University of Groningen

Essays on Financial Development and Financial Inclusion

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DOI:
[10.33612/diss.181610240](https://doi.org/10.33612/diss.181610240)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Peng, Y. (2021). *Essays on Financial Development and Financial Inclusion*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen, SOM research school.
<https://doi.org/10.33612/diss.181610240>

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Yiqing Peng

Publisher: University of Groningen
Groningen, The Netherlands

Printed by: Ipskamp Printing

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Essays on Financial Development and Financial Inclusion

PhD thesis

to obtain the degree of PhD at the
University of Groningen
on the authority of the
Rector Magnificus Prof. C. Wijmenga
and in accordance with
the decision by the College of Deans.

This thesis will be defended in public on
Monday 8 November 2021 at 14.30 hours

by

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Dedicated to my beloved parents

Acknowledgements

It takes me four years to complete this PhD dissertation. While intensive and challenging, I always feel lucky to have had this precious opportunity to conduct independent research, improve my mind and character, and train myself to be a qualified economist. Meanwhile, I am grateful to my colleagues, friends, and family for having supported me throughout this journey.

To start with, I would like to thank my supervisors, Robert Lensink and Niels Hermes. Robert, thanks for inviting me to join the DFID-ESRC research program on “Delivering Inclusive Financial Development and Growth” as research assistant and facilitating my application for the PhD position. Many thanks for your supervision, especially for your constructive advice and guidance on the “big picture” of my thesis. You are always easy to approach and have a discussion. I must tell you that having a chat with you is actually a very effective antidote to relieving stress and anxiety during my PhD life. My gratitude also goes to Niels. You have taught me two lessons that have a profound influence on me. First, the aim of PhD education is to train myself to be an independent researcher. A PhD degree is to show that you have completed such an academic training. Second, economic research should always be embedded in a story. Looking back at my trajectory of growth, I cannot agree with you more. Thank you for sharing your wisdom. Moreover, thanks for supervising my doctoral research regularly and meticulously, from raising research ideas, suggesting organized research plans, providing critical comments, to finally reading and improving my papers, just to name a few. I have benefited greatly from your commitment, rigorousness, and professionalism.

I would also like to express my thanks to the assessment committee: professor Issouf Soumaré, professor Geske Dijkstra, and professor Dirk Bezemer. Thank you very much for your time reading my dissertation and sharing valuable comments.

My gratitude goes to my officemates, and also paranympths, Tobias Grohmann and Bart Claassen. Tobi, your easy-going disposition and open-mindedness make our office warm and relaxing. We have had many pleasant experiences, even though I do not know where to start if I were to list them. In short, it is nice to have you through my PhD days. Bart, I cannot imagine what my workdays would look like without our routine coffee moments. Your coffee always arrives timely as a reminder that I should take a break. I have enjoyed not only your coffee, but learning Dutch language and culture from you as well. We will continue with this tradition in our new office.

I am thankful to many people from EEF department and SOM. Charles, I am very glad to meet you in Groningen. You have given me a lot of useful tips and advice on research, and I have always enjoyed talking to you and having our ideas exchanged on a range of topics and issues. I look forward to welcoming you again in Groningen. Gianmaria, thank you for inviting me to stay at your home and take a holiday in Udine in the summer of 2019. It was my first time travelling to Italy, and the trip has left me very nice memories. My thanks go to EEF secretaries: Grietje Pol, Ellie Jelsema, Martine Geerlings-Koolman, Kim Beute, and Kimberley Vudinh. Thank you for your constant support on my teaching and research activities. I have also enjoyed talks with Arjan Trink, Marc Kramer, Steffen Eriksen, Wim Westerman, Bert Scholtens, Shan Ahmad, Jos Offerein, Shuye Yu, Wentao Li and Lina Xie. I would also like to thank SOM for your help and support throughout my PhD education.

My warm thanks go to my friends in Groningen. Xinhui (Sheila) Wu, you are ambitious and conscientious as a scholar; honest, kind, and generous as a person; and helpful and trustworthy as a friend. I am grateful for having you during my PhD life. Guanqun (Bruce) Ma, we have gone through many things in the past years. Thanks for your support. Paul Bezkorovainyi, Ivan Khlyzov, and Alex Popoff, it is spiritually rewarding to witness your growth. Besides, I have also had many happy moments with those, who used to study in Groningen before, and to whom I am sincerely thankful: Mingde Pang, Yimin Xu, Jiyan (Jerry) Wang, Thanh-Nam Le, Yueqi (Moon) Gao, Bonan Wan, Yang Jiang, Linyang Li, Songlin Li, Jin Huang, Tianhan Ji, Harry Suffield, Ruben Huidekoper, Mark Roijackers, Yunpeng Xiong, Pengfei Feng, Fengtian Shi.

Special gratitude goes to my friends in Shanghai. I cherish those happy moments before I left for the Netherlands. Lock Chen, I am glad that you live the life of Riley in Shanghai.

Vivian Xu, finally I can deliver this dissertation to you as promised. Looking forward to next time when I can sit down, get a good pot of tea, and listen to your stories again. Cain Lin, many thanks for welcoming me at Schiphol in the August of 2013. The days we stayed in Rotterdam have become my unforgettable memories. Wait till I come back to Shanghai, and we will have a good reunion. This time, no haste is needed. Yanfeng Qi, Zhixiong Hu, and Ying Huang, I owe you enormously for not being able to meet you more often in the past years. In the meantime, I am happy to see that you have your own family with your cutie and sweetie walking around. My best wishes to you all.

Lastly, I want to thank my family, who always stand by me throughout this journey. I am proud to be awarded a doctoral degree, which is also a deserved pride for you.

Yiqing
Groningen
Summer 2021

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Chapter 1

Introduction

1.1 Background

Finance plays an essential role in economic development. Firms need finance to make investments in equipment, technologies, and innovations to expand business operation and production, which is expected to enhance firm performance and, ultimately, lead to overall economic growth. Therefore, promoting financial development is considered as an important policy goal in many countries. In general, *financial development* refers to a financial system being able to perform better with respect to producing information, allocating capital, monitoring investments, exerting corporate governance, ameliorating risks, mobilizing and pooling savings, and easing the exchange of goods and services (see, e.g., Levine, 1997). Extensive research has been done to understand what factors influence the level of financial development in a country. Specifically, the literature suggests that a higher degree of financial liberalization and stronger institutions are the key determinants of financial development. Another strand of the literature has investigated the impact of financial development. The message is that financial development has a positive effect on

economic growth, poverty reduction, and reducing income inequality. In section 1.1.1-1.1.3, we provide a summary of the main findings from the related literature.

1.1.1 Key Determinants of Financial Development

First, financial development is stimulated by *financial liberalization* policies, which include privatizing state-owned financial institutions, freeing up interest rates, removing control over credit, and reducing entry barriers for foreign financial institutions.¹ These policies aim to reduce government interventions in financial markets and strengthen the role of market, based on the belief that financial liberalization allows interest rates to rise to the equilibrium levels, which fosters the accumulation of savings, facilitates investments, and leads to economic growth (McKinnon, 1973; Shaw, 1973). Empirically, Chinn & Ito (2006) show that increased capital market openness promotes equity market development after the legal system has reached a reasonable level. Claessens, Demirgüç-Kunt & Huizinga (2001) find that foreign bank entry improves the cost efficiency among domestic banks by learning superior techniques and practices from foreign banks.

Second, the literature highlights that institutions are critical for financial development.² Formally, *institutions* are “humanly devised constraints that structure political, economic and social interaction”, including *formal* institutions, such as constitutions, laws, property rights, and *informal* institutions, such as sanctions, taboos, customs, traditions, and codes of conduct (North, 1991, p.97). As information asymmetry prevails in the financial system, financial activities are heavily reliant on financial contracts. Pioneered by La Porta, Lopez-de-Silanes, Shleifer & Vishny (1997, 1998), the theory of law and finance suggests that strong legal institutions, which better protect the rights of creditors and shareholders and enforce financial contracts, are expected to stimulate the supply of financial services and lead to the development of financial markets.³ Besides, the literature suggests that cross-country differences in legal institutions can be explained by a country’s legal tradition, which can be broadly categorized into a common law or civil law tradition. Specifically, common law is originated in England. Civil law originates from Roman law and can be categorized into French, German, and Scandinavian families. Through colonization and imitation, these legal traditions spread, evolved, and eventually shaped the contemporary legal systems across the world. A main difference between common law and civil law is that common law tends to better protect private property, while civil law puts more focus

¹ See Loizos (2018) for a discussion on financial liberalization.

² See Fergusson (2006) for a detailed review of the literature on institutions and financial development.

³ See Beck & Levine (2005) for a detailed discussion on legal institutions and financial development.

on protecting the rights of the state. As documented in La Porta et al., (1997, 1998), legal right of creditors and shareholders is better protected in countries with a common law system, compared with civil law countries. And among civil law countries, creditor rights protection and contract enforceability tend to be weaker in countries with French civil law tradition, which are also found to have less-developed financial systems, compared with German and Scandinavian civil law countries.

Informal institutions are also found relevant for financial development. Since financial contracts can never be complete and perfectly enforced, they are intrinsically built upon trust. Financial activities are more likely to take place if trust is strong between lenders and borrowers, such that the expectation that contractual obligations can be fulfilled is high, especially when legal institutions are weak. Hence, financial markets are expected to be better developed in countries where the level of social trust is higher. For example, Guiso, Sapienza & Zingales (2004) find that a high level of trust is associated with more use of checks, stock investments, and use of credit from financial institutions in Italy. Calderón, Chong & Galindo (2002) provide cross-country evidence that a higher level of trust is correlated with a larger and a more efficient financial system. A higher level of trust is expected to foster stock market development (see, e.g., Guiso, Sapienza & Zingales, 2008; Law & Ibrahim, 2013; Ng, Ibrahim & Mirakhor, 2016). In addition to trust, Garretsen, Lensink & Sterken (2004) examine the impact of societal norms on financial development in a cross-country setting. Specifically, they consider four societal norms, including power distance, individualism, masculinity, and uncertainty avoidance. They find that these societal norms have a strong explanatory power on stock market development. Stulz & Williamson (2003) use language and religion as two proxy indicators for culture and find that culture explains the strength of creditor rights and investor protection, which, in turn, impacts financial development.

1.1.2 Financial Development and Economic Growth

The theory with respect to the relationship between financial development and economic growth can be traced back to the seminal work “The Theory of Economic Development” by Schumpeter (1934). The main idea is that innovation is the driving force of economic growth by creating advanced technologies, improving the process of production, and providing more products to the economy. Therefore, entrepreneurs, as the initiators and leaders of innovation, play a central role in the course of economic development. For entrepreneurs to innovate, they should have new knowledge in the first place. But, more importantly, they should have sufficient capital resources to purchase the inputs they

need for conducting experiments or making trials before an innovation can be put into practical use. Since financial development increases the liquidity for entrepreneurs to finance their investment projects and bring innovation into full play, it is expected to foster economic growth.

Pioneered by the publication of “Financial Structure and Development” by Goldsmith (1969), empirical studies on finance and economic growth started to burgeon since 1990s. Consistent with Schumpeter’s view, early evidence has established a positive effect of financial development on economic growth. For instance, King & Levine (1993) find that financial development, indicated by total credit stocks to the private sector scaled by GDP, has a strong positive effect on GDP growth based on data of 80 countries over 1960-1980. However, this study has two main limitations. First, potential simultaneity bias due to reverse causality from economic growth to financial development is not well addressed. Second, the cross-country setting implies that there might be omitted variable bias due to unobservable country-specific effects not being controlled for. In the follow-up study, Levine, Loayza & Beck (2000) first reassess the impact of finance on GDP growth under a cross-country setting, using the instrument variable approach to deal with simultaneity bias. In addition, they further evaluate the finance-growth relationship in a panel setting, where the lagged effect of GDP growth and country fixed effects are taken into account. Based on a dataset of 74 countries over 1960-1995, they find that the level of financial development is positively associated with GDP growth.

The literature also examines the conditions under which financial development exerts a positive effect on economic growth. To illustrate, Rioja & Valev (2004) find that financial development promotes economic growth only in high-income countries, while not in low-income ones. Huang, Lin, Kim & Yeh (2010) find that financial development contributes to economic growth when inflation rates stay below a threshold level. Demetriades & Law (2006) and Law, Azman-Saini & Ibrahim (2013) focus on formal institutions and show that financial development promotes economic growth only after institutional development has reached a reasonable level. Overall, the empirical literature has established a positive association between financial development and economic growth.⁴

However, recent empirical evidence suggests that the positive link between financial development and economic growth has weakened (Rousseau & Wachtel, 2011) and even become negative after financial development exceeds a certain level, which implies that finance-growth relationship may be nonlinear, and that too much finance may even drag economic growth (see, e.g., Law & Singh, 2014; Arcand, Berkes & Panizza, 2015). One

⁴ See Levine (2005) and Ang (2008) for systematic reviews on the literature of finance and economic growth.

possible reason for the non-linearities in the finance-growth relationship is that financial development may be accompanied by increased bank lending to the household sector. Since households are more likely to borrow for the purpose of consumption or purchasing real-estate assets rather than investing in production as firms often do, a less productive use of financial resources means that financial development, in this case, may no longer generate growth benefit. Indeed, Beck, Büyükkarabacak, Rioja & Valve (2012) find that bank lending to enterprises boosts economic growth, but lending to households does not. Sassi & Gasmi (2014) examine 27 countries from the European Union. They find that bank lending to firms leads to economic growth, while lending to households drags economic growth. Similarly, Bezemer, Grydaki & Zhang (2016) establish a positive growth effect for bank lending to non-financial business, but not for lending to households in the form of mortgages.

1.1.3 Financial Development and Income Inequality

Economic theory provides different predictions on the impact of financial development on income inequality.⁵ On the one hand, the poor and socially disadvantaged groups are most likely to be affected by financial market frictions due to asymmetric information and transaction costs. Due to insufficient collateral and a lack of credit histories, they are often bounded by financial constraints and excluded from the formal financial system. From this perspective, financial development relaxes financial constraints, facilitates funding to those who were previously unable to get financed, and allows them to make productive investments, especially in human capital accumulation. Therefore, financial development contributes to a fall in income inequality by improving the efficiency of capital allocation (Galor & Zeira, 1993; Aghion & Bolton, 1997; Galor & Moav, 2004). On the other hand, if the benefits of financial development are largely enjoyed by those who have already been using financial services without reaching those who are usually poor and excluded from the financial system, financial development will widen income inequality. This view is captured by Greenwood & Jovanovic (1990), who maintain that the relationship between financial development and income inequality reduction depends on the level of economic development. At the early stage, income inequality aggravates since only the rich can afford the costly financial services. As the economy develops, financial services become more affordable to the poor, and income inequality reduces gradually.

⁵ See Demirgüç-Kunt & Levine (2009) for a detailed discussion on finance and inequality.

Empirical studies that investigate the relationship between financial development and income inequality provides mixed results. Some studies show that financial development improves income inequality (see, e.g., Clarke, Xu & Zou, 2006; Beck, Demirgüç-Kunt & Levine, 2007; Hamori & Hashiguchi, 2012; Zhang & Naceur, 2019), while others find the opposite that financial development exacerbates income inequality (see, e.g., Jaumotte, Lall & Papageorgiou, 2013; Jauch & Watzka, 2015; De Haan & Sturm, 2017). In addition, the literature suggests that the impact of financial development on income inequality may be conditional on a number of factors. For example, Kim & Lin (2011) and Nikoloski (2013) find that financial development reduces income inequality only after the level of financial development has reached a threshold level, indicating an inverted U-shaped relationship between financial development and inequality. On the contrary, Tan & Law (2012) find a U-shaped relationship. Financial development reduces income inequality until a certain level, before further financial development starts to widen income inequality again. Law, Tan & Azman-Saini (2014) find that financial development reduces income inequality only after a certain level of institutional quality is attained. Below this threshold, financial development has an insignificant effect on income inequality. Kunieda, Okada & Shibata (2014) suggest that the impact of financial development on inequality is conditional on the level of financial integration. Financial development reduces inequality if the financial system is not connected to global financial markets.

1.2 Motivation for the Thesis

Financial development indicators should, ideally, be able to capture a financial system's capability of performing the main functions suggested by Levine (1997, 2005), including producing information of firms, identifying productive investment projects, exerting corporate governance, improving risk management, ameliorating transactions costs, and facilitating capital allocation. However, since the performance of these functions is not explicitly observable and, thus, difficult to be quantified, these indicators are not available for empirical research. Consequently, the existing empirical work has largely focused on financial development with respect to increasing *financial depth*, i.e., the size of a financial system, based on the idea that a deep financial system usually has a large banking system and/or capital market, which indicates a high level of financial development. That is why the term financial development is often used interchangeably with *financial deepening* in

the literature, the latter of which refers to the growth of the size of the banking sector and/or capital market. Accordingly, financial deepening is typically measured by private credit, liquid liabilities, and bank deposits that capture the size of the banking sector, or stock value traded, stock market turnover, stock market capitalization, and the number of listed companies that capture the size of capital market. The most common measure is *private credit*, i.e., credit issued by financial institutions to the private sector as a share of GDP. Since private credit describes the size of financial intermediation, which is the key function of a financial system, it is widely employed as a proxy for financial development. Increased lending to the private sector is also known as *credit deepening*.

It is noteworthy that financial development is not equivalent to financial deepening, even though they are often used synonymously in the literature. Financial deepening is one dimension of financial development, but not the only one. For example, thanks to the advancement of financial products, risk management techniques, and financial regulation and supervision, financial development is also expected to lead to *financial stability*, i.e., a condition in which the financial system, comprising financial intermediaries, markets and market infrastructures, is capable of withstanding shocks and the unravelling of financial imbalances, according to the definition by the European Central Bank.⁶ Nevertheless, not much is known so far as to how these two dimensions of financial development interact with each other, i.e., how financial stability is associated with financial deepening in the process of financial development. The recent global financial crisis seems to indicate that credit deepening, as many countries across the world had experienced before the crisis, is a destabilizing factor. A possible explanation is that credit deepening may be driven by banks increased risk-taking, which increases the risk of default in the banking system, or *banking fragility* as we define in this thesis, therefore making a banking crisis more likely to take place. However, empirical evidence that supports this suspicion is still scant.

In addition to financial stability, financial development is expected to promote *financial inclusion*, in which case more individuals, households, and firms are able to access and use financial services, especially for the poor and the small-sized enterprises, which were previously excluded from formal finance. Since financial inclusion allows those who live outside the mainstream financial system to finance prospective economic opportunities and improve their well-being, many countries have recognized financial inclusion as an important development goal. For example, leaders of G20 countries have jointly launched The Global Partnership for Financial Inclusion in 2010 in Seoul, with a commitment to promoting financial inclusion around the world.⁷ Unfortunately, cross-country evidence

⁶ Source: <https://www.ecb.europa.eu/pub/financial-stability/html/index.en.html>.

⁷ Source: <https://www.gpfi.org>.

on the determinants and impact of financial inclusion is still very limited, largely because country-level data on financial inclusion has not been made accessible until recently, even though there has already been an extensive discussion on the determinants and impact of financial deepening as summarized in section 1.1.1-1.1.3.

Financial inclusion should be distinguished from financial deepening for two reasons. First, financial depth captures the size of a financial system, i.e., how many products and services can be provided by the financial system. Therefore, financial deepening tends to operate on the *intensive* margin of financial development, where a wider range of financial services are provided to those who have already accessed the financial system. Instead, financial inclusion describes how broad financial resources can be allocated to different economic agents. Hence, financial inclusion tends to operate on the *extensive* margin of financial development by allowing those who were formerly excluded from the financial system to access and use financial services (Demirgüç-Kunt & Levine, 2009). Second, and related to the first remark, it is possible that a financial system grows larger in size without effectively increasing its inclusiveness. For instance, both the United Kingdom and the United States have a large financial system. However, in the United Kingdom 1.7 million adults still do not have a formal account.⁸ In the United States, 109 million adults are non-prime, i.e., their credit scores are higher than those of subprime borrowers, but lower than those of prime borrowers; 53 million adults are credit invisibles, i.e., they do not have any credit history from credit reporting companies; and there has been a total of 143 billion dollar reduction in credit lending to the non-prime since 2008.⁹ While in some countries a deep financial system is associated with a broad access to finance, this association is not universally established (Claessens & Perotti, 2007). Thus, financial inclusion and financial deepening capture two different dimensions of financial development, as is suggested by Čihák, Demirgüç-Kunt, Feyen & Levine (2012).

This PhD thesis aims to add to our understanding about the importance of financial development, focusing on three main topics: (1) the link between financial deepening and financial stability; (2) the determinants of financial inclusion; and (3) the effect of financial inclusion on improving economic welfare. These topics have received less attention in the literature. Specifically, chapter 2 investigates the impact of credit deepening on banking fragility. Chapter 3 studies the role of formal institutions in promoting financial inclusion at the individual level. Chapter 4 looks at the impact of financial inclusion at the firm level by investigating whether access to formal credit improves firm performance. Section 1.3 elaborates on the content of these three chapters in more detail. Section 1.4 discusses the

⁸ Source: <https://publications.parliament.uk/pa/ld201617/ldselect/ldfinexcl/132/13202.htm>.

⁹ Source: <https://www.elevate.com/who-we-help.html>.

limitations of this thesis and provide some directions for future research. Section 1.5 summarizes the main lessons that can be learned from this thesis.

1.3 Overview of the Thesis

1.3.1 Credit Deepening and Banking Fragility

The existing empirical work has largely focused on the bright side, i.e., the benefits of financial development. But what about the dark side? Can financial development lead to undesirable economic outcomes? Thus far, a banking crisis is cited most as a negative outcome associated with financial development in the literature (see, e.g., Demirgüç-Kunt & Detragiache, 2005; Wachtel, 2018). The main idea is that credit deepening, as a result of financial development, is a predictor of banking crisis. However, explanations are missing regarding how banking crisis and credit deepening are connected. We propose that credit deepening may be associated with increased default risk of the banking system, namely banking fragility, which leads to a higher probability of banking crisis.

The literature suggests two potential mechanisms explaining how credit deepening can be linked to banking fragility. First, banks tend to relax lending standards and take more risk in response to low short-term interest rates. Low nominal interest rates reduce the margin between the lending and the deposit, thus encouraging banks to search for yield by taking more risks (Dell’Ariccia & Marquez, 2006; Rajan, 2006; Delis & Kouretas, 2011; Borio & Zhu, 2012). This tendency is further amplified by the advancement of the banks’ business model. Under the traditional “originate-to-hold” model, banks originate and issue loans, and hold their lending until maturity. However, under the new “originate-to-distribute” model, banks originate and issue loans and then sell them to third parties through a securitization process, which allows banks to transfer credit risk of the loans to the third parties as well. The possibility of sharing credit risk with the rest of the economy weakens banks’ screening and monitoring incentives when they make lending decisions, especially in mortgage lending (Brunnermeier, 2009; Keys, Mukherjee, Seru & Vig, 2010; Maddaloni & Peydró, 2011; Purnanandam, 2011). The consequence is that banks tend to take too much risk, which leads to a deterioration of loan quality and raises the default risk of the banking system.

Second, credit deepening is expected to lead to banking fragility if it is driven by banks' increased lending to the household sector to support non-productive activities, such as the purchase of real-estate assets. In this case, a rising share of household credit in total private credit means that the overall effect of credit deepening on income growth will be dampened, because household credit, in particular mortgages, tends to hinder economic growth (Beck et al., 2012; Sassi & Gasmi, 2014; Bezemer et al., 2016). The rationale is that credit lending by the banking system ultimately turns into the liabilities held by firms and individuals in the private sector, which need to be repaid from income. If credit deepening fails to go hand in hand with income growth, the obligation of repaying these liabilities will be increasingly difficult to realize, which will translate into a higher risk of default of the banking system, as the probability of banks not being able to get their assets back will be higher.

We further expect that the relationship between credit deepening and banking fragility differs by the type of credit. In the non-financial business sector, banks' relaxed lending standards and weak screening and monitoring efforts mean that an increasing amount of loans may be extended to the "wrong" investments, i.e., projects with low returns and/or projects with a high risk-return profile. As a result, if credit deepening in the non-financial business sector leads to reducing the quality of the loan portfolio of banks, this increases the risk of default of the banking system and, thereby, banking fragility. In the household sector, since banks' lending to households is mainly used to finance the purchase of real-estate assets, the default risk of household credit is largely dependent on asset prices. As long as asset prices keep rising, credit deepening in the household sector may not lead to banking fragility, since assets can be liquidated to repay household debt. Therefore, the research questions to be discussed in chapter 2 are:

Does credit deepening raise banking fragility? Do non-financial business credit and household credit have a different impact on banking fragility?

To investigate whether credit deepening has an impact on banking fragility, we collect data from the Global Financial Development Database (GFDD) published by the World Bank, which provides financial system characteristics for 203 economies since 1960s. Our results suggest that credit deepening is associated with increased banking fragility. To further examine whether the type of credit matters for the impact of credit deepening on banking fragility, we collect data from Bezemer, Samarina & Zhang (2017), who provide information on bank credit allocated to non-financial corporations and households for 74 economies over 1990–2013. We find that banking fragility is only related to the deepening of credit to non-financial corporations, but not to credit to households.

We contribute to the literature in the following ways. First, we explicitly investigate how credit deepening is associated with banking fragility, which is different from the literature that looks at how credit expansion predicts the occurrence of banking crises (see, e.g., Demirgüç-Kunt & Detragiache, 2005). Banking crisis is an outcome, while banking fragility describes the resilience of a financial system, which usually precedes a banking crisis. Thus, our finding of a strong relationship between credit deepening and banking fragility provides an explanation for credit expansion as a predictor of banking crises. Second, most empirical work studies credit deepening at the aggregate level. It is not clear whether heterogeneity exists in the impact of different types of credit on banking fragility. We fill this gap by explicitly showing that banking fragility is related to the expansion of non-financial business credit, but not household credit.

