up activities, individual characteristics, and the regional milieu: Lessons for entrepreneurship support policies from German micro data." *The Annals of Regional Science* 38: 219-240.
- World Bank. 2018a. *The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech*. April 19.
- World Bank. 2018b. *Overview of Financial Inclusion*. Last Updated: Apr 20, 2018. <http://www.worldbank.org/en/topic/financialinclusion>.

국문 초록

핀테크 신용 팽창 결정요인

서울대학교 행정대학원

글로벌행정 전공

김윤희

이 연구의 목적은 국가 수준에서 핀테크 신용 팽창을 결정짓는 핵심 요인을 규명하는 것이다. 전세계 핀테크 신용 시장 관련 데이터가 부족한 점을 고려하여 본 연구에서는 실증분석 못지않게 탐색적 연구를 심층적으로 다루었다. 13 개 국가 표본을 대상으로 OLS 회귀분석을 실시한 결과 통계적으로 유의한 4 가지 결정요인을 확인할 수 있었다. (1) 인구 규모, (2) 청년층 인구 비율이 핀테크 신용 팽창과 양(+)의 관계에 있는 반면, (3) 금융 포용성, (4) 창업 절차상 행정비용은 음(-)의 관계에 놓여 있다. 다만, 은행 순이자 마진(NIM)과 핀테크 신용 팽창 사이에서는 유의한 음(-)의 관계를 발견할 수 없었다. 이는 은행이 특정 차입자 시장에서 대출을 축소한다 하더라도 핀테크 신용 플랫폼에 대한 시장 진입 장벽을 낮추는 효과가 있는 것은 아님을 시사한다.

주요어: FinTech credit, peer-to-peer (P2P) lending, marketplace lending, crowdfunding, crowdlending

학번: 2016-25112