1.3.2 Formal Institutions and Financial Inclusion

While the literature has established a positive impact of formal institutions on financial development in general, it remains unclear whether the positive impact operates on the intensive or the extensive margin.¹⁰ That is, it is not clear whether formal institutions lead to financial development, because more financial services have been offered to those who have already accessed the financial system, or because individuals who were previously excluded from the financial system have started to use financial services. To shed light on this question, chapter 3 explicitly investigates whether better formal institutions increase financial inclusion, indicated by the share of adults (aged 15+) who make use of four basic formal financial services, i.e., formal account, saving, borrowing, and digital payments.

We propose that formal institutions impose a positive impact on financial inclusion. The idea is that strong formal institutions are expected to better protect investor rights and enforce financial contracts, which not only motivates financial institutions to provide more financial services, but also increases the willingness of individuals to use financial services, therefore leading to a higher level of financial inclusion. In addition, the theory of law and finance suggests that investor rights protection is stronger in English common law countries, compared with civil law countries. Among civil law countries, the level of investor rights protection is weakest in French civil law countries, compared with those with a German or Scandinavian civil law tradition. Hence, it is expected that financial inclusion is less developed in countries with a French civil law tradition, compared with

¹⁰ See Fergusson (2006) and Fernández & Tamayo (2017) for a review of the literature on institutions and financial development.

English common law countries. Further, we propose that financial inclusion is negatively influenced by financial barriers. Financial institutions may limit the provision of financial services, e.g., credit rationing, when there is a high degree of asymmetric information and transaction costs are high. Individuals are less likely to use financial services, when they do not have sufficient funds, do not have the need, do not have sufficient knowledge to understand financial contracts, do not trust in financial institutions, or cannot physically access financial institutions due to geographical obstacles. Consequently, the presence of these barriers imposes a direct negative impact on financial inclusion. Furthermore, the positive impact of formal institutions on financial inclusion is expected to be undermined by the presence of financial barriers. While institutional development is expected to raise the provision of financial services by financial institutions and motivates individuals to use financial services, the positive impact of formal institutions on financial inclusion will be weakened, for example, by the fact that potential clients are not well informed to make financial decisions due to a lack of financial knowledge, or that financial services are too costly as a result of high transaction costs, or that a lack of economic opportunities limits individuals' need for financial services. Therefore, the research questions to be discussed in chapter 3 are:

Do better formal institutions promote financial inclusion? Is the positive impact of formal institutions on financial inclusion conditional on the degree of prevailing financial barriers?

To study these research questions, we collect data from the Global Findex Database (2017 edition) on how people make use of bank accounts, savings, borrowings, and digital payments across 144 countries. Besides, the database provides us with information about financial barriers, including 1) insufficient income (people do not have sufficient funds); 2) a lack of economic opportunities (people do not have the need for financial services); 3) distrust (people lack trust in financial institutions); 4) religion (people do not have a formal account due to religious considerations); 5) financial illiteracy (people lack basic financial knowledge); 6) transaction costs (financial services are too expensive); 7) geographical barriers (financial institutions are too far away); and 8) asymmetric information (people lack the necessary documentation). Formal institutions are measured in two ways. First, we collect information about a country's legal tradition from La Porta et al., (1998) and Beck, Demirgüç-Kunt & Levine (2003b). Specifically, we distinguish four legal families, i.e., English common law, French civil law, German civil law, and other civil law families, including Scandinavian civil law and Socialist law. Second, we use the World Governance Indicators from Kaufmann, Kraay & Mastruzzi (2011) to measure a country's institutional quality with respect to the following dimensions: 1) voice and accountability; 2) political stability and absence of violence; 3) government effectiveness; 4) regulatory quality; 5)

rule of law; and 6) control of corruption. Our results are threefold. First, we find that a country's legal tradition has a strong explanatory power on financial inclusion. Consistent with Levine et al., (2000), we show that countries with an English common law tradition have a higher level of financial inclusion, while financial inclusion is lower in French civil law countries. Second, we find a strong positive relationship between formal institutions and financial inclusion. This finding is robust to different measures for formal institutions and model specifications. Third, we find that the positive impact of formal institutions on financial inclusion is weaker for a higher degree of financial barriers.

We contribute to the literature in the following ways. First, while there is a substantial amount of research on the impact of formal institutions on financial deepening, there are no studies that have looked at the relationship between formal institutions and financial inclusion. This chapter takes up the challenge by empirically testing the theory of law and finance with a focus on financial inclusion and by using latest information from the Global Findex Database. Second, we provide the first country-level study that investigates the impact of formal institutions on the uptake of financial services, rather than the access to financial services measured by, such as the number of bank branches or ATM machines, while taking into account the role of financial barriers. Focusing on the uptake dimension of financial inclusion is important as a high level of financial access does not necessarily imply a high level of financial usage. Individuals who have access to financial resources may still choose not using finance due to the presence of various financial barriers. Third, and related to the previous remark, we test the moderating effect of financial barriers on the relationship between formal institutions and financial inclusion, which has not been examined yet in the existing empirical literature.

1.3.3 Access to Finance and Firm Performance

The literature highlights that financial constraints are a critical obstacle to firm growth (Beck & Demirgüç-Kunt, 2006; Ayyagari, Demirgüç-Kunt & Maksimovic, 2008; Kuntchev, Ramalho, Rodríguez-Meza & Yang, 2013). In fact, the key mechanism by which financial development leads to economic growth is that access to finance allows firms to invest in new technologies, expand production, and improve firm performance (Demirgüç-Kunt & Maksimovic, 1998; Beck, Demirgüç-Kunt, Laeven & Levine, 2008). Hence, the issue of alleviating firms' financial constraints has received increasing attention (see, e.g., OECD, 2006). This has also led to empirical studies, which investigate whether access to finance improves firm performance at the firm level using survey data (see e.g., Gatti & Love, 2008; Bopkin, Ackah & Kunawotor, 2018; Levine & Warusawitharana, 2021). For example,

World Bank's Enterprise Survey is the one that has been widely cited in the literature.¹¹ The dataset provides information on the factors that shape the business environment of firms across the world, ranging from infrastructure, trade, finance, regulations, taxes and business licensing, corruption, crime and informality, finance, innovation, labor, to the perceptions about obstacles to doing business. However, World Bank's Enterprise Survey mainly covers firms that are formally registered. As a matter of fact, in many developing countries it is often firms that are not formally registered at authorities and operate in the informal sector, e.g., microenterprises specialized in small-scale production, that matter most. To illustrate, employment in the informal sector represents 85.8 percent of total employment in Africa, which makes a great contribution to national GDP.¹² About 40% of households operate non-farm household enterprises in the informal sector, which plays an important role in economic development in Africa (see, e.g., Owusu Abdulai & Abdul-Rahman 2011; Bezu, Barrett & Holden, 2012; Senadza 2012; Thomas, 2015; Fox & Sohnesen, 2012; 2016). Despite their importance to the economy, not much is known as to how access to finance affects firm performance for microenterprises operating in the informal sector in developing countries.

In addition, the empirical work suggests a gender gap in firm performance. Overall, female-led enterprises have weaker firm performance compared with male counterparts with respect to firm size, profitability, productivity, growth, and survival. The reason for these differences can be threefold (see, e.g., Bardasi, Sabarwal & Terrell, 2011; Carranza, Dhakal & Love, 2018). First, female entrepreneurs tend to have less endowment with respect to assets (e.g., start-up capital), education (e.g., business knowledge and literacy), skills (e.g., management skills), business experience (e.g., apprenticeship), social network, and so on. Second, female entrepreneurs tend to lack competition, self-confidence, and the tolerance of risk, which are necessary qualities to identify business opportunities and achieve business goals. This may be explained by the fact that women are more likely to enter self-employment because of economic necessity rather than business ambition, that women prefer a work-life balance over stress and pressure, and that women tend to be risk-averse. Third, female entrepreneurs are sometimes constrained by discrimination through laws or social norms. For example, in some countries women are not allowed to own, buy, sell, and use property; they are not permitted to use financial services without their husbands' consent and to take control of household finances; they are more likely to be discriminated by financial institutions when applying for external finance; they are not allowed to work in certain jobs; and they are bounded by family responsibilities, such as

¹¹ Source: <https://www.enterprisesurveys.org/en/enterprisesurveys>.

¹² Source: www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_626831/lang--en/index.htm.

taking care of kids and domestic chores. All these constraints hinder female entrepreneurs from achieving as good firm performance as male entrepreneurs can do. However, most empirical studies do not take gender dimension into account when it comes to the impact of access to finance on firm performance. Therefore, the research questions to be discussed in chapter 4 are:

Does access to finance improve firm performance of microenterprises? Does the impact of access to finance on firm performance differ between male-headed and female-headed microenterprises?

To study these research questions, we use data from the Ghana Living Standard Survey 2016/2017, which is a nation-wide survey that provides comprehensive information on households, including demographic characteristics, education, health, migration, finance, and so on. Specifically, we focus on non-farm household enterprises, which is reported in section 10 of the survey. This section provides information on the characteristics of non-farm household enterprises, such as how long an enterprise has been operated, how much output it has produced, how much revenue it has earned, whether it is formally registered, whether it employs household members and apprentices, and so on. Besides, this section provides information about the “finance” of the household enterprise, such as the main source of capital when it was established in the first place, the nature of the capital, and whether the entrepreneur makes use of credit from banks or other financial institutions. Our results are twofold. First, non-farm household enterprises, which have tried to apply for credit from banks and other financial institutions and finally managed to get credit, have a higher level of labor productivity than those that have not even tried to apply for credit in the first place. Second, we find a gender gap in the productivity-enhancing effect of credit. The positive impact of formal credit on labor productivity only appears in male-headed enterprises, but not in female-headed ones, implying that access to finance is not effective in enhancing performance of female-headed firms in terms of labor productivity.

We contribute to the literature in the following ways. First, to our knowledge, we are the first to empirically test the impact of access to formal credit on firm performance of microenterprises, while taking the gender dimension into account. Second, different from studies that look at the impact of finance on firm performance in the formal economy, we focus on firm performance of microenterprises operating in the informal economy, due to their critical role in economic development in developing countries. Our findings provide support to policy programs that aim at improving financial inclusion for microenterprises and raising returns to capital for female entrepreneurs in particular, given the important role of microenterprises in developing countries.

1.4 Limitations and Directions for Future Research

In chapter 2, we find that banking fragility is strongly related to credit deepening of non-financial business credit. However, we are not able to further investigate through which channels this relationship is established, because aggregate data only tells us how much credit goes to non-financial business corporations, but not how credit is put into use. One possibility is that credit is not used productively, or that credit is used to invest in risky investment projects, which leads to lower returns of capital, a higher chance of default, and, ultimately, banking fragility at the system level. Future research can use firm-level data to examine what types of investment projects that credit is used to support are linked most strongly to bank fragility, controlling for firm- and industry-specific characteristics.

In chapter 3, we study the impact of formal institutions on financial inclusion. One important limitation of this study is that endogeneity cannot be adequately solved due to the nature of cross-section data, which does not allow us to explore the variables of our interest across years. We are not able to conduct a panel data analysis, since the previous editions of the Global Findex Database do not present data on financial barriers, which is a key element of our analysis. Since the Global Findex Database continues to update once every four years, future research can extend our analysis by looking at the effect of formal institutions and financial barriers on financial inclusion in the panel setting. Next, we put a focus on formal institutions, while the literature highlights that informal institutions are also relevant for financial development. For example, Guiso et al., (2004) show that firms and households are more likely to obtain credit from financial institutions if they are located in areas where the level of social capital is high. Elkhuisen, Hermes & Jacobs (2018) find that strong social capital can be a substitute for weak formal institutions in promoting financial development. Therefore, future research can investigate whether social capital has a positive impact on financial inclusion, and whether the positive effect of formal institutions on financial inclusion is stronger in countries with a higher level of social capital.

In chapter 4, we use the Ghanaian living Standard Survey 2016/2017 to investigate how access to finance impacts firm performance of non-farm household enterprises in Ghana. Since our data is cross-sectional, endogeneity cannot be adequately solved. Besides, we find that the positive impact of access to finance only appears in male-headed enterprises, but not in female-headed ones. We suspect that entrepreneurs need to be equipped with complementary resources to use credit effectively. Since, in general, female entrepreneurs have a lower level of business knowledge, management skills, and education compared

with male entrepreneurs, a lack of these complementary resources means that the effect of female entrepreneurs accessing finance on firm performance may be limited. We have tried to explore potential moderating effect of complementary resources, e.g., household heads' marital status, education, business experience, and household size, on the impact of access to finance on firm performance in female-headed enterprises, but do not find significant results. Future research can further explore complementary resources that may potentially enhance the impact of access to finance on firm performance in female-headed enterprises. However, this will have to rely on future Ghanaian Living Standard Surveys to provide researchers with more and deeper information about household enterprises, as well as the characteristics of household heads of non-farm household enterprises.

1.5 Lessons Learned from the Thesis

This PhD thesis addresses several issues related to financial deepening, financial inclusion, and financial stability. Below, we summarize the main lessons learned from our research. First, financial development is a multidimensional concept. We show that a deep financial system may not necessarily be a stable one. Hence, financial development policies should not only focus on increasing the size of financial intermediation, but also minimizing the risk of banking fragility. Second, we show that default risk of the banking system is linked to bank lending to non-financial corporations. It implies that credit may have gone to less-qualified borrowers or borrowers with risky investment projects. Therefore, our findings confirm the important role of screening and monitoring in maintaining banking stability that has been emphasized in the literature. Third, strong formal institutions help to foster financial inclusion. However, this effect is undermined by the presence of various barriers that constrain individuals from using finance. Hence, financial inclusion policies should not only focus on improving institutional environment, but also making finance easier to use, especially for those who were previously excluded from formal finance, for example, by increasing financial infrastructure, reducing the cost of financial services, and relaxing documentation and/or collateral requirements when possible. Fourth, and related to the previous remark, financial inclusion policies should aim at alleviating barriers that may lead to financial exclusion for microenterprises and encourage entrepreneurs to make use of formal finance to improve firm performance.

Chapter 2

Credit Deepening and Banking Fragility: Evidence from Panel Data Analysis

2.1 Introduction

Since the 1990s, governments of several countries across the globe have pursued financial liberalization policies based on the idea that these policies lead to increased availability of credit for the private sector at lower interest rates, a process generally known as *credit deepening*. In this chapter, we study the consequence of credit deepening for the stability of the banking system at large. We propose that credit deepening may lead to *banking fragility*, which is defined as a higher risk of default of the banking system.

We start by arguing that credit deepening, if driven by excessive risk-taking of banks, e.g., by reducing screening and monitoring efforts, means that an increasing volume of credit will go to less-qualified borrowers or to finance the “wrong” investment projects, that is, projects with low returns and/or projects with high risk-return, which will lead to a deterioration of loan quality in the banking system. As a result, chances are higher that

banks cannot get their loans repaid, which raises the risk of default of the banking system, i.e., banking fragility. Further, we argue that credit is supposed to be used productively, that is, to find innovative projects and/or promising investment opportunities. If credit deepening is driven by banks' increased lending to the household sector to support non-productive purposes, such as purchasing real-estate assets, the growth impact of credit deepening will be weakened. The consequence may even be that the banking system will become fragile. Credit deepening means that the banking system creates additional debt, which ultimately needs to be repaid by income. Yet, as the link between credit and income growth becomes weak because credit is used for non-productive purposes, the probability that debt obligations can be fulfilled in the future will be lower. As a result, the banking system will be faced with a higher risk of default and banking fragility rises.

We collect data on credit issued to the private sector by domestic money banks (% GDP) for 124 countries over the period 1998-2012. Banking fragility is measured as the share of nonperforming loans in gross loans of the banking system, which captures the overall quality of loans in the banking system. A higher share of nonperforming loans indicates a lower quality of banks' loan portfolios, which signals a higher level of fragility of the banking system. Our empirical results suggest that credit deepening, measured as the private credit-to-GDP ratio, is strongly and positively related to banking fragility. This relationship is robust to a number of robustness checks. Moreover, we find that the link between banking fragility and credit deepening differs by the type of credit. Specifically, we distinguish credit allocated to non-financial businesses and credit to households. Our results suggest that banking fragility is associated more with lending to non-financial businesses, rather than lending to households. The implication is that non-financial firms may make wrong investments, and that banks may extend loans for these projects if they do not screen and monitor potential borrowers well enough, e.g., due to lax regulation, too high growth expectations, or high competition in the banking market.

We contribute to the literature in the following ways. First, we examine the relationship between credit deepening and banking fragility, which differs from the literature that links credit deepening to banking crises (see, e.g., Demirgüç-Kunt & Detragiache, 2005). A banking crisis is an outcome, which can be observed, while banking fragility describes the resilience of a financial system, which often precedes a banking crisis. Hence, these two variables are conceptually different. Since banking crises are usually very costly, it is important to examine what determines banking fragility to provide informed advice on how banking fragility, and, ultimately, a banking crisis, can be prevented from occurring. Second, and related to the previous remark, the existing empirical work does not clearly discuss through which mechanism banking crises and credit deepening are associated.

We fill this gap by suggesting that credit deepening tends to increase banking fragility, which may further lead to a higher risk of banking crises. Third, most empirical work looks at credit deepening at the aggregate level. It is not clear whether heterogeneity exists with respect to the impact of different types of credit on banking fragility. We fill this gap by showing that banking fragility is mainly related to the expansion of credit allocated to non-financial business sector, rather than household sector.

The remainder of the chapter proceeds as follows. In section 2.2, we provide a literature review on banks' risk-taking, credit deepening, and banking fragility. In section 2.3, we discuss the methodology used in our empirical analysis and provide a description of the dataset. Section 2.4 presents the estimation results. This chapter concludes in section 2.5.

2.2 Literature Review

Credit deepening, i.e., an increased availability of credit for the private sector, is an important aspect of financial development. While credit deepening is often believed to benefit economic growth (see, e.g., Levine, 2005), the literature also suggests a strong link between credit deepening and the probability of systemic banking crises (Demirgüç-Kunt & Detragiache, 2005; Schularick & Taylor, 2012; Gourinchas & Obstfeld, 2012), though the mechanism explaining how credit deepening leads to a higher chance of banking crises is not well established.

At the bank level, banks are incentivized to take more risk in response to low short-term interest rates. Low nominal interest rates drag the margin between the lending and the deposit rate down (Borio, Gambacorta & Hofmann, 2017), which encourages banks to search for yield by taking more risks (Rajan, 2006). Dell'Ariccia & Marquez (2006) present a theoretical model, in which adverse selection problems incentivize banks to exercise stringent screening to prevent them from lending to borrowers who have been previously evaluated but rejected by their competitor banks. However, low interest rates induced by financial liberalization or an expansionary monetary policy increase credit demand. As new borrowers enter the loan market, the proportion of unknown borrowers, that is, those whose creditworthiness is not known to banks, rises in the economy. In this case, adverse selection becomes less severe, and banks are inclined to soften collateral requirements to gain an edge over their competitors. As a result, eased lending standards lead to a lending

boom, and a deterioration of loan portfolios raises the likelihood of a banking crisis. Delis & Kouretas (2011), Jiménez, Ongena, Peydró & Saurina (2014), Ioannidou, Ongena, & Peydró (2015), and Dell’Ariccia Laeven & Suarez (2017) empirically show that low short-term interest rates significantly increase the risk-taking of banks in the Euro area, Spain, Bolivia, and the United States, respectively.

In addition, banks have become incentivized to take more risk with the advent of a new business model adopted in the banking industry since the issuance of the first mortgage-backed securities in the 1980s. Under the traditional “originate-to-hold” model, banks originate loans and hold them until maturity, i.e., when they are repaid. However, under the new “originate-to-distribute” model, banks originate loans and sell them to the capital markets through a securitization process, which allows banks to transfer credit risk to the third parties. The possibility of sharing risk with the rest of the economy via securitization weakens banks’ incentive to screen and monitor borrowers, which leads to a reduction in loan quality, especially for mortgages (Brunnermeier, 2009; Mian & Sufi, 2009; Keys et al., 2010; Purnanandam, 2011; Dell’Ariccia, Igan & Laeven, 2012; Jiménez, Mian, Peydró & Saurina, 2020). Moreover, since securitization allows banks to sell their loans in the capital markets, it improves the liquidity of loans and provides banks with an alternative funding source without having to rely on taking deposit, which raises banks’ motivation to supply even more credit (Loutskina & Strahan, 2009; Loutskina, 2011). Maddaloni & Peydró (2011) find that the impact of low interest rates on the softening of bank lending standards is intensified by the widespread use of securitization in modern banks.

As a consequence, there are increasing tradable assets lying on asset and liability side of balance sheets, whose value are calculated based on mark to market principle, and the banking system is becoming more market-based (Hardie & Howarth, 2013). In order to target a constant leverage ratio, banks tend to lend more as the value of bank capital increases in good times when asset prices rise, leading to aggressive credit expansion to risky investments or loan structure (Adrian & Shin, 2010). That is why countercyclical capital buffer requirement is introduced into Basel III regulatory standards after the recent global financial crisis 2007-2009. The idea is that banks must maintain a higher capital-to-asset ratio when the economy is performing well and reduce capital-to-asset ratio during economic recessions, which helps to prevent imprudent bank lending from going too far in good times and reduces banking fragility thereby. Indeed, recent evidence shows that tightening of capital requirements reduces supply of bank credit (see, e.g., Aiyar, Calomiris & Wieladek, 2016; Imbierowicz, Kragh & Rangvid, 2018; De Jonghe, Dewachter & Ongena, 2020).

At the macroeconomic level, banks' softened lending standards and reduced screening incentives, e.g., due to lax regulation, high growth expectations, and high competition in the banking market, lead to an increased volume of credit being issued to less-qualified borrowers, e.g., firms with weak debt repayment capabilities, firms with risky investment projects, and/or individuals with low credit scores. As a result, loan quality is likely to deteriorate in the banking system. Moreover, banks' increased lending to the household sector, mainly in the form of mortgages, changed the composition of total private credit. As is illustrated by Jordà, Schularick & Taylor (2017), the average level of credit-to-GDP ratio has increased from about 50% in 1970 to 110% in 2010 in 17 advanced economies. In particular, mortgage lending as a share of GDP has increased from 15% to 60% from 1990 to 2010 on average. Similar trends can be found in Bezemer et al., (2016), who show that on average credit-to-GDP ratio has risen from 75% to 120% over the period 1990–2011 in 14 selected countries, which is largely driven by the growth of mortgages from 20% to 50% in the same period. The consequence of a rising share of household credit in total credit is that the overall effect of credit deepening on income growth will be weakened, because lending to the non-financial business sector tends to facilitate innovations and the growth of productivity and leads to income growth, while lending to the household sector tends to reduce saving and constrain consumption, and its growth-enhancing effect is limited (Becket al., 2012; Sassi & Gasmi, 2014; Bezemer et al., 2016).¹ Since lending by the banking system ultimately turns into the liabilities of individuals and firms in the private sector, a weak growth-enhancing effect of credit deepening means that the obligation of repaying these liabilities will be difficult to realize, as eventually they will have to be repaid out of income. Consequently, the probability that banks are not able to get their loans repaid will be higher, and the banking system will be more likely to default, i.e., banking fragility rises.

While credit deepening tends to increase banking fragility in general, we expect that this relationship differs between non-financial business credit and household credit. In the non-financial business sector, banks' relaxed lending standards and weak screening and monitoring efforts mean that an increasing amount of loans may be extended to the "wrong" investments, i.e., projects with low returns and/or projects with high risk-return, whose risk of default is higher. As a result, credit deepening in the non-financial business sector, due to reduced loan quality, increases the risk of default of the banking system and, thus, banking fragility. In the household sector, banks' softened lending standards means that borrowers with lower credit scores are able to get loans, mainly mortgages, to

¹ Turner (2017) calls this shift in the allocation of bank credit as "too much of the wrong sort of debt", which, he believes, is the key factor for the global 2007-2008 financial crisis.

finance the purchase of real-estate assets. While banks' imprudent lending deteriorates the quality of household loans, it may not necessarily increase default risk of the banking system, as long as asset prices and, therefore, asset values keep growing. In this case, real-estate assets can be sold to repay bank mortgages, when needed. In other words, the risk of lending to non-financial businesses comes from the failure of investment projects, while the risk of lending to households comes from a drop in the value of real-estate assets. The functional difference between non-financial business credit and household credit (see, e.g., Bezemer, 2014) makes their impact on banking fragility different.

Based on the previous discussion, we derive the following hypothesis:

H1: There is a positive relationship between credit deepening and banking fragility;

H2: Banking fragility is associated more with the deepening of non-financial business credit than the deepening of household credit.

2.3 Methodology and Data

The purpose of the empirical analysis is to investigate the relationship between credit deepening and banking fragility, taking into account the effects of other covariates. In order to test our hypothesis, we develop a fixed-effect regression model as our baseline specification:

$$\text{NPLs}_t^i = \alpha + \beta_1 \text{CREDIT}_{t-1}^i + \gamma \mathbf{X}_t^i + \varphi_t + \mu_i + \varepsilon_t^i, \quad (2.1)$$

where i indicates country ($i = 1, 2, \dots, N$) and t refers to year ($t = 1, 2, \dots, T$). Our analysis is based on an unbalanced panel dataset, which covers 124 countries over 1998-2012.

Dependent Variable

The dependent variable is a proxy for banking fragility, which is measured by the ratio of nonperforming loans to gross loans in the banking system (NPLs). The motivation is that

a higher value of NPLs indicates an overall deterioration in the quality of loan portfolio in the banking system and a higher risk of default, i.e., increased banking fragility, which is considered as a warning signal for systemic banking crisis (Čihák & Schaeck, 2010). A loan is categorized as a nonperforming loan if its payments of interest and principal past due by 90 days or more. The data of NPLs is collected from the International Financial Statistics database published by the International Monetary Fund.

Independent Variables

The key explanatory variable is the credit-to-GDP ratio (CREDIT). Specifically, credit refers to total credit issued to the private sector by domestic money banks, comprising commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. Scaled by GDP, CREDIT captures how large the stock of outstanding credit is relative to the total size of the economy. Credit deepening occurs when CREDIT is rising relative to the size of the economy. CREDIT enters the regression with a lag of one period to make sure that causality runs from credit to banking fragility only. The coefficient of interest is β_1 , which is expected to have a positive sign, implying that credit deepening tends to increase banking fragility. The data for CREDIT is collected from the International Financial Statistics database published by the International Monetary Fund.

To examine whether credit type matters with respect to the impact of credit deepening on banking fragility, we further collect data from a new dataset on bank credit allocation constructed by Bezemer et al., (2017), which provides information about credit allocated to two main sectors, i.e., non-financial corporations and households. According to their definition (pp.7), non-financial business credit (NONFINANCIAL) refers to “loans to non-financial companies”, and household credit (HOUSEHOLD) refers to mortgages and consumption credit, the latter of which includes “all types of household loans that are not mortgages. These are, for example, loans for purchase of passenger cars, other consumer durable goods, student loans, and credit card advances”.

Our data shows that there is an overall deepening in both non-financial business credit and household credit during the period 1998-2012. As is illustrated in Panel (a) of Figure 2.1, household credit has, on average, increased sharply from 27.1% to 42.1% (relative to GDP), while non-financial business credit has only experienced a more modest rise from 31.7% to 34.6% (relative to GDP) in this period. Another observation is a change in the composition of total private credit, i.e., a shift from non-financial business sector to household sector, during the process of credit deepening. Panel (b) shows that the share

of non-financial business credit (% total bank credit) drops from 60.5% to 48.6%, while the share of household credit (% total bank credit) increases from 33.8% to 44.5% over 1998-2012.

X is a vector of control variables. Following Demirgüç-Kunt & Detragiache (1998), the first set of control variables includes a number of macroeconomic indicators. First, since banking fragility rises when debt repayment becomes more difficult, we control for the level of income measured by GDP per capita (GDP). Since a higher level of income means that the chance that debt repayment cannot be fulfilled is smaller and, thus, a lower risk of default of the banking system, we expect that GDP per capita is negatively related with banking fragility. Next, Demirgüç-Kunt & Detragiache (2005) argue that high inflation (INFLATION), which indicates monetary instability, is a source of banking fragility. Thus, we control for inflation to capture monetary stability. Data of GDP per capita and inflation comes from the World Development Indicators published by the World Bank. Moreover, we control for credit market deregulation (DERGULATION) as a proxy for financial liberalization. Financial liberalization may be one of the causes of increased risk-taking by banks and, thus, may raise banking fragility (Dell’Ariccia & Marquez, 2006; Cubillas & González, 2014). The data on credit market deregulation are collected from the Fraser Institute.

The second set of covariates is concerned with banking characteristics. First, we control for banking costs (COST), measured by the cost-to-income ratio. A higher value of COST implies lower efficiency in the banking system, which is expected to increase banking fragility. Second, we control for banking concentration (CONCENTRATION), measured by the assets of three largest commercial banks as a share of total commercial banking assets. Beck, Demirgüç-Kunt & Levine (2006) show that the degree of concentration in the banking system, among others, is an important determinant of banking fragility. On the one hand, a more concentrated banking system may be less fragile. The intuition is that first of all a more concentrated banking system tends to have more market power and earn more profit, which can be used as a buffer against adverse shocks. In this case, bank owners and managers tend to be less incentivized to take excessive risk. Second, it is easier to monitor banks in a concentrated banking system, which makes bank supervision more effective and banking fragility less pronounced. On the other hand, banking fragility may be higher in a concentrated banking system. First, more market power in a concentrated banking system motivates banks to charge a higher interest rate when performing lending activities, which induces firms to take greater risk. Second, since a concentrated banking system is generally dominated by a few big and, thereby, important banks, their potential failure is more likely to be a public concern. Consequently, the presence of “too important

to fail” policies intensify banks’ risk-taking incentives, raising banking fragility. Besides, we control for the level of foreign bank ownership (OWNERSHIP), which is measured by the percentage of foreign banks among total banks in a country. Banking fragility is found to be associated with foreign bank ownership (see, e.g., Angkinand & Wihlborg, 2010; Lee & Hsieh, 2014). The data on COST and CONCENTRATION are taken from the Bankscope database. The data on OWNERSHIP come from Claessens & Van Horen (2015).

The third set of covariates are institutional factors. Following the literature on financial stability (e.g., Demirgüç-Kunt & Detragiache, 2002; 2011; Demirgüç-Kunt, Detragiache & Tressel, 2008), we control for the institutional environment using the World Governance Indicators (WGIs) published by the World Bank. WGIs contain six indices, including voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. We construct an indicator of overall institutional quality (INSTITUTION) by taking the average of the above six indices, given that they are overlapping and tautological by definition (Langbein & Knack, 2010). Finally, μ_i is the unobserved time-invariant country-specific fixed effects, φ_t captures time fixed effects, and ε_t^i is the white-noise error term with zero mean. Therefore, our baseline specification is a fixed-effect panel estimation model.² Countries included in the sample are reported in Table 2.A.1. Table 2.A.2 presents the definitions and sources of these variables in detail. Table 2.1 shows the descriptive statistics for the variables used in our analysis. Correlations between the main variables are presented in Table 2.2.

² Cameron and Trivedi (2005) argue that if the fixed-effect model in equation (1) is correctly specified, within estimation and first difference estimation are expected to yield similar estimates for the parameter of interest. In case these two procedures yield dramatically different estimates, we expect that either the assumption of strict exogeneity does not hold for some of the right-hand-side variables, or some important time varying covariates are omitted, which makes the baseline model incorrectly specified. Therefore, we also estimate equation (1) using first-difference approach. In general, we do not find substantial differences between the within estimates and the first-difference estimates, which give more confidence in our results shown in Table 2.3.

(a) Credit Deepening over 1998-2012

(b) Credit Composition over 1998-2012

Figure 2.1. Credit Deepening and Credit Composition over 1998-2012

Figure 2.1 plots the unweighted averages based on authors' own calculations for a panel of 37 countries, including Australia, Austria, Argentina, Belgium, Bulgaria, Belarus, Brazil, Canada, Chile, Czech Republic, Germany, Spain, Estonia, Finland, France, United Kingdom, Greece, Hong Kong, Hungary, Italy, Japan, Kenya, Kyrgyz Republic, Kazakhstan, Lithuania, Malaysia, Norway, Netherlands, New Zealand, Philippines, Poland, Portugal, Russia, Sri Lanka, Sweden, Turkey, and USA. Data is drawn from Bezemer et al., (2017). Panel (a) depicts the evolution of credit deepening of different type of credit over the period 1998-2012. Panel (b) presents the change in the composition of total credit over the period 1998-2012.

Table 2.1. Descriptive Statistics³

Variable	N	Mean	SD	Min	Max
<i>Dependent variable</i>					
NPLs	1,174	7.255	7.944	0.100	74.100
<i>Credit variable</i>					
CREDIT	1,654	41.896	40.738	0.551	212.900
<i>Control variables</i>					
GDP	1,826	7.931	1.668	4.866	11.143
INFLATION	1,676	0.076	0.216	-0.186	6.497
CONCENTRATION	1,609	71.113	19.497	21.417	100.000
OWNERSHIP	1,632	39.239	26.607	0.000	100.000
COST	1,764	60.719	21.472	3.810	382.166
DEREGULATION	1,386	8.187	1.464	1.416	10.000
INSTITUTION	1,612	-0.058	0.946	-2.296	2.046

Table 2.2. Pairwise Correlation Matrix

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
<i>Dependent variable</i>									
[1] NPLs	1.00								
<i>Explanatory variable</i>									
[2] CREDIT	-0.24	1.00							
<i>Control variables</i>									
[3] GDP	-0.49	0.70	1.00						
[4] INFLATION	0.16	-0.22	-0.16	1.00					
[5] CONCENTRATION	-0.02	-0.03	-0.06	0.03	1.00				
[6] OWNERSHIP	-0.02	-0.19	-0.17	-0.02	0.09	1.00			
[7] COST	0.17	-0.05	-0.02	-0.01	-0.04	-0.04	1.00		
[8] DEREGULATION	-0.42	0.41	0.51	-0.21	0.06	0.04	-0.04	1.00	
[9] INSTITUTION	-0.41	0.77	0.83	-0.19	0.09	-0.04	-0.04	0.56	1.00

³ GDP and INFLATION are expressed in logarithm.

2.4 Results

2.4.1 Baseline Analysis

The results of estimating equation (2.1) are presented in Table 2.3. As mentioned above, the dependent variable is NPLs, which measures banking fragility; the key explanatory variable is CREDIT. To start with, we estimate the relationship between credit deepening and banking fragility by controlling for macroeconomic conditions only, i.e., GDP per capita, inflation and credit market deregulation, in column (1). The result suggests that credit deepening is positively associated with banking fragility. The coefficient of credit deepening is 0.121 and is statistically significant at the 1% level, implying that the share of nonperforming loans in gross loans tends to increase 0.121 percentage point when credit-to-GDP ratio increases 1 percentage point. The result from column (1) is robust when we include additional covariates in the specifications in columns (2) and (3), including banking characteristics and institutional quality. In both cases, the coefficients of credit deepening are positive and statistically significant at the 1% level (0.119 and 0.128 respectively). Among the control variables, we find that banking fragility is negatively associated with the level of GDP per capita and positively associated with banking costs at the 1% significance level, implying that, as expected, a financial system tends to have a lower risk of default when the income level is higher in the economy and when the efficiency of banks is higher.

We perform a number of robustness checks in columns (4)-(6). First, we examine how the results change when the outbreak of 2007-2008 global financial crisis is taken into account in column (4). Evidence shows that nonperforming loans tends to increase more substantially during the crisis period than in normal times, as suggested by Ari, Chen & Ratnovski (2019). Hence, we include a dummy variable in the previous regression, which equals to 1 for the presence of a banking crisis, and 0 otherwise (CRISIS). Besides, we also include the interaction term of CRISIS with CREDIT to test whether the impact of credit deepening on banking fragility may differ inside and outside the crisis period. Second, since our data exhibits some extreme values, especially in the variable of our interest NPLs and CREDIT, we winsorize our sample at the 1st and 99th percentiles and redo the

regression in column (5) to examine how country outliers may influence the main results.⁴ Third, we compute the 3-year averages of the annual data and redo the previous analysis in column (6). The purpose is to smooth out potential short-term fluctuations in the variables. Overall, the results from these robustness checks confirm a strong positive relationship between credit deepening and banking fragility. Fourth, it is noteworthy that nonperforming loans are found to be highly persistent, that is the present level of NPLs is expected to be highly correlated with its past value (Nkusu, 2011). Hence, we take the persistence of NPLs into account by including the lagged level of NPLs as an additional explanatory variable on the right-hand side of equation (2.1). The regression model now reads as follows.

$$\text{NPLs}_t^i = \alpha + \beta_0 \text{NPLs}_{t-1}^i + \beta_1 \text{CREDIT}_{t-1}^i + \gamma \mathbf{X}_t^i + \varphi_t + \mu_i + \varepsilon_t^i. \quad (2.2)$$

Estimating the econometric model expressed in equation (2.2) is problematic, since the least square estimator of the fixed-effect model may be biased when the lagged dependent variable is included on the right-hand side of the equation.⁵ To address this problem, we adopt a GMM dynamic panel model (Arellano & Bover, 1995; Blundell & Bond, 1998). We take the first difference of equation (2.2) and obtain the equation below

$$\Delta \text{NPLs}_t^i = \beta_0 \Delta \text{NPLs}_{t-1}^i + \beta_1 \Delta \text{CREDIT}_{t-1}^i + \gamma \Delta \mathbf{X}_t^i + \Delta \varphi_t + \Delta \varepsilon_t^i. \quad (2.3)$$

Under the GMM specification, regressions in levels from equation (2.2) and regressions in differences from equation (2.3) are put together and jointly estimated in a system, in which lagged NPLs in the level equation is instrumented by its first differences from the difference equation, and lagged NPLs in the first-difference equation is instrumented by its lags from the level equation.⁶ The results presented in Table 2.4 suggest that NPLs is persistent, that is, the contemporary level of nonperforming loans is strongly correlated with its past value. In all specifications, the coefficients for $\text{NPLs}_{(-1)}$ are found positive and significant at the 1% level. The results from Hansen test and Arellano-Bond test for serial

⁴ As can be seen from Table 2.1, the minimum level of the dependent variable, i.e., nonperforming loans, is 0.1%, while its maximum reaches 74.1%. When it comes to the main explanatory variable, i.e., total credit as a share of GDP, the minimum is 0.551%, while the maximum reaches 212.9%. We also winsorize INFLATION, DEREGULATION, and COST at the 1st and 99th percentiles and put them in the regression as these variables also exhibit extreme values.

⁵ Formally, the problem arises that $(\text{NPL}_{t-1}^i - \overline{\text{NPL}_{t-1}})$ is correlated with $(\varepsilon_t^i - \bar{\varepsilon}_t)$ by construction after the within transformation of equation (2.1), where $\overline{\text{NPL}_{t-1}} = \frac{1}{T-1} \sum_{t=2}^T \text{NPL}_{t-1}^i$.

⁶ In all specifications, we treat lagged NPLs and CREDIT as endogenous. Four lags are used as instruments.

correlation indicate that the regression models are correctly specified.⁷ More importantly, the results once again confirm a positive impact of credit deepening on banking fragility, even after the persistence of nonperforming loans is taken into account. This is captured by the coefficients of CREDIT, which are always positive and highly significant. Overall, the evidence we have found so far supports our first hypothesis, that is, credit deepening increases banking fragility.

Table 2.3. Credit Deepening and Banking Fragility: Fixed Effect Estimation

	(1) Full sample	(2) Full sample	(3) Full sample	(4) Crisis period	(5) Country outlier	(6) 3-year averages
CREDIT	0.121*** (0.024)	0.119*** (0.024)	0.128*** (0.025)	0.140*** (0.025)	0.141*** (0.025)	0.105*** (0.029)
GDP	-17.311*** (3.779)	-14.664*** (4.110)	-12.886*** (4.163)	-13.766*** (4.140)	-13.710*** (3.849)	-10.729 (6.560)
INFLATION	6.632 (6.049)	4.893 (5.935)	4.723 (6.935)	-0.695 (6.975)	5.916 (6.453)	-11.856 (13.534)
DEREGULATION	-0.593 (0.371)	-0.652* (0.362)	-0.549 (0.378)	-0.808** (0.361)	-0.546 (0.368)	-0.280 (0.581)
CONCENTRATION		0.043* (0.024)	0.038 (0.023)	0.036 (0.022)	0.037 (0.022)	0.047 (0.033)
OWNERSHIP		0.001 (0.048)	0.010 (0.044)	0.003 (0.046)	0.015 (0.042)	0.011 (0.063)
COST		0.062*** (0.015)	0.065*** (0.013)	0.040*** (0.014)	0.073*** (0.015)	0.055*** (0.021)
INSTITUTION			-0.859 (2.291)	-0.496 (2.253)	-0.361 (2.135)	-5.431 (4.746)
CRISIS				5.851*** (1.452)		
CREDIT × CRISIS				-0.057*** (0.013)		
Observations	979	921	859	859	859	309
Number of id	95	90	90	90	90	88
R-squared	0.383	0.436	0.446	0.450	0.464	0.459

Note: This table presents the results of baseline regression based on equation (2.1). The dependent variable is nonperforming loans (NPLs), which measures banking fragility. The key explanatory variable is the share of private credit in GDP (CREDIT), which measures credit deepening. In all specifications, constants, time-fixed effects, and country-fixed effects are included (coefficients are not reported). Standard errors robust to heteroscedasticity and serial correlation are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

⁷ We perform Hansen test to check if over-identifying restrictions are valid. We also check if second-order autocorrelation exists in the residuals from the difference equation. It is expected that there exists first-order autocorrelation by construction, but not at the second order, if the assumption that the error term ε_t^i in the level equation does not exhibit autocorrelation is warranted. Formally, it is expected that there is first-order autocorrelation, i.e., $\text{cov}[(\varepsilon_t^i - \varepsilon_{t-1}^i), (\varepsilon_{t-1}^i - \varepsilon_{t-2}^i)] \neq 0$, but not at the second order, i.e., $\text{cov}[(\varepsilon_t^i - \varepsilon_{t-1}^i), (\varepsilon_{t-2}^i - \varepsilon_{t-3}^i)] = 0$.

Table 2.4. Credit Deepening and Banking Fragility: Dynamic Panel Estimation

	(1) Full sample	(2) Full sample	(3) Full sample	(4) Crisis period	(5) Country outlier	(6) 3-year averages
NPLS ₍₋₁₎	0.673*** (0.073)	0.638*** (0.087)	0.636*** (0.086)	0.549*** (0.101)	0.708*** (0.110)	0.464*** (0.130)
CREDIT	0.038** (0.015)	0.030*** (0.012)	0.046*** (0.015)	0.020* (0.012)	0.054*** (0.018)	0.118*** (0.033)
GDP	-1.064*** (0.377)	-0.988** (0.420)	-0.375 (0.408)	-0.552 (0.414)	-0.263 (0.412)	-0.930 (0.869)
INFLATION	6.698*** (2.469)	3.607 (3.795)	2.614 (3.954)	-3.389 (5.391)	0.899 (4.219)	14.337 (15.981)
DEREGULATION	-0.186 (0.157)	-0.242 (0.162)	-0.072 (0.155)	-0.249 (0.191)	-0.050 (0.196)	-0.357 (0.402)
CONCENTRATION		-0.000 (0.010)	0.003 (0.010)	0.012 (0.011)	0.004 (0.012)	0.013 (0.027)
OWNERSHIP		0.009 (0.009)	0.022** (0.010)	0.013 (0.010)	0.023** (0.010)	0.036 (0.028)
COST		0.027** (0.013)	0.028** (0.012)	0.027*** (0.010)	0.026** (0.012)	0.043** (0.022)
INSTITUTION			-1.750*** (0.672)	-1.142** (0.629)	-2.074*** (0.801)	-2.985** (1.331)
CRISIS				3.759*** (1.061)		
CREDIT × CRISIS				-0.015 (0.015)		
Time fixed effect	YES	YES	YES	YES	YES	YES
Observations	935	882	828	748	828	289
Number of id	91	87	87	86	87	81
AR(2)	0.248	0.316	0.132	0.233	0.117	0.182
Hansen test	0.675	0.953	0.538	0.999	0.577	0.164

Note: This table presents the results of baseline regression based on equation (2.2) and equation (2.3). The dependent variable is nonperforming loans (NPLs), which measures banking fragility. The key explanatory variable is the share of private credit in GDP (CREDIT), which measures credit deepening. In all specifications, constants, time-fixed effects, and country-fixed effects are included (coefficients are not reported). AR(2) is the Arellano-Bond test for second-order serial correlation in the residuals (p -value is reported). The Hansen test is a test of over-identification restrictions (p -value is reported). Robust standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

2.4.2 Does the Type of Credit Matter?

To investigate whether credit deepening of different types of credit has a different impact on banking fragility, we repeat the baseline analysis by examining both non-financial business credit and household credit in Table 2.5. In column (1), we find a strong positive relationship between banking fragility and deepening in non-financial business credit (the coefficient of NONFINANCIAL is 0.241). However, we do not find evidence that deepening in household credit has a significant impact on banking fragility. It implies that credit deepening in the non-financial business sector tends to raise nonperforming loans in the banking system, while credit deepening in the household sector does not. This supports our second hypothesis.

We interpret this result in the following way. First, the positive link between banking fragility and deepening in non-financial business credit implies that lending to non-financial businesses is risky, in that firms may borrow to invest in productive but risky projects. Banks may extend loans for these projects if they do not screen and monitor them well enough, for example, due to lax regulation, too high growth expectations during an economic booming, or high competition in the banking market. Consequently, increased banks' lending to non-financial businesses raises banking fragility. Second, in our analysis mortgages account for about 70% of total household credit, i.e., the sum of household mortgages and consumption credit. Typically, mortgages are taken by households for the purchase of real-estate assets, which serve as collateral. As long as asset prices rise, a high level of mortgage-to-GDP ratio may not lead to an increased level of nonperforming loans. Therefore, the values of real-estate assets grow steadily so that assets can be sold to repay the debt before household default occurs. This explains why the impact of deepening in household credit on the level of nonperforming loan in the banking system may not be significant. Indeed, the overall housing prices (HOUSINGPRICE) have been increasing steadily during 1998-2007, before the outbreak of the recent financial crisis (see Figure 2.2).

To test this explanation, we split our sample into two periods, namely the pre-crisis period (1998-2007) and the post-crisis period (2008-2012) and redo the previous regression in each of the subsample. The purpose is to examine whether household credit deepening has a different impact on banking fragility before and after the global crisis. Estimation results in column (2) shows that deepening in household credit does not have a significant impact on banking fragility before the outbreak of the financial crisis. Instead, banking fragility in the pre-crisis period is associated more with the deepening of non-financial business credit. However, in the post-crisis period it is household credit that increases banking fragility. The coefficient for HOUSEHOLD is 0.104 and significant at 10% level

in column (3). This seems to indicate that household credit deepening matters for banking fragility mainly in the period when asset prices start to drop sharply.

Table 2.5. Credit Deepening and Banking Fragility: Does the Type of Credit Matter?

	(1) Full period	(2) Pre-crisis period	(3) Post-crisis period	(4) Post-crisis period	(5) Pre-crisis period	(6) Post-crisis period	(7) Post-crisis period
NONFINANCIAL	0.241*** (0.059)	0.195*** (0.072)	0.001 (0.073)	-0.050 (0.068)	0.174** (0.068)	0.013 (0.074)	-0.056 (0.068)
HOUSEHOLD	-0.020 (0.023)	-0.007 (0.030)	0.104* (0.058)	0.123** (0.052)			
MORTGAGE					-0.001 (0.041)	0.149** (0.059)	0.117** (0.055)
GDP	-13.696*** (4.806)	-21.348*** (4.430)	-15.939*** (5.707)	-26.425*** (8.323)	-20.083*** (4.353)	-15.008*** (5.089)	-27.456*** (8.336)
INFLATION	-9.334 (5.944)	4.157 (3.359)	-36.848*** (10.226)	-13.390 (16.075)	4.743 (3.212)	-35.675*** (9.758)	-14.104 (16.109)
DEREGULATION	-0.812 (0.638)	-1.206** (0.517)	0.006 (0.451)	0.377 (0.255)	-1.329** (0.535)	0.593 (0.616)	0.387 (0.273)
CONCENTRATION	0.078*** (0.025)	0.062*** (0.022)	-0.009 (0.021)	0.021 (0.033)	0.058** (0.023)	-0.024 (0.026)	0.010 (0.032)
OWNERSHIP	0.021 (0.064)	0.077 (0.063)	-0.098 (0.142)	-0.131 (0.146)	0.075 (0.060)	-0.064 (0.135)	-0.174 (0.138)
COST	0.076*** (0.015)	0.034** (0.017)	0.081*** (0.013)	0.047*** (0.014)	0.039** (0.018)	0.082*** (0.016)	0.044*** (0.013)
INSTITUTION	-3.250 (3.246)	-1.076 (2.636)	-10.098** (3.809)	-7.640* (3.778)	-0.772 (2.752)	-12.024*** (4.083)	-7.632** (3.698)
HOUSINGPRICE				-0.092*** (0.033)			-0.092*** (0.032)
Observations	498	258	240	156	275	255	161
R-squared	0.414	0.533	0.442	0.689	0.525	0.408	0.679
Number of id	51	45	51	34	48	54	35

Note: This table presents the results of estimating the impact of deepening in different types of credit on banking fragility based on equation (2.1). The dependent variable is nonperforming loans (NPLs), which measures banking fragility. The key explanatory variable is the share of non-financial business credit (NONFINANCIAL), household credit (HOUSEHOLD), and mortgages (MORTGAGE) as a percentage of GDP. In all specifications, constants and country-fixed effects are included (coefficients are not reported). Standard errors robust to heteroscedasticity and serial correlation are reported in parentheses.

Figure 2.2. Housing Price over 1998-2012

Figure 2.2 plots the evolution of the average Housing Price Index (drawn from OECD) over the period 1998-2012 for a panel of 24 countries, including Australia, Belgium, Canada, Columbia, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Korea, South Africa, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

To substantiate this argument, we further control for the effect of housing prices (HOUSINGPRICE) and redo the estimation in column (4). In line with our expectation, the result shows that the housing price is, indeed, an important determinant of banking fragility. The coefficient before HOUSINGPRICE is -0.092, which is highly significant at 1% level.⁸ The interpretation is straightforward: nonperforming loans in the banking system tends to be lower in the period when housing prices are rising. Besides, household credit deepening is found to raise banking fragility, with a coefficient of 0.123 significant at 5% level. Since the major component of household credit is mortgages, we also examine the impact of credit deepening in mortgages, in particular, on banking fragility before and after the global crisis, which serves as a robustness test for the previous analysis. Again, we find consistent results. The main message is that banking fragility is associated more strongly with deepening in non-financial business credit in the pre-crisis period (column (5)), while mortgage deepening has a more significant impact on banking fragility in the post-crisis period (column (6)), even after the effect of housing prices is controlled for (column (7)).

⁸ Unfortunately, the number of observations in the regression drops substantially due to data limitation on housing prices.

2.5 Conclusion and Discussion

In this chapter, we empirically investigate the relationship between credit deepening and banking fragility. Using panel data from 124 countries over the period 1998-2012, we find that credit deepening has a positive impact on banking fragility, which supports our hypothesis. We explain this finding by pointing out that credit deepening may be driven by banks' relaxed lending standards, motivated by financial liberalization policies (e.g., low interest rates), and new financial technologies (e.g., securitization). As a result, banks are triggered to provide lending more imprudently. This undermines the loan quality in the banking system and leads to an increased risk of default, i.e., banking fragility, which serves as an explanation for the predictive power of credit deepening for banking crises established in the literature (e.g., Demirgüç-Kunt & Detragiache, 2005). Moreover, our results suggest that banking fragility is strongly related to increased bank lending to non-financial corporations, while not lending to households. Our explanation is that since household credit, mainly in the form of mortgages, is backed by real-estate assets, bank lending to households may not necessarily lead to more nonperforming loans as long as asset prices, and, therefore, the values of real-estate assets, keep growing steadily. Indeed, we find that household credit does not have a significant impact on banking fragility in the pre-crisis period (1998-2007), during which there was an overall rise in housing prices. However, this relationship turns positive and significant in the post-crisis period (2008-2012), when housing prices plunged.

Our empirical analysis is limited by data availability. First, the sample only covers the period from 1998 to 2012, due in part to the limited data on nonperforming loans at the country level. Hence, future research can study the relationship between credit deepening and banking fragility within a longer period. Second, our results show that the expansion of non-financial business credit tends to increase default risk of the banking system. This suggests that credit may go to less-qualified corporations, or that credit may not be used productively to support promising investment opportunities, or that credit may be used to finance risky projects. Unfortunately, we are not able to test these possibilities, because the available data only allows us to observe how much credit is allocated to non-financial corporations, but not how credit is put into actual use. Future research can further explore the mechanism through which non-financial business credit is linked to banking fragility.

Our findings provide several implications for policymakers. First, the literature stresses that credit deepening is a key aspect of financial development, which is believed to benefit economic growth and development. However, our results suggest that credit deepening also have drawbacks, that is, it may trigger banking fragility. Hence, policymakers should not focus on the growth-enhancing benefit of credit deepening only, while losing sight of the potential risk of financial instability (see, also, Andrianova & Demetriades, 2018; Beck, 2014; Creel, Hubert & Labondance, 2021). Second, and related to the previous comment, since banking fragility is highly linked to the expansion of non-financial business credit, financial development policies should not only aim at promoting firms' access to credit, but also make sure that these policies are implemented in a way that the risk of default of the banking system can be under control. It is important that banks do sufficient screening such that credit is granted to qualified firms, and sufficient monitoring, such that credit is used in a productive manner.

2.A List of Countries in the Sample

Table 2.A.1

Albania	Algeria	Angola
Argentina	Australia	Austria
Azerbaijan	Bangladesh	Belarus
Belgium	Benin	Bolivia
Botswana	Brazil	Bulgaria
Burkina Faso	Burundi	Cameroon
Canada	Cape Verde	Central African Republic
Chad	Chile	China
Colombia	Congo Dem	Rep Congo
Costa Rica	Cote d'Ivoire	Czech Republic
Denmark	Djibouti	Dominican Republic
Ecuador	Egypt	El Salvador
Equatorial Guinea	Eritrea	Estonia
Ethiopia	Finland	France
Gabon	Gambia	Georgia
Germany	Ghana	Greece
Guatemala	Guinea	Guinea-Bissau
Hong Kong	Hungary	India
Indonesia	Ireland	Israel
Italy	Jamaica	Japan
Jordan	Kazakhstan	Kenya
Korea (Rep)	Kyrgyzstan	Latvia
Lesotho	Liberia	Libya
Lithuania	Madagascar	Malawi
Malaysia	Mali	Mauritania
Mauritius	Mexico	Morocco
Mozambique	Namibia	Nepal
Netherlands	New Zealand	Nicaragua
Niger	Nigeria	Norway
Pakistan	Paraguay	Peru
Philippines	Poland	Portugal
Romania	Russia	Rwanda
Sao Tome and Principe	Senegal	Seychelles
Sierra Leone	Singapore	South Africa
Spain	Sri Lanka	Sudan
Swaziland	Sweden	Switzerland
Taiwan	Tanzania	Thailand
Togo	Tunisia	Turkey
Uganda	Ukraine	United Kingdom
United States	Uruguay	Uzbekistan
Venezuela	Vietnam	Zambia
Zimbabwe		

2.B Data Description and Sources

Table 2.A.2

	Short definition	Source
<i>Dependent variable</i>		
NPLs	Bank nonperforming loans to gross loans	Financial Soundness Indicators
<i>Credit variable</i>		
CREDIT	Private credit by deposit money banks (% GDP)	International Financial Statistics
NONFINANCIAL	Loans to non-financial companies (% GDP)	Bezemer et al., (2017)
HOUSEHOLD	The sum of mortgages and consumption credit (% GDP)	Bezemer et al., (2017)
<i>Control variables</i>		
GDP	GDP divided by midyear population (in logarithm)	World Development Indicators
INFLATION	Growth rate of Consumer price index (in logarithm)	World Development Indicators
DEREGULATION	An index that measures the degree of regulatory restraints that limit the freedom of exchange in credit, based on the extent to which the banking industry is privately owned; the extent to which credit is supplied to the private sector; and the degree of interest rates interference.	Fraser Institute
CONCENTRATION	Assets of three largest commercial banks as a share of total commercial banking assets (%)	Bankscope, Bureau van Dijk (BvD)
OWNERSHIP	Foreign banks among total banks (%)	Claessens and Van Horen (2015)
COSTS	Bank overhead costs to income (%)	Bankscope, Bureau van Dijk (BvD)
INSTITUTION	Overall level of institutional development measured by the average of six sub-components.	Author's own calculation
CRISIS	Dummy=1, if observation is in a banking crisis, otherwise 0.	Global Financial Development Database
CREDIT×CRISIS	Interaction between CREDIT and CRISIS	Author's own calculation

2.C Data: Total Credit (% GDP) and NPLs (% Total Bank Loans)

Table 2.A.3

	NPLs	Credit		NPLs	Credit		NPLs	Credit
Albania	9.00	17.88	Indonesia	14.25	24.59	Seychelles	5.01	20.16
Algeria	16.38	10.15	Ireland	4.99	112.74	Sierra Leone	18.83	3.65
Argentina	7.53	13.87	Israel	3.71	78.82	Singapore	3.65	96.81
Australia	0.95	99.89	Italy	8.31	73.52	South Africa	3.41	68.00
Austria	2.53	92.23	Jamaica	11.00	22.09	Spain	2.43	127.21
Azerbaijan	4.98	9.52	Japan	3.83	124.56	Sri Lanka	3.70	27.58
Bangladesh	25.71	29.62	Jordan	10.43	72.90	Thailand	13.19	105.56
Belarus	5.24	16.55	Kazakhstan	17.40	27.59	Tunisia	18.78	57.09
Belgium	2.59	62.38	Kenya	17.83	27.01	Turkey	7.72	23.94
Bolivia	8.33	43.18	Kyrgyzstan	8.07	7.81	Uganda	5.67	9.17
Botswana	2.15	19.06	Latvia	5.40	49.01	Ukraine	17.67	32.60
Brazil	4.77	37.06	Lesotho	2.49	12.06	United Kingdom	2.52	148.95
Bulgaria	8.14	38.89	Lithuania	9.63	31.98	Tanzania	13.54	9.47
Burundi	8.33	16.82	Madagascar	8.60	9.27	United States	2.01	51.51
Cameroon	11.03	9.22	Malaysia	10.05	113.63	Uruguay	7.26	32.71
Canada	0.98	108.72	Mauritania	36.73	24.50	Venezuela	4.04	13.97
Chile	1.64	62.00	Mauritius	4.16	68.40	Vietnam	2.46	58.70
China	10.83	108.70	Mexico	3.89	16.44	Zambia	11.10	8.07
Colombia	5.90	27.54	Morocco	12.01	54.21			
Congo Dem	1.20	4.83	Mozambique	8.01	14.29			
Costa Rica	2.13	32.99	Namibia	2.63	44.99			
Czech Republic	9.03	41.84	Netherlands	2.40	114.44			
Denmark	1.88	147.60	New Zealand	1.35	115.76			
Djibouti	9.60	27.10	Nicaragua	5.20	24.20			
Dominican Rep	4.09	22.40	Nigeria	17.34	15.83			
Ecuador	8.83	22.75	Norway	1.23	70.83			
Egypt	17.31	43.89	Pakistan	14.95	23.07			
El Salvador	2.97	83.78	Paraguay	7.42	22.26			
Estonia	1.79	59.50	Peru	5.98	22.57			
Finland	0.55	67.60	Philippines	10.89	30.34			
France	4.23	84.11	Poland	10.14	33.89			
Gabon	9.52	9.41	Portugal	3.71	127.22			
Georgia	4.48	16.58	Republic of Korea	2.70	80.60			
Germany	3.93	102.64	Romania	7.72	21.01			
Ghana	14.33	11.89	Russia	6.67	25.73			
Greece	9.55	70.05	Rwanda	26.43	9.37			
Guatemala	3.82	22.94	Senegal	16.81	20.55			
Hong Kong	3.05	153.84	Swaziland	7.26	17.13			
Hungary	5.41	44.97	Sweden	1.13	91.56			
India	6.95	35.61	Switzerland	1.72	149.66			

2.D Data: Credit Composition (% Total Private Credit)

Table 2.A.4

	Non-financial business credit	Mortgages	Consumer credit	Household credit
Australia	34.72	50.13	7.39	57.52
Austria	56.55	25.68	9.60	35.28
Belarus	78.44	15.65	5.22	20.87
Belgium	41.26	38.26	7.00	45.26
Botswana	38.54	18.44	41.79	60.23
Brazil	62.30	6.98	20.95	27.93
Canada	30.29	37.11	22.50	59.61
Cote d'Ivoire	56.38	22.85	12.99	35.84
Denmark	27.37	51.59	16.37	67.96
Estonia	45.39	29.81	8.08	37.89
Finland	36.08	44.70	17.81	62.51
France	43.78	34.82	15.19	50.01
Georgia	65.75	16.99	19.72	36.71
Germany	52.38	32.90	10.64	43.54
Greece	56.04	28.20	13.79	41.99
Hong Kong	50.30	31.24	8.70	39.94
Hungary	48.03	16.82	13.38	30.2
India	74.49	9.21	9.53	18.74
Indonesia	61.21	7.99	21.18	29.17
Ireland	39.30	35.59	9.68	45.27
Italy	54.71	16.10	15.24	31.34
Japan	54.07	34.57	2.87	37.44
Kazakhstan	78.59	5.92	12.23	18.15
Kenya	79.61	4.83	10.28	15.11
Kyrgyzstan	50.93	37.03	9.13	46.16
Libya	62.36	21.73	8.58	30.31
Malawi	43.16	25.06	20.51	45.57
Mexico	50.82	38.29	9.89	48.18
Nepal	31.49	46.65	5.16	51.81
Netherlands	26.69	50.21	3.18	53.39
Nigeria	34.47	51.02	11.31	62.33
Norway	84.52	2.13	9.15	11.28
Peru	68.49	4.23	7.84	12.07
Philippines	46.03	20.77	29.25	50.02
Poland	38.36	39.49	11.05	50.54
Portugal	51.30	26.66	17.85	44.51
Romania	49.90	12.91	35.47	48.38
Russia	82.28	5.22	16.94	22.16
Sri Lanka	72.38	7.80	15.11	22.91
Sweden	34.85	25.12	7.80	32.92

Table 2.A.4 (continued)

	Non-financial business credit	Mortgages	Consumer credit	Household credit
Tanzania	45.59	16.97	33.77	50.74
Tunisia	75.07	10.86	13.06	23.92
Uganda	72.57	14.13	17.35	31.48
Ukraine	19.39	43.37	9.08	52.45

2.E Data: Credit Composition (% GDP)

Table 2.A.5

	Non-financial business credit	Mortgages	Consumer credit	Household credit
Australia	37.22	55.22	7.83	63.05
Austria	44.30	20.18	7.55	27.73
Belarus	21.15	4.69	1.56	6.25
Belgium	29.92	27.80	5.09	32.89
Botswana	9.65	4.62	10.44	15.06
Brazil	20.05	2.41	7.16	9.57
Canada	37.90	47.11	28.51	75.62
Cote d'Ivoire	22.85	9.98	5.48	15.46
Denmark	42.32	79.58	25.63	105.21
Estonia	29.19	22.40	5.44	27.84
Finland	25.00	34.65	13.52	48.17
France	36.32	29.65	12.42	42.07
Georgia	13.17	4.38	3.82	8.2
Germany	52.32	32.73	10.61	43.34
Greece	40.09	22.80	11.03	33.83
Hong Kong	72.50	44.47	12.49	56.96
Hungary	13.33	5.26	3.92	9.18
India	25.29	3.25	3.26	6.51
Indonesia	15.75	2.08	5.49	7.57
Ireland	64.68	57.32	15.53	72.85
Italy	47.18	14.50	13.01	27.51
Japan	48.80	30.70	2.59	33.29
Kazakhstan	24.48	2.43	5.31	7.74
Kenya	23.05	1.50	3.10	4.6
Kyrgyzstan	41.04	29.90	7.39	37.29
Libya	20.52	10.17	3.95	14.12
Malawi	47.26	26.42	21.59	48.01
Mexico	15.11	11.66	3.06	14.72
Netherlands	35.96	68.15	4.23	72.38
Nigeria	35.03	52.19	11.59	63.78
Norway	17.30	0.46	2.04	2.5
Peru	21.79	1.37	2.36	3.73
Philippines	15.10	8.87	10.26	19.13
Poland	49.73	51.94	14.20	66.14
Portugal	59.07	30.14	20.64	50.78
Romania	19.34	5.02	13.72	18.74
Russia	24.28	2.21	6.76	8.97
Sri Lanka	18.90	2.07	4.04	6.11
Sweden	53.15	40.00	11.83	51.83
Tanzania	46.98	17.51	35.08	52.59

Table 2.A.5 (continued)

	Non-financial business credit	Mortgages	Consumer credit	Household credit
Tunisia	13.82	2.50	3.04	5.54
Uganda	34.51	9.39	10.81	20.2
Ukraine	21.13	48.00	9.60	57.6

Chapter 3

Formal Institutions and Financial Inclusion: Evidence from Cross-Country Analysis

3.1 Introduction

In general, a financial system is considered *inclusive* if it offers financial products and services not only to those who have already accessed the financial system, but also those who were previously excluded from formal finance. Hence, financial inclusion captures the extent to which a financial system has developed to allow more individuals to access the financial system and make use of financial resources. By improving financial inclusion, individuals who largely live outside the mainstream financial system are able to finance prospective economic opportunities and improve their well-being. Therefore, financial inclusion is especially important for the disadvantaged groups and is expected to impose a positive impact on economic growth, poverty, and income inequality (Beck, Levine & Loayza, 2000; Beck et al., 2007).

Nevertheless, empirical evidence on the determinants of cross-country variations in financial inclusion is still scant, largely because country-level data on financial inclusion

has not been made accessible until recently. In particular, it is not clear whether better *formal institutions*, e.g., laws, property rights, and governance, help to promote financial inclusion. This chapter aims to fill this gap by looking at the relationship between formal institutions and financial inclusion, using the latest release of the Global Findex Database (2017 edition). This dataset provides us with comprehensive information on how people make use of financial products and services across the world. Specifically, we measure *financial inclusion* by the uptake of four basic financial services, namely, formal accounts, saving, borrowing, and digital payments. Hence, a country is said to have a higher level of financial inclusion if the percentage of individuals (aged 15+), who have used these financial services, is higher.

To start with, we revisit the theory of law and finance put forward by La Porta et al., (1997; 1998) and investigate whether financial inclusion is explained by a country's legal tradition, i.e., whether the country has an English common law, French civil law, German civil law, Scandinavian civil law, or Socialist law system, which forms the basis of formal institutions. Since these legal traditions differ with respect to how well investor rights are protected, how effective financial contracts are enforced, and how flexible a legal system is to adapt itself to the changes of economic environment, it is expected that a country's legal system explains the degree to which financial services are used and, thus, determine financial inclusion. We further examine whether better institutional quality has a positive impact on financial inclusion. The rationale is that strong formal institutions are expected to foster investor rights protection and contract enforcement, which not only incentivizes financial institutions to provide more financial services, but also increases individuals' willingness to use financial services, leading to a higher level of financial inclusion.

Results from our cross-country regressions show that a country's legal tradition has a strong explanatory power on financial inclusion. Consistent with Levine et al., (2000), we find that countries with an English common law tradition have a higher level of financial inclusion, while financial inclusion is lower in French civil law countries. In addition, our results suggest a strong positive relationship between formal institutions and financial inclusion, which is robust to different measures for institutions and model specifications. Moreover, we find that the impact of institutions on financial inclusion is conditional on the degree of prevailing financial barriers, such as transaction costs, geographical obstacle to accessing financial infrastructure, lack of documentation, financial illiteracy, lack of trust in financial institutions, lack of economic opportunities, and insufficient income. In general, we find that the positive impact of formal institutions on financial inclusion is weaker for a higher degree of financial barriers.

We contribute to the literature in the following ways. First, while the literature has established a positive impact of formal institutions on financial development (see, e.g., Fergusson, 2006; Fernández & Tamayo, 2017), it remains not clear whether the positive impact operates on the intensive or the extensive margin. That is, it is not clear whether formal institutions promote financial development, because more financial services have been provided to those who have already accessed the financial system, or because more formerly excluded individuals have started to use financial services. We shed light on this by explicitly examining whether better formal institutions increase the share of adults that make use of financial services. To the best of our knowledge, we are the first to empirically test the theory of law and finance with a focus on financial inclusion, using information from the Global Findex Database. Second, the literature highlights that improvement of the institutional environment helps to broaden *financial access*, which generally refers to the outreach of financial infrastructure indicated by the number of bank branches or ATM machines (e.g., Claessens, 2006; World Bank, 2007; Beck, Demirgüç-Kunt & Peria, 2008; Beck, Demirgüç-Kunt & Honohan, 2009). While having access to finance is a prerequisite for financial inclusion, it should be carefully distinguished from the use of finance. Access mainly captures the supply side of a financial system, while use focuses on the uptake of financial services, which is an outcome of both the supply and demand. Therefore, a high level of financial access does not necessarily imply a high level of financial usage since individuals who have access to financial resources may still choose not using financial services due to the presence of various financial barriers. We provide the first empirical study at the country level that investigates the impact of formal institutions on the uptake of financial services, while taking the role of financial barriers into account. Third, and related to the previous remark, we further explore the interaction effect between formal institutions and financial barriers on financial inclusion, which has not been tested in the existing empirical literature. The idea is that while strong formal institutions have a direct positive impact on financial inclusion, the effect will be weaker if the degree of prevailing financial barriers is high. Our results suggest that promoting financial inclusion not only requires improvement of the institutional environment, but also an endeavor to reduce the degree of financial barriers that may lead to self-exclusion from using formal financial services.

The remainder of this chapter proceeds as follows. In section 3.2, we review the relevant literature. In section 3.3, we discuss the methodology used in our empirical analysis, and provide a description of the data set. Section 3.4 discusses the estimation results. This chapter concludes in section 3.5.

3.2 Literature Review

3.2.1 The Theory of Law and Finance

The theory of law and finance highlights that cross-country differences in financial development, which is generally indicated by an increased volume of financial activities supplied by the financial system, can be explained by the power of the legal system in protecting shareholders and creditors rights and enforcing financial contracts (La Porta et al., 1998). From the perspective of corporate finance, firms can be viewed as a bundle of investment projects, which can be financed by equity or debt instruments. Debt and equity securities are legal claims on the cash flows generated by investments. In the case of equity financing, cash flows may not return to the shareholders due to asymmetric information. For example, the managers of a firm may have private information, which allows them to expropriate the profits to benefit themselves rather than act in the interest of shareholders (Modigliani & Perotti, 1997). Therefore, institutions that better protect shareholders rights are expected to reduce agent problems and stimulate the use of equity instruments, which boosts stock market development, i.e., a higher level of stock market capitalization. In the case of debt financing, institutions that are aimed to reduce adverse selection problems, e.g., by promoting information-sharing in lending activities (Pagano & Jappelli, 1993), and strengthen debt contract enforcement, e.g., by promoting judicial independence (Djankov, La Porta, Lopez-de-Silanes & Shleifer, 2003b), are expected to lead to credit market development, i.e., a larger amount of credit extended to the private sector.

In addition, the theory of law and finance suggests that cross-country differences in investor rights protection and contract enforceability can be explained by a country's legal tradition. Broadly, the theory distinguishes two legal traditions, i.e., the common versus the civil law tradition. The common law tradition originated in England, while civil law tradition originates from Roman law and can be further categorized into French, German, and Scandinavian families. Through colonization and imitation, these legal traditions spread, evolved, and shaped the contemporary legal systems across the world. Djankov, Glaeser, La Porta, Lopez-de-Silanes & Shleifer (2003a) provide an illustration:

"In the 12th and 13th centuries, England and France established the foundations of their modern legal systems, which took quite different forms. England developed a system of common law, characterized by fact-finding by juries, relatively independent judges, infrequent appeals, and the reliance on precedents and judge-made law rather than on strict codes in reaching decisions.

Following the Roman tradition, France adopted a system of civil law, characterized by fact-finding by state-employed judges, automatic superior review of decisions, and later the reliance on procedural and substantive codes rather than judicial discretion. During his wars, Napoleon exported the French legal system to Spain, Portugal, and Holland. Through his and their colonial conquests, it was transplanted to Latin America, to large parts of Europe and North and West Africa, and to parts of the Caribbean and Asia. The common law tradition was transplanted by England to the US, Canada, Australia, New Zealand, East Africa, to large parts of Asia, including India, and to parts of the Caribbean. Two other legal traditions-German civil law and socialist law-were also transplanted. The German legal system was voluntarily adopted by Switzerland, by Austro-Hungary, and later by Japan; through Japan German civil law influenced the legal systems of Korea, Taiwan, and China. The Union of Soviet Socialist Republics transplanted its legal system to socialist countries. These channels of both voluntary and colonial transplantation have led to systematic variation in legal systems among countries" (p.605 & 609).

La Porta et al., (1998) suggest that creditor and shareholder rights protection is stronger in common law countries, compared with those with a civil law tradition. In civil law countries, creditor rights protection is weakest in French civil law countries, compared with German and Scandinavian civil law countries. More specifically, shareholder rights protection captures how well a legal system protects the rights of minority shareholders with respect to 1) the right to mail their proxy vote to the firms; 2) the right to not deposit their shares prior to a shareholder meeting; 3) the right to vote for directors cumulatively or to represent minorities on the board; 4) the right to object to directors or their decisions; 5) the right to purchase new issues of stock in order to prevent dilution; and 6) the right to call an extraordinary shareholder meeting. The strength of creditor rights protection depends on whether: 1) laws impose an automatic stay on the assets upon reorganization; 2) secured creditors are assured to get paid first upon reorganization; 3) management does not stay in place pending the resolution of the reorganization; and 4) credit consent is required before going into reorganization.

Beck, Demirgüç-Kunt & Levine (2003a) explain that a country's legal origin determines the level of investor rights protection, contract enforceability and, ultimately, financial development through two channels, namely the political channel and the adaptability channel. *The political channel* holds that different legal traditions have different priorities with respect to protecting the rights of the state versus the rights of private property. Since the latter forms the basis for making financial transactions, it matters more for financial development. Accordingly, the political channel predicts that countries with an English legal origin tend to have a higher level of financial development, as English common law emphasizes on protecting private property. In contrast, civil law focuses on strengthening

the power of the state more than the rights of investors. Hence, government interference in financial markets reduces competition, hindering financial development in civil law countries. *The adaptability channel* holds that financial development is influenced by how flexible a legal system is able to adapt itself to changing situations. The idea is that a rigid law system that is difficult to adjust itself to support the financial needs of an economy hampers financial development. Since the common law system focuses less on adhering to statutory law and formalistic procedures and gives more weight to court judgements based on judicial precedent, it is expected to be more adaptive and flexible as opposed to civil law system. Therefore, common law countries are expected to have a higher level of financial development compared with civil law counterparts.

The empirical work has tested the prediction of the law and finance theory by looking at the relationship between legal institutions and financial development. For example, Levine (1998, 1999) and Djankov, McLiesh & Shleifer (2007) suggest that countries that emphasize protecting creditor rights and contract enforcement have a larger banking system. Beck et al., (2001; 2003b) find that property rights protection is weakest in French civil-law countries, where the stock market is less developed compared with other civil law countries. Other studies link legal institutions to financial development policies. To illustrate, a strong legal system facilitates bank privatization (Andrianova, Demetriades & Shortland, 2008). A sound institutional environment is viewed as the prerequisite for financial liberalization policies to foster financial development (Chinn & Ito, 2006; Klein & Olivei, 2008; Kose, Prasad & Taylor, 2011; Elkhuisen et al., 2018). The growth benefit of financial development is larger in countries with strong legal institutions (Demetriades & Law; 2006; Law et al., 2013; Law, Kutan & Naseem, 2018).

3.2.2 Formal Institutions, Financial Barriers, and Financial Inclusion

In this study, financial inclusion is viewed as the degree to which formal financial services, e.g., accounts, savings, credit and payment services, are used by individuals. Therefore, financial inclusion is measured by the use, or uptake, of formal financial services, which is a combined outcome of both demand and supply of the financial system. We propose that formal institutions promote financial inclusion by increasing both the supply of and the demand for financial services. On the supply side, strong legal institutions, which protect shareholders against the risk of expropriation, facilitate creditors in screening borrowers, and strengthen the juridical efficiency of a legal system, are expected to reduce agency and adverse selection problems caused by information asymmetry in the financial markets, as well as the enforcing costs of complex, sophisticated financial contracts. This

incentivizes financial institutions to provide more financial services. For example, strong contract enforceability ensures that financial institutions can seize collateral when loans or debts are in default, which motivates financial institutions to provide more lending services at better rates and on longer terms, especially to individuals who were previously viewed as disqualified for credit under a weak institutional environment. On the demand side, better quality of governance, i.e., “the traditions and institutions by which authority in a country is exercised” as is defined by Kaufmann et al., (2011, p.222), strengthens a government’s commitment to sound financial markets policies and control of corruption, which boosts individuals’ confidence in the financial system and, thus, their willingness to make use of financial services (Clausen, Kraay, & Nyiri, 2011). Therefore, institutional development is expected to facilitate financial inclusion.

Rojas-Suarez & Gonzales (2010) point out that financial inclusion may be constrained by various socio-economic factors, such as financial illiteracy, a lack of trust in financial institutions, and low income. First, according to Lusardi & Mitchell (2014, p.6) financial literacy is referred to as “people’s ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions”. Good knowledge of finance allows individuals to better understand financial contracts and use financial resources to support their business or personal development. Hence, improved financial literacy encourages the use of financial services. For example, Van Rooij, Lusardi & Alessie (2011) find that financial literacy is positively related to stock market participation in the Netherlands. Drexler, Fisher & Schoar (2014) conduct an impact analysis in the Dominican Republic. They find that financial training improves the financial practices of microentrepreneurs, especially the less skilful ones. Berry, Kalan & Pradhan (2018) implement a randomized experiment in Ghana. They find that financial education raises kids’ savings at primary schools and junior high schools. Grohmann, Klühs & Menkhoff (2018), in a multi-country study, show that financial literacy has a positive impact on financial inclusion with respect to account ownership, debit card ownership, use of formal savings and use of debit card.

Second, trust in financial institutions refers to the degree to which individuals believe that financial institutions are reliable. When the level of trust is low, individuals are less willing to make use of financial services. A typical example is the use of savings products. Individuals are less likely to save if they do not trust that financial institutions will keep their savings safe, and that they can always get their money back when necessary. A high level of trust incentivizes individuals to use more services offered by financial institutions. Guiso et al., (2004) show that a high level of social trust is associated with more stock

investments and use of checks in Italy. The relationship is more significant among low-educated people, who are not able to read and understand financial contracts very well.

Third, economic development is expected to contribute to financial inclusion. At the macro-level, economic development generates additional economic opportunities, which need to be supported by the financial system. At the micro-level, a higher level of income, as a result of economic development, makes financial services increasingly affordable to people, especially those who were previously excluded from the financial system due to price impediments. As is illustrated by Peachey & Roe (2004), the substantial increase in bank account ownership in most industrial countries in the past two decades can be attributed to the improvement of income and living standards. On the contrary, weak economic development limits the need for finance and, ultimately, leads to a low level of financial usage.

In addition, Rojas-Suarez & Gonzales (2010) point out that financial inclusion may be constrained by financial sector inefficiencies, mainly transaction costs and asymmetric information. First, developing, maintaining, and providing services generate transaction costs for financial institutions. Take saving and payment services for example. Opening a savings account, offering deposits and withdrawals services, and processing payment requests incurring costs. Maintaining existing accounts, setting up new service points, and introducing innovative operating system are also costly. Thus, high transaction costs tend to disincentivize financial institutions to offer services, especially to potential clients, living in remote areas, or whose value of transaction is too small for financial institutions to make a profit. That is, high transaction costs limit the provision of financial services.

Second, financial institutions are not able to fully identify the credibility of potential borrowers, i.e., their risk of default, due to asymmetric information. As a result, they tend to introduce a high risk premium in their lending rate when providing lending services. Nevertheless, charging a high lending rate may not necessarily reduce credit risk. For one thing, a high lending rate may attract riskier borrowers, while safe borrowers are deterred away by the high cost of borrowing, leading to the adverse selection problem. For another, charging a high interest may incentivize borrowers to deviate from what they have agreed with financial institutions and take additional risk in their investment projects in pursuit of a higher return after getting credit, raising the moral hazard problem. Consequently, financial institutions either set up additional requirements before they extend credit, such as collateral and documentation requirements, or simply refuse to lend in the first place. In both cases, information frictions lead to credit rationing, especially among borrowers with little wealth.

Therefore, we expect that financial barriers, due to weak social economic conditions and financial sector inefficiencies, impose a direct, negative impact on financial inclusion. In addition to the direct impact, financial barriers also affect financial inclusion indirectly by weakening the positive impact of formal institutions on financial inclusion. The idea is that even though institutional development reduces the degree of adverse selection and moral hazard, such that financial institutions are more willing to provide lending services, and boosts individuals' trust in financial institutions, such that they are more willing to use saving products, the positive impact of institutions on financial inclusion may still be weakened, for example, by the fact that potential clients are not sufficiently informed to make financial decisions due to a lack of financial knowledge, or that financial services are too costly for potential clients to afford due to high transaction costs, or that a lack of economic opportunities limits the need for using financial services.

Based on the previous discussion, we derive the following hypothesis:

H1: There is a positive association between formal institutions and financial inclusion;

H2: The positive association between formal institutions and financial inclusion is weaker when financial barriers are higher.

3.3 Methodology and Data

3.3.1 Empirical Strategy

In order to test the relationship between formal institutions and financial inclusion, we adopt the following econometric model:

$$\begin{aligned} \text{INCLUSION}_i = & \alpha + \beta_1 \text{INSTITUTION}_i + \gamma \mathbf{X}_i + \delta \text{BARRIER}_i \\ & + \theta \text{INSTITUTION} \times \text{BARRIER}_i + \varepsilon_i, \end{aligned} \quad (3.1)$$

where i indicates country ($i = 1, 2, \dots, N$). Our analysis is based on a cross-sectional data of 144 countries.

Dependent Variable

The dependent variable is financial inclusion (INCLUSION), which, as is noted earlier, is measured by the uptake of financial services. Specifically, we consider four basic financial services, namely account (ACCOUNT); saving (SAVED); borrowing (BORROWED); and digital payments (DIGITAL). The data for these variables are collected from the Global Findex Database (2017 edition), which is based on Gallup World Poll through nationally representative surveys of more than 150,000 adults in over 140 economies. The database provides information as to how adults save, borrow, make payments, and manage risk in these economies.

To be specific, according to Demirgüç-Kunt, Klapper, Singer, Ansar & Hess (2020), ACCOUNT refers to the percentage of respondents who reported having an account by themselves or together with someone else at a bank or another type of financial institution. SAVED refers to the percentage of respondents who report saving or setting aside any money in the past 12 months using an account at a bank or another type of financial institution. BORROWED refers to the percentage of respondents who reported borrowing money from a bank or another type of financial institution, or using a credit card, in the past 12 months. DIGITAL refers to percentage of respondents who reported using mobile money, a debit or credit card, or a mobile phone to make a payment from an account or reported using the internet to pay bills or to buy something online, in the past 12 months. It also includes respondents who reported paying bills, sending, or receiving remittances, receiving payments for agricultural products, receiving government transfers, receiving wages, or receiving a public sector pension directly from or into a financial institution account or through a mobile money account in the past 12 months.

As is illustrated in Table 3.A.4, ACCOUNT, SAVED, BORROWED and DIGITAL are highly correlated. One possible explanation is that owning a formal account is the prerequisite for the use of saving, borrowing and payment services. Therefore, we conduct a principal component analysis to create an indicator that captures the common variation in these variables. The results are presented in Table 3.A.5 and Figure 3.A.1. Specifically, the results suggest that the first principal component explains almost 80% of the variation in these four financial inclusion variables. The eigenvalue of the first principal component is 3.164, which is larger than 1. We take this component as the measure for the variable INCLUSION, which captures the overall level of financial inclusion.

Independent Variables

The key explanatory variable is formal institutions (INSTITUTION). The theory of law and finance suggests that INSTITUTION can be measured in two ways, i.e., a country's legal tradition and the quality of formal institutions (see, e.g., La Porta et al., 1997, 1998; Levine, 1998; Levine, 1999; Law & Azman-Saini, 2012). First, we collect information on legal tradition from La Porta et al., (1998), La Porta et al., (1999), and Beck et al., (2003b). Specifically, we distinguish four legal families: 1) English common law (ENGLISH); 2) French civil law (FRENCH); 3) German civil law (GERMAN); and 4) other law families (OTHER), which includes Scandinavian civil law and Socialist law. Second, we collect the World Governance Indicators (2016 edition), which describe six different dimensions of formal institutions, i.e., 1) voice and accountability; 2) political stability and absence of violence; 3) government effectiveness; 4) regulatory quality; 5) rule of law; and 6) control of corruption.¹ Following Beck, Demirgüç-Kunt & Peria (2007), we take the average of the six indicators as the measure for INSTITUTION. We expect that formal institutions have a positive effect on financial inclusion.

Next, we include several control variables that capture a country's macroeconomic conditions in vector **X**. First, we control for economic development measured by GDP per capita (GDP). A higher level of economic development means a bigger need for financial services to support economic opportunities, which is expected to impose a positive impact on financial inclusion. Second, we control for financial development measured by the private credit-to-GDP ratio (CREDIT). We expect that more financial services will be available for individuals to choose from and use as a financial system becomes larger. Thus, financial inclusion is expected to be positively associated with the size of a financial system. We collect data for GDP and CREDIT from the Global Financial Development Database (2015 edition). Third, following Beck et al., (2008) and Kabakova & Plaksenkov (2018), we control for telecommunication technology, which is indicated by the share of fixed telephone subscriptions per 100 people (PHONE). The data is collected from the World Development Indicators (2015 edition). We expect that better telecommunication infrastructure facilitates the delivery of financial services and positively impacts financial inclusion. Fourth, we control for the level of financial infrastructure, because the chances of using financial resources are slim if financial facilities cannot be reached in the first place. We use ATMs penetration (ATM) as a measure for financial infrastructure. Data for ATM is collected from the Global Financial Development Database (2015 edition).

¹ The six World Governance Indicators range approximately from -2.5 to + 2.5, with a higher value indicating a higher level of governance.

In addition, we take into account the potential impact of financial barriers on financial inclusion in vector **BARRIER**. First, we control for social economic factors: 1) people do not have sufficient fund (FUND), which reflects the degree to which insufficient income constrains people from using financial services; 2) people do not have need for financial services (NEED), which captures the degree to which people do not use formal finance because of a lack economic opportunities; 3) people lack trust in financial institutions (DISTRUST), which measures the degree to which people think that financial institutions are not trustworthy; 4) cultural reasons (RELIGION), which captures the degree to which financial inclusion is hindered due to religious considerations; and 5) level of financial literacy (FINLIT), which represents the degree to which people understand basic financial knowledge.

Data for the financial barrier variable FUND, NEED, DISTRUST and RELIGION are collected from the Global Findex Database (2017 edition). FUND refers to the percentage of respondents who report not having a financial institution account because they do not have enough money to use one; NEED refers to the percentage of respondents who report not having a financial institution account only because they have no need for formal financial services; DISTRUST refers to the percentage of respondents who report not having a financial institution account because they do not trust financial institutions; and RELIGION refers to the percentage of respondents who report not having a financial institution account for religious reasons. Data for FINLIT is collected from S&P Global FinLit Survey (2015). According to Klapper, Lusardi & van Oudheusden (2015), FINLIT is measured by the proportion of people that answer at least three out of four financial concepts correctly from The Standard & Poor's Ratings Services Global Financial Literacy Survey, which includes risk diversification, inflation, interest, and interest compounding. Hence, a higher level of FINLIT indicates a higher level of financial literacy in a country.

Second, we control for financial sector inefficiencies, including 1) financial services are too expensive (COST), which measures transaction costs involved in financial services provision; 2) financial institutions are too far away (FAR), which measures the degree of physical barrier in financial outreach; and 3) people lack the necessary documentation (DOC), which reflects the severity of asymmetric information in the financial system. Data for these financial barrier variables are collected from the Global Findex Database (2017 edition). Specifically, COST refers to the percentage of respondents who report not having a financial institution account because financial services are too expensive; FAR refers to the percentage of respondents who report not having a financial institution account because financial institutions are located too far away; and DOC refers to the percentage

of respondents who report not having a financial institution account because they lack the documentation needed to open one, such as an identity card, a wage slip, or the like.

Furthermore, we include the interaction between **INSITUTION** and **BARRIER**. The purpose is to examine whether the impact of formal institutions on financial inclusion is conditional on the level of prevailing financial barriers. Technically, the marginal effect of formal institutions on financial inclusion can be written as

$$\frac{d \text{ INCLUSION}}{d \text{ INSTITUTION}} = \beta_1 + \theta \times \text{BARRIER.} \quad (3.2)$$

β_1 is expected to have a positive sign, which indicates a direct, positive effect of formal institutions on financial inclusion. Since financial barrier variables in vector **BARRIER** are always positive, θ are expected to have a negative sign, which implies that the positive impact of formal institutions on financial inclusion is weaker for a higher level of financial barriers, except for the variable **FINLIT**, where θ is expected to be positive, meaning that the positive impact of formal institutions on financial inclusion is stronger for a higher level of financial literacy. Table 3.1 provides descriptive statistics for the variables used in our empirical model. Table 3.2 shows the correlations between these variables. Countries included in our sample are listed in Table 3.A.1. Data of legal origin, formal institutions, and financial inclusion are presented in Table 3.A.2. Definition and source of the variables are presented in Table 3.A.3.

3.3.2 A First Look at the Data

From Table 3.A.2, it can be seen that there is a large cross-country variation in financial inclusion. For example, account ownership is less than 10% in Madagascar, Niger, South Sudan and Chad, while it exceeds 95% in countries, such as Australia, Germany, Japan, Norway and Singapore. Institutional quality also varies considerably across countries. For instance, formal institutions are weak in Afghanistan, Central African Republic, Democratic Republic of the Congo and Libya with an overall score less than -1.5. However, the score is much larger (>1.5) in Canada, Switzerland, Netherlands, New Zealand and Sweden. Overall, the dataset exhibits large variations in the variables of interest, which allows us to investigate the relationship between financial inclusion and institutions in a cross-country setting.

Table 3.1. Descriptive Statistics

Variable	N	Mean	SD	Min	Max
<i>Dependent variable</i>					
INCLUSION	144	6.260	1.779	-2.831	4.392
<i>Key explanatory variables</i>					
ENGLISH	139	0.259	0.440	0.000	1.000
FRENCH	139	0.439	0.498	0.000	1.000
GERMAN	139	0.043	0.204	0.000	1.000
OTHER	139	0.259	0.440	0.000	1.000
INSTITUTION	144	-0.032	0.910	-2.011	1.862
<i>Macroeconomic conditions</i>					
GDP	138	8.630	1.503	5.677	11.575
CREDIT	131	61.159	47.511	2.883	247.636
PHONE	142	17.524	16.500	0.000	60.395
ATM	127	52.737	47.082	0.930	276.28
<i>Financial barriers</i>					
FUND	112	0.369	0.195	0.040	0.750
NEED	112	0.018	0.215	0.000	0.012
DISTRUST	112	0.110	0.073	0.010	0.360
REILIGION	112	0.041	0.039	0.000	0.200
FINLIT	134	0.372	0.136	0.14	0.71
COST	112	0.179	0.115	0.010	0.480
FAR	112	0.127	0.095	0.000	0.470
DOC	112	0.138	0.097	0.000	0.460
<i>Variables used in the principal component analysis</i>					
<u>Global Findex Indicators</u>					
ACCOUNT	144	0.614	0.267	0.086	0.999
SAVED	144	0.236	0.196	0.016	0.793
BORROWED	144	0.122	0.070	0.018	0.350
DIGITAL	144	0.538	0.283	0.073	0.994
<u>World Governance Indicators</u>					
Voice and accountability	144	-0.032	0.948	-2.171	1.664
Political stability and Absence of violence	144	-0.198	0.926	-2.671	1.519
Government effectiveness	144	0.044	0.989	-2.350	2.192
Regulatory quality	144	0.070	1.008	-2.274	2.181
Rule of law	144	-0.018	1.004	-2.241	2.036
Control of corruption	144	-0.055	1.010	-1.715	2.284

Table 3.2. Pairwise Correlation Matrix

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]
[1] INCLUSION	1.00																	
[2] ENGLISH	0.11	1.00																
[3] FRENCH	-0.35	-0.52	1.00															
[4] GERMAN	0.28	-0.13	-0.19	1.00														
[5] OTHER	0.16	-0.35	-0.52	-0.13	1.00													
[6] INSTITUTION	0.85	0.09	-0.27	0.31	0.07	1.00												
[7] GDP	0.86	0	-0.18	0.27	0.09	0.84	1.00											
[8] CREDIT	0.67	0.12	-0.2	0.3	-0.02	0.66	0.67	1.00										
[9] PHONE	0.78	-0.05	-0.17	0.39	0.07	0.72	0.81	0.61	1.00									
[10] ATM	0.68	-0.02	-0.19	0.41	0.06	0.57	0.68	0.5	0.73	1.00								
[11] FUND	-0.85	-0.04	0.31	/	-0.32	-0.55	-0.76	-0.52	-0.72	-0.67	1.00							
[12] NEED	-0.11	-0.24	-0.2	/	0.46	-0.09	0	-0.05	0.11	-0.03	-0.07	1.00						
[13] DISTRUST	-0.47	-0.26	0.29	/	-0.08	-0.35	-0.25	-0.29	-0.23	-0.15	0.47	-0.08	1.00					
[14] RELIGION	-0.6	-0.11	0.34	/	-0.28	-0.4	-0.44	-0.31	-0.5	-0.42	0.58	-0.11	0.49	1.00				
[15] FINLIT	0.71	0.13	-0.24	0.17	0.06	0.74	0.68	0.46	0.56	0.39	-0.26	-0.12	-0.17	-0.28	1.00			
[16] COST	-0.57	-0.17	0.43	/	-0.32	-0.3	-0.34	-0.32	-0.43	-0.3	0.66	-0.22	0.82	0.53	-0.22	1.00		
[17] FAR	-0.66	-0.04	0.28	/	-0.28	-0.48	-0.61	-0.36	-0.62	-0.48	0.76	-0.25	0.59	0.6	-0.2	0.77	1.00	
[18] DOC	-0.72	-0.01	0.24	/	-0.26	-0.5	-0.61	-0.44	-0.59	-0.56	0.75	-0.19	0.52	0.56	-0.15	0.66	0.78	1.00

Figure 3.1 depicts the level of financial inclusion across different legal tradition families. In general, financial inclusion is highest in countries with a German legal tradition where the share of people who have owned a formal financial account, saved, and used digital payments is larger than that in countries with the other legal origins. In contrast, French civil law countries have the least development in financial inclusion. Figure 3.2 shows that account ownership and use of saving, borrowing and digital payments are higher in developed economies. Figure 3.3 and 3.4 show a positive association between financial inclusion and formal institutions. In general, financial inclusion is higher in countries where institutions are stronger. Figure 3.5 illustrates the seven financial inclusion barriers cited by the 2017 Global Findex survey. It seems that not having sufficient fund is the main reason why some people remain unbanked, that is, why they do not have an account at a formal financial institution. Only about 2% of respondents, on average, report that they do not have an account because they do not have the need for financial services.

Figure 3.1. Financial Inclusion across Legal Tradition Families

Figure 3.1 illustrates the average level of financial inclusion (account ownership, use of saving, borrowing, and digital payments) by legal family in the sample.

Figure 3.2. Financial Inclusion across Income Groups

Figure 3.2 illustrates the average level of financial inclusion (account ownership, use of saving, borrowing, and digital payments) by income group in the sample.

Figure 3.3. Financial Inclusion and Formal Institutions

Figure 3.3 illustrates the average level of financial inclusion (account ownership, use of saving, borrowing, and digital payments) by institution quartile in the sample.

Figure 3.4. Financial Inclusion and Formal Institutions: Scatter Plot

Figure 3.5. Barriers to Finance Inclusion

Figure 3.5 illustrates the average level of financial barriers in the sample.

3.4 Results

3.4.1 Legal Tradition and Financial Inclusion

As a starting point, we investigate whether legal origins explain cross-country differences in financial inclusion, using the specification suggested by Levine et al., (2000). Table 3.3 shows the results of regressions of different financial inclusion indicators on legal dummy variables, i.e., French civil law, German civil law, and other legal traditions (Scandinavian and Socialist law system). The reference group is countries with English common law tradition.

The results show that the coefficients of FRENCH are negative and significant in all specifications. This suggests that financial inclusion is less developed in countries with a French civil law tradition compared with English common law countries, which is in line with the theory of law and finance. In contrast, the coefficients of GERMAN are positive and significant at 1% level, except specification (4). Compared with English common law countries, German civil law countries tend to have a higher level of financial inclusion, which may be explained by the fact that Austria, Japan, Republic of Korea, Switzerland, and Taiwan, China are the only countries with a German civil law tradition in our sample (see Table 3.A.2). These countries are developed economies and, therefore, expected to have a higher level of financial inclusion. In addition, the opposite signs of coefficients for FRENCH and GERMAN, except for column (4), seem to confirm the adaptability channel suggested in the theory of law and finance that German civil law tends to emphasize less on judicial formalism, making the legal system more flexible compared with French civil law system (Djankov et al., 2003b), which leads to a higher level of financial development and, thus, financial inclusion, in German civil law countries.

To account for the role of economic development in explaining financial inclusion, we perform regressions using the same specifications as in Table 3.3, while controlling for GDP per capita in Table 3.4.² We find that the coefficients of FRENCH remain negative and highly significant. In addition, income level turns out to be an important determinant of financial inclusion. The coefficients of determination increase significantly after GDP per capita is included into our models. Specifically, we find a strong positive relationship between financial inclusion and GDP per capita, which suggests that account ownership and use of saving, borrowing and digital payments are higher in economically advanced

² We also test the robustness of this specification by including additional control variables, which yields similar results. Estimation results are reported in Table 3.A.10 in the Appendix.

countries. Overall, our findings are consistent with Levine et al., (2000), who suggest that legal tradition has a strong explanatory power on financial development. We complement the literature by showing that legal tradition is a determinant of financial development with respect to not only the size of financial intermediation, but also the inclusiveness of a financial system.

Table 3.3. Legal Tradition and Financial Inclusion

	(1) Account ownership	(2) Use of saving	(3) Use of Digital payments	(4) Use of borrowing	(5) 1 st principal component
FRENCH	-0.145** (0.062)	-0.118*** (0.040)	-0.150*** (0.057)	-0.028* (0.015)	-1.017*** (0.379)
GERMAN	0.347*** (0.051)	0.304*** (0.040)	0.337*** (0.055)	-0.008 (0.027)	2.021*** (0.350)
OTHER	0.038 (0.066)	-0.045 (0.049)	0.022 (0.065)	0.029 (0.018)	0.158 (0.423)
Constant	0.624*** (0.051)	0.292*** (0.035)	0.588*** (0.046)	0.128*** (0.013)	0.356 (0.324)
Observations	139	139	139	139	139
Prob (F-test)	0.000	0.000	0.000	0.000	0.000
R-squared	0.155	0.208	0.160	0.109	0.169

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Table 3.4. Legal Tradition and Financial Inclusion: Controlling GDP per capita

	(1) Account ownership	(2) Use of saving	(3) Use of Digital payments	(4) Use of borrowing	(5) 1 st principal component
FRENCH	-0.121*** (0.028)	-0.096*** (0.024)	-0.124*** (0.030)	-0.024** (0.012)	-0.845*** (0.183)
GERMAN	0.003 (0.029)	0.083** (0.034)	0.045 (0.029)	-0.043 (0.029)	0.058 (0.272)
OTHER	-0.012 (0.031)	-0.073** (0.028)	-0.025 (0.034)	0.021 (0.016)	-0.140 (0.204)
GDP	0.162*** (0.007)	0.096*** (0.008)	0.149*** (0.008)	0.023*** (0.003)	0.960*** (0.050)
Constant	-0.758*** (0.066)	-0.533*** (0.066)	-0.687*** (0.080)	-0.066** (0.028)	-7.858*** (0.443)
Observations	133	133	133	133	133
Prob (F-test)	0.000	0.000	0.000	0.000	0.000
R-squared	0.797	0.677	0.751	0.334	0.777

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

3.4.2 Formal Institutions, Financial Barriers, and Financial Inclusion

Next, we examine how financial inclusion measured by the first principal component of ACCOUNT, SAVED, BORROWED and DIGITAL, is associated with formal institutions, measured by the average of World Governance Indicators. Estimation results are reported in Table 3.5. First, we control for macroeconomic conditions in column (1). The coefficient for INSTITUTION is positive and significant at 1% level, implying that formal institutions have a positive impact on financial inclusion. A higher level of economic development and financial infrastructure contribute to financial inclusion. The coefficients for GDP and ATM are both positive and significant at 1% level.

Second, we account for financial barriers in explaining financial inclusion by including the following socio-economic factors, including 1) insufficient income (people do not have sufficient fund); 2) a lack of economic opportunities (people do not have the need for financial services); 3) distrust (people lack trust in financial institutions); 4) religion (people do not have a formal account due to religious reasons); 5) financial illiteracy (people lack basic financial knowledge), and financial sector inefficiencies, including 6) transaction costs (financial services are too expensive); 7) geographical barrier (financial institutions are too far away); and 8) asymmetric information (people lack necessary documentation). In all specifications, the coefficients for INSTITUTION remain positive and significant at 1% level, confirming a positive impact of formal institutions on financial inclusion. In addition, financial barriers have strong explanatory power on financial inclusion. The coefficients of the financial barrier variables have the expected signs and are significant at 1% level, except for the variable NEED in column (3), which suggests that a lack of need for financial service does not have a significant impact on financial inclusion. Overall, the message is that financial barriers tend to drag financial inclusion. Moreover, we find that the coefficients for CREDIT are never significant, meaning that credit-to-GDP, which is widely used to indicate the size of the banking sector, does not have a significant impact on financial inclusion. This implies that a banking system may be large, but not inclusive. Overall, the estimation results we have obtained so far support our first hypothesis.

Further, we include the interaction between INSTITUTION and the financial barrier variables in the previous regressions to test if the impact of formal institutions on financial inclusion is conditional on the prevailing level of financial barriers. Estimation results are reported in Table 3.6. Once again, we find a strong positive effect of formal institutions on financial inclusion. The coefficients for INSTITUTION are all positive and significant, except in column (5). The coefficients of the financial barrier variables have the expected signs and are statistically significant at 1% level, except for the variable NEED in column

(2). When it comes to the interaction effect, we find that the impact of formal institutions on financial inclusion is weaker for a higher degree of financial barriers with respect to distrust in financial institutions in column (3), religious concerns in column (4), financial illiteracy in column (5), cost of financial services in column (6), and lack of documentation in column (8). The coefficients of the interaction terms between INSTITUTION and these financial barrier variables are all negative and significant, except for the interaction term between INSTITUTION with FINLIT, which has a positive sign, as expected.

Table 3.5. Formal Institutions and Financial Inclusion

	(1) Financial inclusion	(2) Financial inclusion	(3) Financial inclusion	(4) Financial inclusion	(5) Financial inclusion	(6) Financial inclusion	(7) Financial inclusion	(8) Financial inclusion	(9) Financial inclusion
INSTITUTION	1.045*** (0.146)	0.537*** (0.143)	0.790*** (0.171)	0.640*** (0.143)	0.701*** (0.137)	0.834*** (0.156)	0.696*** (0.141)	0.710*** (0.153)	0.729*** (0.141)
CREDIT	0.001 (0.002)	0.001 (0.002)	0.003 (0.002)	0.002 (0.002)	0.002 (0.002)	0.003 (0.002)	0.001 (0.002)	0.003 (0.002)	0.001 (0.002)
GDP	0.330*** (0.093)	0.008 (0.087)	0.151 (0.114)	0.160* (0.096)	0.152 (0.097)	0.234** (0.098)	0.191** (0.093)	0.102 (0.098)	0.112 (0.096)
ATM	0.007*** (0.002)	0.005 (0.003)	0.010*** (0.003)	0.010*** (0.003)	0.008*** (0.003)	0.008*** (0.002)	0.009*** (0.002)	0.009*** (0.003)	0.007*** (0.003)
PHONE	0.001 (0.009)	-0.006 (0.009)	0.014 (0.013)	0.011 (0.010)	0.002 (0.011)	-0.001 (0.009)	0.001 (0.010)	0.002 (0.013)	0.002 (0.011)
FUND		-4.022*** (0.626)							
NEED			-3.448 (3.643)						
DISTRUST				-4.375*** (0.863)					
RELIGION					-8.767*** (1.756)				
FINLIT						2.300*** (0.813)			
COST							-3.271*** (0.598)		
FAR								-3.348*** (0.908)	
DOC									-4.678*** (0.809)
Constant	-3.316*** (0.716)	0.772 (0.755)	-2.251*** (0.824)	-1.877*** (0.689)	-1.786** (0.702)	-3.431*** (0.728)	-1.826*** (0.645)	-1.351* (0.712)	-1.079 (0.724)
Observations	118	91	91	91	91	113	91	91	91
Prob (F-test)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared	0.824	0.803	0.671	0.731	0.728	0.841	0.751	0.707	0.744

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Finally, since financial barrier variables, i.e., *FUND*, *NEED*, *DISTRUST*, *RELIGION*, *COST*, *FAR*, and *DOC*, are highly correlated with each other (see Table 3.A.6), we conduct a principal component analysis for these variables. Results are presented in Table 3.A.7 and Figure 3.A.2. The results suggest that the first principal component explains about 61% of the variation in these indicators. The eigenvalue for the first principal component is 4.24, which is larger than 1. We use the first principal component to create a new variable (*FINBAR*), which captures the overall degree of financial barriers. We repeat the previous regressions by including *FINBAR* and its interaction with *INSTITUTION* in column (9). Again, we find that formal institutions help to promote financial inclusion, while financial barriers hamper financial inclusion. The coefficients for *INSTITUTION* and *FINBAR* are significant at 1% level. Besides, the impact of formal institutions is found to be weaker for a higher degree of financial barriers in general. The coefficient for the interaction term between *INSTITUTION* and *FINBAR* is negative and significant at 5% level. Overall, the empirical evidence supports our second hypothesis.

3.4.3 Robustness Checks

As robustness checks, we examine each of the four financial inclusion indicators, namely *ACCOUNT*, *SAVED*, *BORROWED* and *DIGITAL*, and repeat the previous regressions to test how they can be explained by formal institutions. Overall, we find consistent results in Table 3.7. Specifically, in column (1)-(4) we find that formal institutions promote the use of four basic financial services, namely formal account, saving, borrowing, and digital payments. The coefficients for *INSTITUTION* are all positive and statistically significant. Second, financial barriers tend to hamper the use of formal account, saving, and digital payments. The coefficients for *FINBAR* are negative and significant in column (1)-(3). Third, the positive effect of formal institutions on the use of formal account, saving, and digital payments is weaker with higher degree of financial barriers, which is captured by the negative coefficient for the interaction term between *INSTITUTION* and *FINBAR* in column (1)-(3). Given that World Governance Indicators are highly correlated with each other (see Table 3.A.8), we also conduct a principal component analysis and construct an alternative measure for variable *INSTITUTION* by taking the first principal component of the six indicators. The results are reported in Table 3.A.9 and Figure 3.A.3. The results suggest that the first principal component explains about 86% of the variation in these indicators. The eigenvalue for the first principal component is 5.17, which is larger than 1.

Table 3.6. Formal Institutions, Financial Barriers, and Financial Inclusion

	(1) Financial inclusion	(2) Financial inclusion	(3) Financial inclusion	(4) Financial inclusion	(5) Financial inclusion	(6) Financial inclusion	(7) Financial inclusion	(8) Financial inclusion	(9) Financial inclusion
INSTITUTION	0.787*** (0.236)	0.782*** (0.238)	0.973*** (0.248)	0.888*** (0.200)	0.355 (0.263)	0.978*** (0.245)	0.896*** (0.222)	1.031*** (0.216)	0.556*** (0.127)
CREDIT	0.000 (0.002)	0.003 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.001 (0.002)	0.003 (0.002)	0.001 (0.002)	0.001 (0.002)
GDP	-0.017 (0.090)	0.152 (0.117)	0.136 (0.098)	0.141 (0.095)	0.222** (0.100)	0.167* (0.097)	0.087 (0.098)	0.081 (0.101)	0.095 (0.085)
ATM	0.006* (0.003)	0.010*** (0.003)	0.011*** (0.003)	0.009*** (0.003)	0.009*** (0.002)	0.010*** (0.002)	0.010*** (0.003)	0.008*** (0.003)	0.009*** (0.002)
PHONE	-0.007 (0.010)	0.014 (0.013)	0.009 (0.011)	-0.002 (0.013)	-0.000 (0.009)	-0.001 (0.011)	-0.001 (0.014)	0.001 (0.011)	-0.005 (0.011)
FUND	-4.334*** (0.625)								
INS×FUND	-0.801 (0.487)								
NEED		-3.307 (4.875)							
INS×NEED		0.405 (7.586)							
DISTRUST			-5.598*** (1.076)						
INS×DISTRUST			-3.240* (1.638)						
RELIGION				-11.417*** (2.210)					
INS×RELIGION				-4.848** (2.341)					
FINLIT					1.753** (0.846)				
INS×FINLIT					1.168** (0.524)				
COST						-3.917*** (0.629)			
INS×COST						-1.843* (1.077)			
FAR							-4.431*** (1.253)		
INS×FAR							-2.002 (1.329)		
DOC								-6.104*** (1.099)	
INS×DOC								-2.915* (1.522)	
FINBAR									-0.294*** (0.043)
INS× FINBAR									-0.110** (0.037)
Constant	1.003 (0.773)	-2.259** (0.858)	-1.606** (0.730)	-1.627** (0.708)	-3.257*** (0.730)	-1.596** (0.695)	-1.174 (0.731)	-0.754 (0.772)	-1.684*** (0.616)
Observations	91	91	91	91	113	91	91	91	91
Prob (F-test)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared	0.807	0.671	0.739	0.736	0.846	0.757	0.712	0.753	0.781

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Then, we repeat the previous robustness checks in column (5)-(8), which yields similar results, in general.³

Table 3.7. Formal Institutions, Financial Barriers, and Financial Inclusion Indicators

	(1) Account	(2) Saving	(3) Digital payments	(4) Borrowing	(5) Account	(6) Saving	(7) Digital payments	(8) Borrowing
INSTITUTION	0.067*** (0.018)	0.046*** (0.016)	0.102*** (0.024)	0.021* (0.012)	0.027*** (0.007)	0.018*** (0.007)	0.041*** (0.010)	0.008* (0.005)
CREDIT	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
GDP	0.028** (0.012)	0.019* (0.011)	-0.000 (0.018)	-0.001 (0.008)	0.028** (0.012)	0.019* (0.011)	-0.001 (0.018)	-0.001 (0.008)
ATM	0.002*** (0.000)	0.000 (0.000)	0.002*** (0.000)	0.000* (0.000)	0.002*** (0.000)	0.000 (0.000)	0.002*** (0.000)	0.000* (0.000)
PHONE	0.001 (0.002)	-0.004** (0.002)	0.002 (0.002)	-0.000 (0.001)	0.001 (0.002)	-0.004** (0.001)	0.002 (0.002)	-0.000 (0.001)
FINBAR	-0.058*** (0.007)	-0.031*** (0.006)	-0.044*** (0.008)	-0.004 (0.003)	-0.057*** (0.007)	-0.031*** (0.006)	-0.043*** (0.008)	-0.004 (0.003)
INS× FINBAR	-0.018*** (0.007)	-0.017** (0.007)	-0.027*** (0.008)	0.003 (0.004)	-0.007*** (0.003)	-0.007** (0.003)	-0.011*** (0.003)	0.001 (0.002)
Constant	0.165* (0.096)	0.018 (0.075)	0.369** (0.140)	0.116* (0.061)	0.164* (0.096)	0.017 (0.075)	0.368** (0.141)	0.116* (0.061)
Observations	91	91	91	91	91	91	91	91
Prob (F-test)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared	0.860	0.611	0.722	0.191	0.860	0.610	0.722	0.191

Note: In column (1)-(4) INSTITUTION is measured by the average of six World Governance Indicators. In column (5)-(8) INSTITUTION is measured by the first principal component of six World Governance Indicators. All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Further, we do a subsample analysis to examine if the impact of formal institutions on financial inclusion differs by income level groups. Estimation results are reported in Table 3.8 and Table 3.9. In column (1)-(3), INSTITUTIONS is measured by the average of the six World Governance Indicators. In column (4)-(6), INSTITUTIONS is measured by the first principal component of the six World Governance Indicators. From Table 3.8, we find that the positive effect of formal institutions on financial inclusion appears among high- and middle-income countries. However, when we take into account the interaction effect of financial barriers in Table 3.9, the positive effect of formal institutions on financial inclusion only appears among middle-income countries. Overall, we do not find a strong positive impact of formal institutions on financial inclusion across low-income countries.

³ In addition, we test the robustness on the relationship between formal institutions and financial inclusion by controlling for banking characteristics as suggested by Sha'ban, Girardone & Sarkisyan (2020), including competition and concentration in the banking system, which yields consistent results. Estimation results are not reported in the text.

Table 3.8. Formal Institutions, Financial Barriers, and Financial Inclusion: Subsample Analysis

	(1) Financial inclusion	(2) Financial inclusion	(3) Financial inclusion	(4) Financial inclusion	(5) Financial inclusion	(6) Financial inclusion
INSTITUTION	0.873* (0.363)	0.490*** (0.137)	0.390 (0.229)	0.348* (0.146)	0.198*** (0.055)	0.157 (0.093)
CREDIT	-0.001 (0.002)	0.006** (0.002)	-0.005 (0.013)	-0.001 (0.002)	0.006** (0.002)	-0.005 (0.013)
GDP	0.140 (0.536)	-0.175 (0.158)	0.189 (0.293)	0.127 (0.537)	-0.176 (0.158)	0.190 (0.294)
ATM	-0.000 (0.021)	0.009*** (0.002)	0.063 (0.050)	-0.001 (0.021)	0.009*** (0.002)	0.063 (0.050)
PHONE	-0.038** (0.013)	0.018 (0.012)	0.113 (0.128)	-0.038** (0.013)	0.018 (0.012)	0.113 (0.128)
FINBAR	-0.744** (0.276)	-0.185*** (0.043)	-0.199** (0.071)	-0.747** (0.278)	-0.184*** (0.043)	-0.198** (0.072)
Constant	-1.538 (4.918)	0.056 (1.240)	-2.616 (1.868)	-1.411 (4.901)	0.050 (1.241)	-2.631 (1.868)
Income group	High	Middle	Low	High	Middle	Low
Observations	13	62	16	13	62	16
Prob (<i>F</i> -test)	0.015	0.000	0.000	0.014	0.000	0.000
R-squared	0.768	0.676	0.672	0.765	0.676	0.672

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Table 3.9. Formal Institutions, Financial Barriers, and Financial Inclusion by Country Group: Controlling for Interaction Effect

	(1) Financial inclusion	(2) Financial inclusion	(3) Financial inclusion	(4) Financial inclusion	(5) Financial inclusion	(6) Financial inclusion
INSTITUTION	2.331 (1.526)	0.457*** (0.131)	0.204 (0.230)	0.931 (0.619)	0.185*** (0.053)	0.083 (0.090)
CREDIT	-0.001 (0.002)	0.006** (0.002)	-0.006 (0.013)	-0.001 (0.002)	0.005** (0.002)	-0.006 (0.013)
GDP	0.009 (0.521)	-0.184 (0.155)	0.189 (0.325)	0.003 (0.520)	-0.184 (0.155)	0.190 (0.326)
ATM	0.005 (0.020)	0.009*** (0.002)	0.064 (0.052)	0.004 (0.020)	0.009*** (0.002)	0.064 (0.052)
PHONE	-0.042** (0.015)	0.016 (0.013)	0.097 (0.132)	-0.041** (0.015)	0.016 (0.013)	0.095 (0.131)
FINBAR	-1.296 (0.654)	-0.221*** (0.050)	-0.107 (0.123)	-1.314 (0.679)	-0.218*** (0.049)	-0.109 (0.121)
INS× FINBAR	0.635 (0.640)	-0.089 (0.060)	0.131 (0.106)	0.253 (0.259)	-0.036 (0.024)	0.054 (0.043)
Constant	-1.738 (5.022)	0.100 (1.221)	-2.705 (2.097)	-1.724 (5.020)	0.094 (1.222)	-2.714 (2.101)
Income group	High	Middle	Low	High	Middle	Low
Observations	13	62	16	13	62	16
Prob (F-test)	0.085	0.000	0.000	0.083	0.000	0.000
R-squared	0.793	0.682	0.690	0.791	0.682	0.690

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

3.5 Conclusion and Discussion

In this chapter, we investigate the impact of institutions on financial inclusion. Using the latest edition of the Global Findex Database, we contribute to the literature by linking formal institutions to financial inclusion, rather than to financial depth as the traditional measure for financial development. Moreover, we measure financial inclusion by the uptake of financial service rather than financial access. Our motivation is that financial inclusion not only concerns the supply of a financial system, i.e., accessibility of financial resources, but also the use of financial services. To the best of our knowledge, this paper is the first attempt at analyzing the role of institutions in promoting financial inclusion.

To perform our empirical analysis, we construct a cross-country data, which provides information on how people make use of formal accounts, saving, borrowing and digital payments across 144 economies. First, we find that a country's legal tradition explains financial inclusion. Our results show that countries with a French legal tradition tend to have a lower level of financial inclusion compared with those with an English common law tradition. This is in line with the prediction of the theory of law and finance. Second, we find a strong positive relationship between formal institutions and financial inclusion. Therefore, institutional quality is not only important for increasing the size of financial system, but also promoting the use of financial services. Third, we find that the positive impact of formal institutions on financial inclusion is weakened by the prevailing level of financial barriers. One policy implication is that promoting financial inclusion not only needs an improvement in the institutional environment, but also an endeavor to reduce the degree of financial barriers that may lead to voluntary exclusion from formal finance or a sub-optimal provision of financial services.

This study has some limitations. First, we acknowledge the issue of endogeneity in our empirical analysis. It is expected that country-specific characteristics, which are captured by the error term, also explain cross-country differences in financial inclusion. Since this chapter is a first attempt at examining the link between formal institutions and financial inclusion, we focus on OLS regressions and leave the endogeneity problem and omitted variable biases for future research. Second, and related to the previous remark, our data is cross-sectional, which does not allow us to control for country-specific, time-invariant fixed effects using panel estimations. While it still takes time before we are able to explore a longer data series on financial inclusion, investigating the impact of formal institutions on financial inclusion under a panel setting is definitely a direction for future research. Third, this chapter focuses on the role of formal institutions in financial inclusion, the

theoretical underpinning of which lies in the theory of law and finance. However, the literature also suggests that, in addition to formal institutions, informal institutions, e.g., social norms, culture, and trust, also matter for financial development. For example, Garretsen et al., (2004) examine the impact of societal norms on financial development. Specifically, they consider four types of societal norms, i.e., power distance, individualism, masculinity, and uncertainty avoidance, which are found to have a strong explanatory power on stock market development. Stulz & Williamson (2003) look at culture. They use language and religion as proxy indicators for culture and find that the culture indicators are associated with the strength of creditor rights and investor protection, which, in turn, exert an impact on financial development. Calderón et al., (2002) show that a higher level of trust is associated with a deeper and a more efficient financial system. Besides, the positive impact of trust on financial depth and financial efficiency is weaker in countries where rule of law is more stringent. Such a substitution effect between trust and formal institutions is also documented by Ahlerup, Olsson & Yanagizawa (2009) and Elkhuizen et al., (2018), explaining economic growth and the effectiveness of financial liberalization policies on financial development. Other studies, e.g., Guiso et al., (2008), Law & Ibrahim (2013), and Ng et al., (2016), emphasize the positive role of trust when it comes to stock market development. Nevertheless, empirical evidence as to how informal institutions, interacted with formal institutions, influence financial inclusion is scant in the literature, which merits research in the future.

3.A List of Countries in the Sample

Table 3.A.1

Afghanistan	Greece	Nigeria
Albania	Guatemala	Nicaragua
United Arab Emirates	Hong Kong SAR, China	Netherlands
Argentina	Honduras	Norway
Armenia	Croatia	Nepal
Australia	Haiti	New Zealand
Austria	Hungary	Pakistan
Azerbaijan	Indonesia	Panama
Belgium	India	Peru
Benin	Ireland	Philippines
Burkina Faso	Iran, Islamic Rep.	Poland
Bangladesh	Iraq	Portugal
Bulgaria	Israel	Paraguay
Bahrain	Italy	West Bank and Gaza
Bosnia and Herzegovina	Jordan	Romania
Belarus	Japan	Russian Federation
Bolivia	Kazakhstan	Rwanda
Brazil	Kenya	Saudi Arabia
Botswana	Kyrgyz Republic	Senegal
Central African Republic	Cambodia	Singapore
Canada	Korea, Rep.	Sierra Leone
Switzerland	Kuwait	El Salvador
Chile	Lao PDR	Serbia
China	Lebanon	South Sudan
Cote d'Ivoire	Liberia	Slovak Republic
Cameroon	Libya	Slovenia
Congo, Dem. Rep.	Sri Lanka	Sweden
Congo, Rep.	Lesotho	Chad
Colombia	Lithuania	Togo
Costa Rica	Luxembourg	Thailand
Cyprus	Latvia	Tajikistan
Czech Republic	Morocco	Turkmenistan
Germany	Moldova	Trinidad and Tobago
Denmark	Madagascar	Tunisia
Dominican Republic	Mexico	Turkey
Algeria	Macedonia, FYR	Taiwan, China
Ecuador	Mali	Tanzania
Egypt, Arab Rep.	Malta	Uganda
Spain	Myanmar	Ukraine
Estonia	Montenegro	Uruguay
Ethiopia	Mongolia	United States
Finland	Mozambique	Uzbekistan
France	Mauritania	Venezuela, RB
Gabon	Mauritius	Vietnam
United Kingdom	Malawi	Kosovo
Georgia	Malaysia	South Africa
Ghana	Namibia	Zambia
Guinea	Niger	Zimbabwe

3.B Data: Legal Origin, Formal Institutions and Financial Inclusion

Table 3.A.2

Country code	Country name	Indicators of financial inclusion			Indicators of institutions		
		Account ownership	Saving	Borrowing	Digital payments	Formal institutions	Legal origin
AFG	Afghanistan	0.145	0.037	0.033	0.108	-1.547	French
ALB	Albania	0.393	0.087	0.088	0.288	-0.004	Socialist
ARE	United Arab Emirates	0.874	0.287	0.189	0.840	0.651	English
ARG	Argentina	0.479	0.072	0.073	0.402	-0.046	French
ARM	Armenia	0.453	0.100	0.285	0.415	-0.305	Socialist
AUS	Australia	0.995	0.621	0.203	0.959	1.573	English
AUT	Austria	0.982	0.558	0.142	0.961	1.427	German
AZE	Azerbaijan	0.286	0.045	0.131	0.246	-0.694	Socialist
BEL	Belgium	0.986	0.556	0.158	0.971	1.253	French
BEN	Benin	0.319	0.098	0.094	0.285	-0.301	French
BFA	Burkina Faso	0.233	0.121	0.091	0.389	-0.399	French
BGD	Bangladesh	0.410	0.099	0.091	0.341	-0.808	English
BGR	Bulgaria	0.722	0.278	0.119	0.649	0.201	Socialist
BHR	Bahrain	0.826	0.307	0.168	0.773	-0.133	English
BIH	Bosnia and Herzegovina	0.588	0.098	0.086	0.503	-0.294	Socialist
BLR	Belarus	0.812	0.222	0.147	0.787	-0.599	Socialist
BOL	Bolivia	0.512	0.164	0.163	0.400	-0.618	French
BRA	Brazil	0.700	0.145	0.086	0.579	-0.141	French
BWA	Botswana	0.448	0.180	0.052	0.418	0.648	English
CAF	Central African Republic	0.137	0.057	0.035	0.093	-1.529	French
CAN	Canada	0.997	0.676	0.264	0.979	1.676	English
CHE	Switzerland	0.984	0.595	0.102	0.965	1.782	German
CHL	Chile	0.738	0.211	0.134	0.654	1.011	French
CHN	China	0.802	0.348	0.086	0.679	-0.426	Socialist
CIV	Côte d'Ivoire	0.148	0.064	0.022	0.383	-0.566	French

Table 3.A.2 (continued)

Country code	Country name	Indicators of financial inclusion				Indicators of institutions		
		Account ownership	Saving	Borrowing	Digital payments	Formal institutions	Legal origin	
CMR	Cameroon	0.269	0.109	0.065	0.286	-0.972	French	
COD	Congo, Dem. Rep.	0.150	0.047	0.030	0.217	-1.569	French	
COG	Congo, Rep.	0.233	0.074	0.037	0.178	-1.036	French	
COL	Colombia	0.449	0.087	0.145	0.373	-0.157	French	
CRI	Costa Rica	0.678	0.230	0.141	0.592	0.625	French	
CYP	Cyprus	0.887	0.260	0.088	0.801	0.869	English	
CZE	Czech Republic	0.810	0.453	0.149	0.796	0.936	Socialist	
DEU	Germany	0.991	0.554	0.196	0.978	1.510	German	
DNK	Denmark	0.999	0.631	0.206	0.994	1.667	Scandinavian	
DOM	Dominican Republic	0.548	0.195	0.227	0.444	-0.172	French	
DZA	Algeria	0.428	0.114	0.030	0.260	-0.869	French	
ECU	Ecuador	0.509	0.122	0.118	0.316	-0.537	French	
EGY	Egypt, Arab Rep.	0.321	0.062	0.063	0.228	-0.895	French	
ESP	Spain	0.938	0.508	0.184	0.905	0.846	French	
EST	Estonia	0.980	0.469	0.140	0.968	1.196	Socialist	
ETH	Ethiopia	0.348	0.263	0.106	0.119	-0.946	French	
FIN	Finland	0.998	0.545	0.201	0.983	1.739	Scandinavian	
FRA	France	0.940	0.481	0.183	0.922	1.055	French	
GAB	Gabon	0.340	0.135	0.051	0.540	-0.670	French	
GBR	United Kingdom	0.964	0.637	0.176	0.956	1.435	English	
GEO	Georgia	0.612	0.046	0.237	0.530	0.428	Socialist	
GHA	Ghana	0.423	0.162	0.102	0.495	-0.014	English	
GIN	Guinea	0.146	0.065	0.044	0.202	-0.860	French	
GRC	Greece	0.855	0.127	0.018	0.737	0.156	French	
GTM	Guatemala	0.435	0.121	0.096	0.333	-0.567	French	
HKG	Hong Kong SAR, China	0.953	0.509	0.088	0.845	1.401	English	
HND	Honduras	0.429	0.146	0.124	0.372	-0.649	French	
HRV	Croatia	0.861	0.358	0.131	0.831	0.443	Socialist	

Table 3.A.2 (continued)

Country code	Country name	Indicators of financial inclusion			Indicators of institutions		
		Account ownership	Saving	Borrowing	Digital payments	Formal institutions	Legal origin
HTI	Haiti	0.282	0.122	0.115	0.275	-1.190	French
HUN	Hungary	0.749	0.236	0.073	0.715	0.439	Socialist
IDN	Indonesia	0.484	0.215	0.172	0.346	-0.178	French
IND	India	0.798	0.196	0.066	0.287	-0.176	English
IRL	Ireland	0.953	0.475	0.172	0.935	1.385	English
IRN	Iran, Islamic Rep.	0.934	0.262	0.239	0.898	-0.827	French
IRQ	Iraq	0.203	0.016	0.028	0.191	-1.456	French
ISR	Israel	0.928	0.534	0.350	0.908	0.818	English
ITA	Italy	0.938	0.453	0.162	0.897	0.510	French
JOR	Jordan	0.421	0.101	0.166	0.325	-0.074	French
JPN	Japan	0.982	0.645	0.057	0.953	1.361	German
KAZ	Kazakhstan	0.587	0.139	0.200	0.539	-0.436	Socialist
KEN	Kenya	0.557	0.268	0.168	0.790	-0.569	English
KGZ	Kyrgyz Republic	0.383	0.030	0.094	0.361	-0.737	Socialist
KHM	Cambodia	0.178	0.053	0.267	0.156	-0.732	Socialist
KOR	Korea, Rep.	0.949	0.553	0.177	0.924	0.768	German
KWT	Kuwait	0.798	0.266	0.165	0.748	-0.191	French
LAO	Lao PDR	0.291	0.180	0.086	0.133	-0.679	Socialist
LBN	Lebanon	0.448	0.212	0.166	0.331	-0.803	French
LBR	Liberia	0.216	0.109	0.075	0.276	-0.748	English
LIB	Libya	0.657	0.171	0.047	0.318	-1.887	French
LKA	Sri Lanka	0.736	0.288	0.148	0.472	-0.069	English
LSO	Lesotho	0.333	0.088	0.049	0.378	-0.263	English
LTU	Lithuania	0.829	0.340	0.133	0.776	0.965	Socialist
LUX	Luxembourg	0.988	0.616	0.213	0.983	1.699	French
LVA	Latvia	0.932	0.275	0.099	0.909	0.800	Socialist
MAR	Morocco	0.284	0.063	0.026	0.167	-0.261	French
MDA	Moldova	0.438	0.088	0.090	0.404	-0.416	Socialist

Table 3.A.2 (continued)

Country code	Country name	Indicators of financial inclusion				Indicators of institutions	
		Account ownership	Saving	Borrowing	Digital payments	Formal institutions	Legal origin
MDG	Madagascar	0.096	0.040	0.036	0.150	-0.698	French
MEX	Mexico	0.354	0.098	0.057	0.317	-0.259	French
MKD	Macedonia, FYR	0.766	0.173	0.131	0.658	-0.102	Socialist
MLI	Mali	0.182	0.061	0.063	0.310	-0.805	French
MLT	Malta	0.974	0.466	0.091	0.888	1.018	French
MMR	Myanmar	0.256	0.081	0.191	0.077	-0.826	Socialist
MNE	Montenegro	0.684	0.101	0.150	0.598	0.097	Civil law
MNG	Mongolia	0.930	0.193	0.289	0.853	0.042	Socialist
MOZ	Mozambique	0.330	0.108	0.050	0.341	-0.834	French
MRT	Mauritania	0.190	0.091	0.075	0.157	-0.749	French
MUS	Mauritius	0.895	0.244	0.101	0.685	0.797	French
MWI	Malawi	0.230	0.087	0.085	0.276	-0.475	English
MYS	Malaysia	0.851	0.378	0.123	0.704	0.317	English
NAM	Namibia	0.773	0.344	0.087	0.714	0.336	English
NER	Niger	0.095	0.019	0.028	0.130	-0.685	French
NGA	Nigeria	0.394	0.206	0.040	0.297	-1.042	English
NIC	Nicaragua	0.284	0.081	0.110	0.246	-0.582	French
NLD	Netherlands	0.996	0.593	0.121	0.977	1.678	French
NOR	Norway	0.997	0.793	0.350	0.991	1.777	Scandinavian
NPL	Nepal	0.454	0.171	0.134	0.163	-0.714	English
NZL	New Zealand	0.992	0.694	0.291	0.973	1.862	English
PAK	Pakistan	0.180	0.061	0.023	0.177	-1.024	English
PAN	Panama	0.458	0.145	0.083	0.350	0.170	French
PER	Peru	0.422	0.082	0.147	0.339	-0.075	French
PHL	Philippines	0.318	0.119	0.097	0.251	-0.348	French
POL	Poland	0.867	0.326	0.234	0.819	0.729	Socialist
PRT	Portugal	0.923	0.316	0.089	0.863	1.035	French
PRY	Paraguay	0.311	0.063	0.133	0.446	-0.407	French

Table 3.A.2 (continued)

Country code	Country name	Indicators of financial inclusion			Indicators of institutions		
		Account ownership	Saving	Borrowing	Digital payments	Formal institutions	Legal origin
PSE	West Bank and Gaza	0.250	0.060	0.052	0.142	-0.689	
ROU	Romania	0.576	0.136	0.149	0.472	0.263	Socialist
RUS	Russian Federation	0.758	0.135	0.139	0.705	-0.718	Socialist
RWA	Rwanda	0.367	0.189	0.077	0.389	-0.044	French
SAU	Saudi Arabia	0.717	0.143	0.112	0.612	-0.216	English
SEN	Senegal	0.204	0.073	0.066	0.395	-0.095	French
SGP	Singapore	0.978	0.669	0.156	0.901	1.605	English
SLE	Sierra Leone	0.124	0.052	0.043	0.156	-0.678	English
SLV	El Salvador	0.293	0.109	0.085	0.236	-0.223	French
SRB	Serbia	0.714	0.120	0.121	0.661	0.000	Civil
SSD	South Sudan	0.086	0.037	0.030	0.073	-2.011	English
SVK	Slovak Republic	0.842	0.499	0.195	0.815	0.725	Socialist
SVN	Slovenia	0.975	0.312	0.163	0.957	0.946	Socialist
SWE	Sweden	0.997	0.754	0.215	0.983	1.737	Scandinavian
TCD	Chad	0.088	0.025	0.028	0.190	-1.368	French
TGO	Togo	0.341	0.118	0.075	0.313	-0.647	French
THA	Thailand	0.810	0.388	0.152	0.623	-0.316	English
TJK	Tajikistan	0.470	0.113	0.147	0.439	-1.148	Socialist
TKM	Turkmenistan	0.406	0.048	0.068	0.343	-1.432	Socialist
TTO	Trinidad and Tobago	0.808	0.362	0.189	0.641	0.127	English
TUN	Tunisia	0.368	0.183	0.085	0.294	-0.275	French
TUR	Turkey	0.677	0.229	0.138	0.638	-0.463	French
TWN	Taiwan, China	0.942	0.669	0.045	0.771	1.102	German
TZA	Tanzania	0.210	0.061	0.053	0.430	-0.423	English
UGA	Uganda	0.328	0.127	0.137	0.547	-0.577	English
UKR	Ukraine	0.629	0.129	0.109	0.607	-0.740	Socialist
URY	Uruguay	0.639	0.118	0.183	0.593	0.862	French
USA	United States	0.931	0.622	0.289	0.911	1.246	English

Table 3.A.2 (continued)

Country code	Country name	Indicators of financial inclusion				Indicators of institutions	
		Account ownership	Saving	Borrowing	Digital payments	Formal institutions	Legal origin
UZB	Uzbekistan	0.371	0.023	0.021	0.342	-1.105	Socialist
VEN	Venezuela, RB	0.732	0.194	0.076	0.688	-1.507	French
VNM	Vietnam	0.300	0.145	0.206	0.227	-0.327	Socialist
XKX	Kosovo	0.523	0.087	0.103	0.386	-0.303	Civil
ZAF	South Africa	0.674	0.221	0.093	0.601	0.206	English
ZMB	Zambia	0.358	0.136	0.088	0.387	-0.335	English
ZWE	Zimbabwe	0.282	0.053	0.040	0.525	-1.217	English

3.C Data Description and Sources

Table 3.A.3

Variable	Short definition	Source
ACCOUNT	The percentage of respondents who reported having an account (by themselves or together with someone else) at a bank or another type of financial institution.	Global Findex Database (2017)
SAVED	The percentage of respondents who report saving or setting aside any money in the past 12 months by using an account at a bank or another type of financial institution.	Global Findex Database (2017)
BORROWED	The percentage of respondents who reported borrowing any money from a bank or another type of financial institution, or using a credit card, in the past 12 months.	Global Findex Database (2017)
DIGITAL	The percentage of respondents who reported using mobile money, a debit or credit card, or a mobile phone to make a payment from an account or reported using the internet to pay bills or to buy something online, in the past 12 months. It also includes respondents who reported paying bills, sending or receiving remittances, receiving payments for agricultural products, receiving government transfers, receiving wages, or receiving a public sector pension directly from or into a financial institution account or through a mobile money account in the past 12 months.	Global Findex Database (2017)
ENGLISH	Dummy=1, if English legal origin	La Porta et al., (1998, 1999); Beck et al., (2003)
FRENCH	Dummy=1, if French legal origin	La Porta et al., (1998, 1999); Beck et al., (2003)
GERMAN	Dummy=1, if German legal origin	La Porta et al., (1998, 1999); Beck et al., (2003)
OTHER	Dummy=1, if Scandinavian or Socialist legal origin	La Porta et al., (1998, 1999); Beck et al., (2003)
INSTITUTION	Unweighted averages of the six indices from WGIs	World Governance Indicators (2016)
GDP	GDP per capita (in log)	Global Financial Development Database (2015)
CREDIT	Private credit (% GDP)	Global Financial Development Database (2015)
ATM	Number of ATMs per 100,000 adults.	Financial Access Survey (2015)
PHONE	Fixed telephone subscriptions (%)	World Development Indicators (2015)
FUND	The percentage of respondents who report not having a financial institution account because they do not have enough money to use one (% age 15+).	Global Findex Database (2017)
NEED	The percentage of respondents who report not having a financial institution account only because they have no need for formal financial services (% age 15+).	Global Findex Database (2017)

Table 3.A.3 (continued)

Variable	Short definition	Source
DISTRUST	The percentage of respondents who report not having a financial institution account because they do not trust financial institutions (% age 15+).	Global Findex Database (2017)
RELIGION	The percentage of respondents who report not having a financial institution account for religious reasons (% age 15+).	Global Findex Database (2017)
FINLIT	Proportion of people that answer at least three out four financial concepts correctly, including risk diversification, inflation, interest, and interest compounding.	S&P Global FinLit Survey (2015)
COST	The percentage of respondents who report not having a financial institution account because financial services are too expensive (% age 15+).	Global Findex Database (2017)
FAR	The percentage of respondents who report not having a financial institution account because financial institutions are too far away (% age 15+).	Global Findex Database (2017)
DOC	The percentage of respondents who report not having a financial institution account because they lack the documentation needed to open one, such as an identity card, a wage slip, or the like (% age 15+).	Global Findex Database (2017)

3.D Principal Component Analysis for Financial Inclusion Indicators

Table 3.A.4. Correlations between Financial Inclusion Indicators

	[1]	[2]	[3]	[4]
[1] account	1.00			
[2] saving	0.84	1.00		
[3] borrowing	0.54	0.54	1.00	
[4] digital payments	0.97	0.84	0.55	1.00

Table 3.A.5. Principal Component Analysis for Financial Inclusion Indicators

Component	Eigenvalue	Proportion	Cumulative proportion
1	3.164	0.791	0.791
2	0.582	0.145	0.936
3	0.193	0.048	0.985

Figure 3.A.1. Principal Component Analysis for Financial Inclusion Indicators: Graphical Expression of Eigenvalues of Components

3.E Principal Component Analysis for Financial Barrier Indicators

Table 3.A.6. Correlations between Financial Barrier Indicators

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
[1] FUND	1						
[2] NEED	-0.07	1					
[3] DISTRUST	0.47	-0.08	1				
[4] RELIGION	0.58	-0.11	0.49	1			
[5] COST	0.66	-0.22	0.82	0.53	1		
[6] FAR	0.76	-0.25	0.59	0.6	0.77	1	
[7] DOC	0.75	-0.19	0.52	0.56	0.66	0.78	1

Table 3.A.7. Principal Component Analysis for Financial Barrier Indicators

Component	Eigenvalue	Proportion	Cumulative proportion
1	4.243	0.606	0.606
2	0.985	0.141	0.747
3	0.691	0.100	0.846
4	0.514	0.073	0.919
5	0.251	0.036	0.955
6	0.195	0.028	0.983
7	0.120	0.017	1.000

Figure 3.A.2. Principal Component Analysis for Financial Barrier Indicators: Graphical Expression of Eigenvalues of Components

3.F Principal Component Analysis for World Governance Indicators

Table 3.A.8. Correlations between Worldwide Governance Indicators

	[1]	[2]	[3]	[4]	[5]	[6]
[1] VOICE	1.00					
[2] POLITICAL	0.68	1.00				
[3] GOVERNMENT	0.75	0.76	1.00			
[4] REGQUALITY	0.8	0.72	0.94	1.00		
[5] LAW	0.79	0.76	0.96	0.95	1.00	
[6] CORRUPTION	0.78	0.74	0.93	0.92	0.96	1.00

Table 3.A.9. Principal Component Analysis for World Governance Indicators

Component	Eigenvalue	Proportion	Cumulative proportion
1	5.170	0.862	0.862
2	0.363	0.061	0.922
3	0.309	0.052	0.974
4	0.084	0.014	0.988
5	0.045	0.008	0.995
6	0.028	0.005	1.000

Figure 3.A.3. Principal Component Analysis for World Governance Indicators: Graphical Expression of Eigenvalues of Components

3.G Additional Robustness Check

Table 3.A.10. Legal Tradition and Financial Inclusion: More Control Variables

	(1) Account ownership	(2) Use of saving	(3) Use of Digital payments	(4) Use of borrowing	(5) 1 st principal component
FRENCH	-0.093*** (0.028)	-0.044** (0.019)	-0.105** (0.041)	0.000 (0.014)	-0.486** (0.206)
OTHER	-0.090** (0.035)	-0.016 (0.031)	-0.079 (0.051)	0.050** (0.022)	-0.067 (0.238)
CREDIT	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.002 (0.002)
GDP	0.049*** (0.013)	0.038** (0.015)	0.037* (0.020)	0.010 (0.007)	0.317*** (0.102)
ATM	0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)	0.000 (0.000)	0.006** (0.002)
PHONE	0.004*** (0.001)	-0.003* (0.001)	0.004** (0.002)	-0.001 (0.001)	0.002 (0.011)
FIMBAR	-0.047*** (0.007)	-0.023*** (0.005)	-0.029*** (0.009)	-0.004 (0.003)	-0.227*** (0.046)
Constant	0.036 (0.095)	-0.113 (0.103)	0.113 (0.157)	0.016 (0.050)	-3.324*** (0.737)
Observations	89	89	89	89	89
Prob (<i>F</i> -test)	0.000	0.000	0.000	0.000	0.000
R-squared	0.857	0.575	0.679	0.262	0.754

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Chapter 4

Access to Formal Finance and Firm Performance: Does Gender Matter?

4.1 Introduction

The literature highlights the important role of finance in firm growth and development. The main idea is that having access to finance allows firms to borrow and invest in new machinery, equipment, and technology, which help them expand business operation and production and improve firm performance. Thus, promoting firms' access to finance has been recognized as a key development goal in many countries across the globe. Access to finance is especially relevant for microenterprises largely operating in the informal sector in developing countries, since they account for a big share of total employment and GDP, but still face severe financial constraints due to the underdevelopment of the financial system.¹ Hence, it is important to examine whether access to formal finance has a positive

¹ According to the World Bank, the standard for microenterprises is up to 10 employees, total assets of up to 10,000 dollars and total annual sales of up to 100,000 dollars.

effect on firm performance of microenterprises in developing countries. Furthermore, the literature suggests a gender gap when it comes to firm performance. In general, female-owned enterprises are smaller, with respect to sales, assets, and employment, and are less profitable compared with those owned by male entrepreneurs, which can be explained by the difference between male and female entrepreneurs in preferences, endowments, and institutional constraints they are faced with. Thus far, there is almost no study that has examined whether a gender gap exists regarding the impact of access to finance on firm performance, which is the aim of this chapter.

To fill the gap in the literature, we collect data from the latest Ghana Living Standards Survey 2016/2017 (henceforth GLSS 7) and study the impact of access to formal credit on the productivity of non-farm household enterprises in Ghana, the majority of which are microenterprises specialized in small-scale production in the informal sector and have difficulty in accessing formal credit. Our data shows that about 85% of the household enterprises are not formally registered. Our findings are twofold. First, we find that non-farm household enterprises, which have applied for credit from banks and other financial institutions and managed to get credit, have a higher level of labor productivity than those that have not applied for credit. Second, we distinguish between male- and female-headed enterprises and find a gender gap in the productivity-enhancing effect of credit. The positive impact of access to credit on labor productivity is only found in male-headed enterprises, but not in female-headed ones.

We contribute to the literature on finance and firm performance in three ways. First, while the literature highlights the heterogeneity between male and female entrepreneurs with respect to business knowledge, skills, and experience, as well as personality traits, such as entrepreneurship and attitude towards risk (Bardasi et al., 2011), most empirical work does not examine the gender dimension when it comes to the impact of access to finance on firm performance. In this study, we explicitly investigate the role of gender. We suspect that entrepreneurs need to possess certain knowledge, skills, and personality traits in order to use credit efficiently and reap its benefits. Since female entrepreneurs have less resources, technology, and education compared with male entrepreneurs in general, a lack of these complementary factors means that the effect of access to credit on firm performance will be limited among female-headed enterprises. Second, different from the empirical studies that look at the impact of access to finance on firm performance of small and medium-sized enterprises (see, e.g., Fowowe, 2017; Bokpin et al., 2018), we focus on microenterprises, which are often not formally registered at authorities, and whose business activities are largely domiciled in households. In fact, microenterprises in the informal sector play a critical role in developing countries. According to International

Labor Organization, informal sector employment represents 85.8% of total employment in Africa and makes a major contribution to GDP.² Hence, promoting financial inclusion for small household enterprises is vital, especially to African countries. Nevertheless, not much is known as to how access to finance impacts firm performance of microenterprises in the informal sector. We aim to fill this gap in the literature. Third, this study is related to a small strand of the literature that examines the effect of finance on firm performance in the Ghanaian context. To illustrate, Osei-Assibey (2013) investigates whether sources of finance, that is, whether firms use internal finance from savings and retained earnings or get external finance from formal or semi-formal financial institutions, have an impact on firm productivity growth. Fafchamps, McKenzie, Quinn and Woodruff (2014) examine how access to cash and in-kind grants impacts the profit of microenterprises in Ghana by implementing a randomized controlled trial. We complement these studies by focusing on access to credit from banks and other formal financial institutions, since it is where household enterprises have the most difficulty in accessing credit in Ghana, and we are interested to know whether formal finance, if accessible to household enterprises, impacts their firm performance.

The remainder of this chapter proceeds as follows. In section 4.2, we review the relevant literature. In section 4.3, we provide a description of microenterprises and their access to credit in the context of Ghana. In section 4.4, we discuss the methodology used in our empirical analysis and provide a description of the data set. Section 4.5 discusses the estimation results. The chapter ends with conclusions and policy recommendations in section 4.6.

4.2 Literature Review

Access to finance is important for firms. A lack of finance means that establishing an enterprise is difficult in the first place. Despite promising business ideas, entrepreneurs are not able to get sufficient funds from the financial sector to carry them out. Financial constraints also negatively impact the existing enterprises. Credit inaccessibility hinders entrepreneurs from investing in new production facilities, e.g., machinery, equipment, and technology, and hiring new employees to expand business operation and production,

² Source: www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_626831/lang-en/index.htm

which hampers firm growth. In fact, many enterprises claim finance as their main obstacle to firm growth (see, e.g., Beck & Demirgüç-Kunt, 2006; Ayyagari et al., 2008; Kuntchev et al., 2013).³ Empirically, Beck, Demirgüç-Kunt & Maksimovic (2005) find that financing barriers impose an adverse impact on firms' growth in sales, especially for small-sized enterprises.⁴ Beck, Demirgüç-Kunt & Maksimovic (2006) shows that firm size, indicated by total sales, is positively associated with the amount of credit extended to the private sector by financial intermediaries. Fowowe (2017) finds that financial constraints hinder firms' employment in hiring permanent workers in 30 African countries.

Productivity is another critical dimension of firm growth. As the literature on finance and growth (see, e.g., King & Levine, 1993; Levine, 1997, 2005) suggests, the mechanism by which finance contributes to economic growth is through productivity enhancement. Hence, the issue of alleviating firms' financial constraints has received much attention (see, e.g., OECD, 2006). Empirical evidence has also established a positive link between finance and productivity. At the macro-level, the literature looks at country-level data and investigates the impact of finance on aggregate productivity. For example, Beck et al., (2000) and Rioja & Valev (2004) show that credit expansion to the private sector is positively related to total factor productivity (henceforth TFP) growth in the economy. At the micro-level, the literature uses firm-level data and examines the relationship between access to finance and firm productivity. For example, Anos-Casero & Udomsaph (2009) show that firms' TFP growth in eight Eastern Europe countries is positively related to access to finance, that is, the degree to which firms are able to get financed from the formal sector (both domestic and foreign banks), and the informal sector, such as family or friends.⁵ Bopkin et al., (2018) investigate 15 Sub-Saharan African countries and reveal that having access to a credit line or an overdraft facility improves firms' TFP growth. Ferrando & Ruggieri (2018) examine 7 euro-area countries and find that financially constrained firms tend to have lower labor productivity. Levine & Warusawitharana (2021) look at France, Italy, and Spain and show that firms' financial frictions, with respect

³ See Carreira and Silva (2010) for a review of the literature on firms' financial constraints.

⁴ In their study Beck et al. (2005) measure financing constraints as follows. The variable financing barrier takes a value between 1 and 4, where 1 indicates no obstacle and 4 indicates major obstacle, based on the survey question "How problematic is financing for the operation and growth of your business: no obstacle (1), a minor obstacle (2), a moderate obstacle (3), or a major obstacle (4)?" Data is drawn from the World Business Environment Survey conducted by the World Bank.

⁵ Specifically, in this study access to finance is measured by the first principal component, based on a principal component analysis of the following three variables: 1) The percentage of new fixed investment financed by borrowing from local private commercial banks; 2) The percentage of new fixed investment financed by borrowing from foreign banks; 3) The percentage of new fixed investment financed by borrowing from loans from family or friends, money lenders, or other informal sources. Data of these variables are drawn from the Business Environment and Enterprise Performance Survey, which is jointly conducted by the World Bank and the European Bank for Reconstruction and Development. The survey covers information about firms from all countries of Central and Eastern Europe, the former Soviet Union, and Turkey.

to leverage, cash holdings, and interest expense, tend to drag firms' TFP growth. Gatti & Love (2008) use a dataset of 548 firms in Bulgaria and find that firms' TFP is positively associated with the degree of financial access. Similarly, Galasso, Gerotto, Infantino, Nucci & Ricchi (2018) show that financial constraints drag the productivity of firms in the manufacturing industry in Italy. Krishnan, Nandy & Puri (2015) use banking sector deregulation in 1990 in the United States as a natural experiment and find that increased access to bank financing raises firms' TFP. This effect is more significant for financially constrained firms.

While access to finance is found to improve firm performance in general, this effect may differ across firms headed by male entrepreneurs and female entrepreneurs since the latter are faced with more severe social and economic constraints, which undermine their firm performance. Carranza et al., (2018) conduct a comprehensive literature review of the constraints that explain the heterogeneity in business performance between male and female entrepreneurs. Below, we provide a summary of their findings.

To start with, male entrepreneurs and female entrepreneurs are different with respect to the motivation to set up their business, goal of firm growth, attitude towards risk, and personality traits. First, women are more likely to enter self-employment due to economic necessity, e.g., low household income or unsatisfactory earnings from wage employment, rather than a creative business idea. Second, women usually have a lower expectation with respect to the growth of their business, as they prefer a work-life balance over stress and pressure that they must overcome to meet their business outcomes. Third, women are often more risk-averse than men. Consequently, women are more likely to stay away from high risk-return projects, even though risk is an unavoidable part of any business activity. Fourth, women are less competitive. Compared with men, they emphasize more on achieving a sense of fulfilment, rather than financial profitability, independence, and position.

Next, male entrepreneurs and female entrepreneurs are endowed differently with respect to assets, knowledge and business skills, and social networks. First, women, in general, have less assets, such as land, property and productive assets (e.g., cattle or goats), as they have fewer years of employment due to pregnancy, childbirth and household care, suffer from wage discrimination in the labor market, or are even forbidden to hold assets by law in some countries. As a result, female entrepreneurs are less likely to access formal credit and expand their business due to a lack of collateral. Second, women usually have less education, management skills, and business experiences. Since entrepreneurs need to acquire a certain level of knowledge and skills before they can identify prospective business opportunities, adopt innovations, and implement business ideas, a lack of these

essentials means that female entrepreneurs have to operate in less profitable sectors where a lower level of human capital is required. Third, the social networks of female entrepreneurs are often composed of relatives and friends, who are also female. A lack of connections makes it difficult for them to gain information and enter more profitable sectors, such as science, technology, manufacturing, or other high-order services.

In addition, women are faced with external constraints arising from the legal system, social norms and culture, discrimination from financial institutions, and the responsibility of taking care of family. First, legal institutions sometimes put women at a disadvantaged position.⁶ For example, women are not allowed, by law, to open bank accounts without the permission of their husbands in Nigeria, Chad, and Guinea-Bissau. Women in some African countries are deprived of their right to possess property, e.g., by inheritance, or manage property to finance their businesses. Obviously, discrimination against women by the legal system discourages female entrepreneurship and adversely impacts their firm growth. Second, social norms may also be discriminatory against female entrepreneurs. For example, in many cultures it is unacceptable for women to take control of finances, to have contact with men outside of their household, or to spend time and effort in running their business, which is often viewed as a man's responsibility. Undoubtedly, such a social environment restricts the growth potential of female-headed enterprises. Third, women are more likely to be discriminated by financial institutions, which can be seen by the fact that female entrepreneurs are required to have more collateral or pay higher interest rates to secure a bank loan. Fourth, women usually take up the responsibility of taking care of their family, which limits the time and efforts they can devote to entrepreneurial activities, leading to lower profitability of female-headed enterprises. Besides, evidence shows that some female entrepreneurs tend to use bank loan for household expenditures, rather than invest in their business as supposed to be, due to the pressure of fulfilling domestic duties. This way of using credit by women makes the impact of access to finance on firm performance limited.

Hence, we expect that the impact of access to finance on firm performance is weaker in female-headed enterprises. The idea is that while finance allows female entrepreneurs to invest in new facilities to enhance the efficiency in production and firm performance, this effect will be weakened by the fact that female entrepreneurs are bounded by certain social and economic constraints as we have summarized them above. A lack of business ambition, confidence, tolerance of risk, business knowledge and skills, social networks, protection by the legal system, and support from family or community makes it difficult

⁶ See World Bank (2015) for a more detailed discussion.

for female entrepreneurs to make the best use of finance and reap the full benefits. Recent evidence from field experiments seems to support our expectation. For example, De Mel, McKenzie & Woodruff (2008) conduct a randomized experiment in Sri Lanka, where they provide cash grants to microenterprise owners and investigate the impact of access to cash investments on the profitability of the microenterprise. They find that grants create large profit increases for male entrepreneurs, but no increase in profit is found for female entrepreneurs, even though women are often believed to be more credit constrained than men in low-income countries. Fafchamps et al., (2014) run a field experiment, where they provide cash and in-kind grants to the owner of microenterprises in Ghana. For female-led microenterprises running at the subsistence level, they do not find a gain in profits from getting either cash or in-kind grants. For larger female-led microenterprises, only in-kind grants exert a positive impact on profit growth, while cash grants do not.

Based on the above discussion, we derive the following hypotheses:

H1: Access to formal finance has a positive impact on firm performance;

H2: The positive impact of access to formal finance on firm performance is weaker for female-headed enterprises.

4.3 The Ghanaian Context

An important type of business in Ghana is microenterprises, in which no more than four people are hired (Masakure, Cranfield & Henson, 2008; Mensah, Tribe & Wess, 2007).⁷ Typically, these microenterprises specialize in small-scale production and operate in the informal sector, where “paid production and sale of goods and services that are legitimate in all respects besides the fact that they are unregistered by or hidden from the state for tax and/or benefit purposes” (Williams & Nadin, 2010, p.363). A particular form of microenterprises is household enterprises, whose activities are domiciled in households, and which are usually unregistered.

To illustrate, the most recent survey on households in Ghana, i.e., The Ghana Living Standards Survey 2016/2017 (GLSS7) indicates that 43.5% of Ghanaian households own

⁷ In Ghana, the most commonly used criteria for defining the size of an enterprise is the number of employees. The Ghana Statistical Service (GSS) defines firms with less than 10 employees as micro-and-small enterprises.

or operate a non-farm household enterprise. Despite a drop from 51% of households in 1992, the proportion of households engaged in non-farm enterprises and the growth in non-farm enterprises over the years show the importance of these enterprises to the economic development of the country. Indeed, at an estimated number of 3.825 million enterprises, and with a household population of 28.4 million in 2017, the level of non-farm household enterprise activity is very dense. These non-farm household enterprises operate mostly (close to 90% or more) without formal documentation.

A critical challenge faced by the microenterprises in Ghana is access to finance from commercial or rural community banks (Nkuah, Tanyeh & Gaeten, 2013). Particularly, credit constraint is severe for non-farm household enterprises (Ackah 2013). The GLSS 7 reports that 56% of non-farm household enterprises consider access to credit as the most challenging factor when doing business. Household savings form a major component of capital for most of these enterprises (69% in the 2017 survey). An average of 60% of non-farm household enterprises have cited access to credit as a major challenge in most of the surveys. Obviously, Ghana's financial system has not enhanced access to credit in a way that can be of utmost benefit to such non-farm household enterprises.

Consequently, firms have to consider other sources of finance (Osei-Assibey, Bokpin & Twerefou, 2012). First, firms can make use of internal finance, i.e., firm's savings and retained earnings, which, in general, incurs no transaction costs and does not require disclosing firms' information. Alternatively, firms can turn to external finance from semi-formal financial institutions, i.e., non-bank institutions, such as NGOs, savings and loans companies, credit unions and cooperatives, government agencies, and microfinance institutions. Compared with banks, semi-formal institutions are more willing to provide loans, lend to women and the poor, and reduce collateral requirements, thus particularly catering to firms that are unable to get financed formally. Lastly, microenterprises can rely on informal finance from institutions that are not regulated by Ghanaian banking laws, such as money lenders, SUSU or ROSCA operators, friends and relatives, or from other resources, also known as bootstrap financing. One important example of the latter is trade credit.

Nevertheless, Osei-Assibey (2013) highlights that bank finance in Ghana has several distinct advantages. First, banks are able to provide long-term finance that allow firms to invest in new capital and modern technologies to promote production without relying on working capital. Long-term finance is usually not available from other sources. Second, banks are specialized in monitoring firm investments and exerting corporate governance, which help microenterprises to be organized, managed, and operated in a productive manner. Third, the interest-bearing nature of bank finance incentivizes firms to make an

extra effort to develop. In contrast, the favorable lending conditions offered by informal finance, e.g., interest-subsidized loans or free grants, make the effect of credit on firm performances less prominent. Hence, we expect that access to bank credit has a positive impact on improving the productivity of non-farm household enterprises in Ghana.

4.4 Methodology and Data

4.4.1 Data and Sample

To conduct empirical analysis, we draw data from the Ghana Living Standard Survey 2016/2017 (GLSS7) conducted by the Ghana Statistical Service, which is a nation-wide survey that provides us with comprehensive information about households in Ghana, including demographic characteristics, education, health, migration, and finance.⁸ We focus on non-farm household enterprises, which is reported in section 10 of GLSS 7. Specifically, section 10 provides information on the characteristics of non-farm household enterprises, such as how long an enterprise has been operated, how much output it has produced, how much revenue it has generated, whether it is formally registered, and whether it hires household members and apprentices. Besides, this section provides information about the “finance” of household enterprises, including the main source of capital to establish an enterprise, the nature of the capital, and whether the entrepreneur has access to credit from formal financial institutions. This allows us to investigate the relationship between enterprise’s access to credit and firm performance, which is the core of the present study.

Our sample includes 6,959 non-farm household enterprises, among which 97.5% of the enterprises hire less than 5 workers. Only about 1.8% of the household enterprises hire 6-10 employees. On average, enterprises in our sample hire 1.67 employees, which confirms the predominance of microenterprises in Ghana. The median size of a non-farm household is 3 members. About 63% of the household heads are male (with an average age of 55) and 37% are female (with an average age of 50). When it comes to finance, 89.5% of non-farm household enterprises do not have access to formal credit, because the entrepreneurs do not apply for formal credit in the first place. Among those who do apply

⁸ Source: http://www2.statsghana.gov.gh/nada/index.php/catalog/97/related_materials.

for formal credit, about 80% of the enterprises succeed and 20% of them failed (see Figure 4.1). Overall, only 8.5% of non-farm enterprises in our sample have gained access to formal credit, which means that access to formal credit is still very limited in Ghana (see Figure 4.2). Limited access to formal credit has also been reflected in the response to Question 12 from Section 10 of GLSS 7, i.e., “What was the most serious difficulty in establishing this enterprise?”. Among the enterprises which do have difficulty, 93% of them cite having access to capital/credit as the main impediment (See Figure 4.3).

Figure 4.1. Access to Credit from Banks and Other Financial Institutions

Figure 4.2. Access to Credit from Banks and Other Financial Institutions

Figure 4.3. Sources of Difficulty in Establishing a Household Enterprise

4.4.2 Empirical Strategy

To test our hypothesis, we adopt the following econometric model:

$$\text{PRODUCTIVITY}_i = \beta_0 + \gamma \text{FINANCE}_i + \theta \mathbf{X}_i + \varepsilon_i, \quad (4.1)$$

where i refers to household enterprise and ε is the error term.

Dependent Variable

The dependent variable is **PRODUCTIVITY**, which is measured by the labor productivity of household enterprises. It is calculated as the total value of sales divided by the number of workers hired.⁹ We focus on productivity, rather than other dimensions of firm performance, e.g., firm size, sales, or profitability, because lagging productivity growth has been claimed as the main constraint for economic development in Africa (see, e.g., Wolf, 2007; Naanwaab & Yeboah, 2013; Wamboye & Tochkov, 2015). Thus, we are interested in examining whether access to formal finance can help non-farm household enterprises improve the efficiency of their production.

Independent Variables

The key explanatory variables are captured by vector **FINANCE**, which include three dummy variables that indicate an enterprise's access to formal finance based on the response to the question "During the past 12 months, has this enterprise tried to get credit from banks, and other financial institutions?"¹⁰ Specifically, these dummy variables are

⁹ Another measure for firm productivity is total factor productivity (TFP), which has been adopted by e.g., Gatti & Love (2006), Arnold, Mattoo & Narciso (2008), Chen & Guariglia (2013), Osei-Assibey (2013), and Bopkin et al., (2018). Specifically, the Cobb–Douglas production function, in the form of $Y_i = A_i K_i^{\beta_1} L_i^{\beta_2}$, is assumed, where a firm's output (Y_i) depends on capital (K_i), labor (L_i), and total factor productivity (A_i), which is directly observable. To calculate A_i , we first take the natural logarithm of the production function and reach $\ln Y_i = \ln A_i + \beta_1 \ln K_i + \beta_2 \ln L_i$. After rearrangement, $\ln A_i$ can be expressed as $\ln Y_i - (\beta_1 \ln K_i + \beta_2 \ln L_i)$, where the term $(\beta_1 \ln K_i + \beta_2 \ln L_i)$ can be obtained by estimating the following equation $\ln Y_i = \beta_0 + \beta_1 \ln K_i + \beta_2 \ln L_i + \varepsilon_i$. Thus, $\ln A_i = \ln Y_i - (\beta_1 \ln K_i + \beta_2 \ln L_i) = (\beta_0 + \varepsilon_i)$, and $TFP_i = A_i = e^{(\beta_0 + \varepsilon_i)}$. For instance, Osei-Assibey (2013, p.378) uses "the book value of such physical assets as machines, simple tools and equipment, land, vehicles, and etc." as a proxy for capital stock and "the total number of people engaged by the enterprise" as the indicator of labor input, and calculate TFP of non-farm household enterprises, based on the information from Ghana Living Standard Survey 2005/2006 (GLSS 5). However, our empirical analysis is using data from Ghana Living Standard Survey 2016/2017 (GLSS 7), from which information on the capital stock of non-farm household enterprises are missing. Therefore, we stick to labor productivity as the main variable of our interest. In our regression analyses, labor productivity is expressed in logarithm.

¹⁰ Source: GLSS7, Section 10, Part A, Question 15.

1) NOTAPPLIED, which equals to 1, if the enterprise has not applied for formal credit, otherwise 0; 2) SUCCESS, which equals to 1, if the household enterprise has applied for formal credit and has succeeded; and 3) FAIL, which equals to 1, if the household enterprise has applied for formal credit, but has failed. In our analysis, we treat household enterprises, which have not applied for formal credit, namely NOTAPPLIED=1, as our reference group. We are interested in the coefficient for the variable SUCCESS, which is expected to have a positive sign, indicating that, compared with household enterprises that have not applied for formal credit, those who have and gained the access to formal credit are expected to have a higher level of labor productivity.

X is a vector of control variables, which are suggested by recent empirical studies that aim to explain firm productivity (see, e.g., Gatti and Love, 2008; Ayyagari, Demirgüç-Kunt and Maksimovic, 2010; Du and Girma, 2012; Osei-Assibey, 2013; Fowowe, 2017; Bopkin et al., 2018; Adegboye and Iweriebor, 2018). To start with, we control for household head characteristics, which include age (AGE), gender (MALE), education (SCHOOLED), and marital status (MARRIED).¹¹ First, business experiences are expected to improve as household heads become senior. Thus, we expect a positive link between the age of household heads and their firm performance. Second, as is noted in section 2, female entrepreneurs are faced with more social and economic constraints that tend to drag their firm performance in general. Hence, we expect that firm productivity is lower for female-headed enterprises. Third, household heads, who have attended school, tend to have more training and, thus, are more likely to use credit productively compared with unschooled counterparts. Hence, we expect that firm performance is better in enterprises whose household heads have attended school. Fourth, household heads, who are married, are expected to bear additional responsibility for taking care of their family and have less time and effort that can be otherwise devoted to their enterprise. Therefore, productivity performance is expected to be better in enterprises whose household heads are unmarried.

Next, we control for enterprise characteristics, including firm age, i.e., the number of years that the household enterprise has been operating (OPERATION), size of household (HOUSEHOLD SIZE), and the proportion of female workers hired in the total labor force (WOMEN LABOR). First, household enterprises that have operated for a long period are often mature enterprises, which have a good knowledge about their businesses and have strong connections with suppliers, customers, and other players in the industry. Thus, household enterprises with a long history of operation are expected to be more productive

¹¹ According to GLSS 7, the head of household is identified by the household members themselves. He or she is the person who is named in reply to the question 'Who is the head of this household?' Most often, but not always, it will be the person who is the main provider and who is familiar with all the activities and occupations of household members. The head of household can be male or female.

compared with newly established enterprises. Second, it is usually easier for household enterprises to have more labor supply and get support if the household has more family members. We expect that the size of household has a positive effect on firm productivity. Third, evidence shows that women in Ghana are determined and hard-working (Dzisi, 2008). While Ghanaian women have lower levels of resources, technology, and education in general compared with their male counterparts, they learn to develop and utilize social relations and capital and combine them with their ability and flexibility in managing their household and enterprise (Kuada, 2009). It is also possible that women are more willing and able to work compared with men, since the latter have other businesses or obligations to deal with. Thus, hiring more female workers in the labor force is expected to be helpful for improving the production efficiency of the household enterprise.

In addition, we control for the industry and the location where household enterprises operate. Specifically, we include three industry dummies that capture whether household enterprises have a business in wholesale/retail trade (TRADE), services other than trade (OTHER SERVICE), or sale of meals (MEAL). It is expected that productivity is influenced by the industry of household enterprises. Further, we include five location dummies that capture whether household enterprises are located in Accra (ACCRA), other urban areas (URBAN), the rural coastal area (COASTAL), the rural forest area (FOREST), or the rural savannah area (SAVANNAH). Household enterprises are expected to be more productive in urban areas, where there is more competition and larger market exposure.

Table 4.1 provides descriptive statistics for the variables we use in our empirical model. Table 4.2 reports the correlations between these variables. More details of our data can be found in the Appendix. Specifically, Table 4.A.1 presents the data sources and definitions of these variables in detail. Table 4.A.2 reports descriptive statistics of the variables used in the regression analysis for household enterprises that have tried to apply for formal credit. Table 4.A.3 reports descriptive statistics of the variables used in the regression analysis by gender. For each variable, a *t*-test is performed to test whether the mean of the variable differs significantly across male and female group. Results of the *t*-test are also reported. Table 4.A.4 and Table 4.A.5 reports descriptive statistics of the variables used in the regression analysis by gender for household enterprises that have tried to apply for formal credit and for household enterprises that have tried to apply for formal credit and succeed respectively.

Table 4.1. Descriptive Statistics¹²

Variable	Variable name	N	Mean	SD	Min	Max
Dependent variable						
Labor productivity	PRODUCTIVITY	6088	4.372	1.655	-0.916	11.695
Explanatory variable						
Not applied	NOTAPPLIED	6959	0.895	0.307	0.000	1.000
Successful	SUCCESS	6959	0.085	0.279	0.000	1.000
Unsuccessful	FAIL	6959	0.020	0.141	0.000	1.000
Control variables						
<i>Household head characteristics</i>						
Age	AGE	6962	53.250	13.970	17.000	97.000
Male	MALE	6962	0.627	0.484	0.000	1.000
Female	FEMALE	6962	0.373	0.484	0.000	1.000
Schooled	SCHOOLED	6962	0.810	0.392	0.000	1.000
Not schooled	NOTSCHOOLED	6962	0.190	0.392	0.000	1.000
Married	MARRIED	6962	0.648	0.478	0.000	1.000
Unmarried		6962	0.352	0.478	0.000	1.000
<i>Enterprise characteristics</i>						
Years operating	OPERATION	6408	1.739	0.930	0.000	4.595
Women labor	WOMEN LABOR	6959	0.711	0.435	0.000	1.000
Household size	HOUSEHOLD SIZE	6962	4.072	3.225	1.000	28.00
<i>Enterprise location</i>						
Accra	ACCRA	6962	0.011	0.103	0.000	1.000
Other urban	URBAN	6962	0.493	0.500	0.000	1.000
Rural coastal	COASTAL	6962	0.069	0.254	0.000	1.000
Rural forest	FOREST	6962	0.152	0.359	0.000	1.000
Rural savannah	SAVVANNAH	6962	0.275	0.446	0.000	1.000
<i>Industry characteristics</i>						
Manufacturing	MANUFACTURING	6959	0.188	0.391	0.000	1.000
Wholesale/Retail trade	TRADE	6959	0.448	0.497	0.000	1.000
Other services	OTHER SERVICES	6959	0.220	0.415	0.000	1.000
Meals	MEAL	6959	0.143	0.350	0.000	1.000

¹² PRODUCTIVITY and OPERATION are expressed in logarithm.

Table 4.2. Pair-wise Correlation Matrix

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
[1] Labor productivity	1.00																
[2] Success	0.03	1.00															
[3] Fail	-0.02	-0.04	1.00														
[4] Male	-0.11	-0.01	0.00	1.00													
[5] Age	-0.08	-0.01	0.01	0.17	1.00												
[6] Married	-0.25	-0.01	0.01	0.54	0.44	1.00											
[7] Schooled	-0.01	-0.00	0.00	-0.01	0.02	-0.00	1.00										
[8] Years of operation	-0.00	0.02	0.01	-0.01	0.02	0.01	0.00	1.00									
[9] Women labor	0.07	-0.01	-0.02	-0.00	0.00	0.00	0.01	0.00	1.00								
[10] Household size	0.05	-0.01	-0.03	0.22	-0.09	-0.04	0.00	0.00	-0.00	1.00							
[11] Other urban	-0.17	0.00	0.01	-0.17	0.07	0.15	0.02	0.01	-0.03	-0.22	1.00						
[12] Rural coastal	0.36	0.01	0.02	-0.25	-0.15	-0.27	0.00	-0.01	0.01	-0.14	-0.27	1.00					
[13] Rural forest	-0.03	0.00	0.01	0.23	0.05	0.17	-0.03	0.01	0.01	-0.09	-0.42	-0.12	1.00				
[14] Rural savannah	-0.01	-0.02	-0.03	0.14	-0.02	-0.16	0.00	-0.01	0.02	0.40	-0.61	-0.17	-0.26	1.00			
[15] Wholesale/Retail trade	-0.01	0.06	0.00	-0.00	-0.00	0.02	-0.01	-0.08	0.00	-0.01	0.01	-0.00	0.00	-0.01	1.00		
[16] Other services	0.01	-0.09	-0.01	0.00	-0.00	-0.01	0.00	0.03	0.01	0.01	-0.01	0.00	-0.01	0.02	-0.48	1.00	
[17] Meals	-0.00	0.06	0.00	0.01	0.01	0.01	0.01	-0.05	-0.00	-0.02	-0.00	-0.01	0.02	-0.01	-0.37	-0.22	1.00

4.5 Results

4.5.1 Baseline Analysis

The results of estimating the baseline model in equation (4.1) is presented in Table 4.3. To start with, we regress labor productivity on enterprises' access to formal credit only. The result in column (1) shows that household enterprises that have applied and succeeded in getting formal credit, have a higher level of labor productivity, compared with those that have not applied for credit. This is captured by the positive coefficient of SUCCESS (0.153), which is significant at 10% level. In column (2)-(4), we control for household head characteristics, enterprise characteristics, industry dummies, and location dummies, and redo the previous regression. The positive impact of access to credit on labor productivity is consistently found in these regressions. The coefficients of SUCCESS remain positive and significant at 10% level (0.146, 0.168, and 0.151 respectively).

When it comes to the control variables, we find that household head's age (AGE) and marital status (MARRIED) explain the level of enterprise labor productivity. First, labor productivity is found higher in household enterprises, whose head is older. This suggests that senior household heads have more business experiences and management skills and are more likely to achieve business success. Second, labor productivity is found higher in household enterprises, whose head is unmarried. This supports the view that married household heads may have to bear more family obligations, which leave them less time and effort that can be put in their enterprises and, thus, hinder them from achieving as good business performances as unmarried household heads can otherwise do.

Furthermore, enterprises that have a larger size of household (HOUSEHOLD SIZE) and hire more female employees (WOMEN LABOR) are expected to be more labor productive. Specifically, we interpret household size as an indicator that captures the overall labor and resource endowment of the enterprise. Hence, household enterprises having more resources are more likely to achieve business success. The extent of female participation may reflect the level of productive labor input of production for household enterprises. As is mentioned in section 4.4.2., there is evidence showing that indigenous women in Ghana are confident, determined, and hard-working (e.g., Dzisi, 2008), which may help to explain our finding that household enterprises that hire more female employees are more likely to be labor productive. Finally, our result suggests that household enterprises located in the rural costal area tend to be more productive compared with those located in Accra, i.e., our reference group. Overall, the empirical analyses we have performed so

far support our first hypothesis that access to formal finance has a positive impact on labor productivity of non-farm household enterprises in Ghana.

Table 4.3. Access to Finance and Firm Productivity: Baseline Analysis

	(1) Productivity	(2) Productivity	(3) Productivity	(4) Productivity
SUCCESS	0.153*	0.146*	0.168**	0.151*
	(0.080)	(0.078)	(0.082)	(0.080)
FAIL	-0.199	-0.168	-0.133	-0.185
	(0.154)	(0.148)	(0.151)	(0.148)
MALE		0.078	0.014	0.156***
		(0.048)	(0.051)	(0.054)
AGE		0.006***	0.006***	0.007***
		(0.002)	(0.002)	(0.002)
MARRIED		-0.980***	-0.938***	-0.685***
		(0.055)	(0.058)	(0.061)
SCHOOLED		0.043	0.046	0.038
		(0.053)	(0.055)	(0.052)
OPERATION			0.001	0.002
			(0.023)	(0.022)
WOMEN LABOR			0.264***	0.255***
			(0.049)	(0.047)
HOUSEHOLD SIZE			0.025***	0.050***
			(0.006)	(0.006)
TRADE				-0.019
				(0.055)
OTHER SERVICE				0.021
				(0.062)
MEAL				-0.018
				(0.073)
URBAN				-0.289
				(0.217)
COASTAL				1.820***
				(0.238)
FOREST				-0.208
				(0.223)
SAVANNAH				-0.345
				(0.219)
Constant	4.363***	4.654***	4.369***	4.084***
	(0.022)	(0.099)	(0.126)	(0.240)
Observations	6,086	6,086	5,608	5,608
R-squared	0.001	0.063	0.069	0.166

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

As is discussed in section 2, the impact of access to finance on firm performance may differ based on the gender of entrepreneurs, as female entrepreneurs are bounded with more severe social and economic constraints. To test this hypothesis, we further conduct a subsample analysis, in which we redo the regressions we have performed in Table 4.4 for the group of male-headed and female-headed household enterprises separately. Table 4.4 reports the estimation results. The message is that access to credit seems to enhance labor productivity only for non-farm household enterprises domiciled in male-headed households, but not for those domiciled in female-headed households. In the sub-sample of non-farm household enterprises in male-headed households (column (1)-(4)), the coefficients of SUCCESS are always positive and significant, while in the sub-sample of non-farm household enterprises in female-headed households (column (5)-(8)) the coefficients of SUCCESS are never significant. This is in line with the findings presented by De Mel et al., (2008), and Fafchamps et al., (2014). Of the control variables, household size (HOUSEHOLD SIZE), household head's age (AGE) and marital status (MARRIED), the share of female employees in the labor force (WOMEN LABOR) are again found to have a strong explanatory power on household enterprise productivity. In general, our results support our second hypothesis that the impact of access to formal finance on firm performance is weaker for female-headed enterprises.

4.5.2 Robustness Checks

To test the robustness our results, we remove household enterprises that have not applied for credit from the previous sample. The idea is that household enterprises may choose to exclude themselves from formal finance, because they believe that they do not meet the requirements so that they will not succeed in obtaining credit anyway, even if they apply for credit, or because they simply do not have the need for financial services. To address the role of selection bias in explaining firm productivity, we redo the baseline regressions on this smaller sample, which is composed of household enterprises that have applied for formal credit only. In general, the robustness checks yield consistent results with what we have found before. First, the results from Table 4.5 shows that household enterprises that have tried to apply for formal credit and finally succeeded, have a higher level of labor productivity, compared with those that have applied but failed to get credit. This is captured by the positive and significant coefficients before SUCCESS. Second, when we conduct a subsample analysis in Table 4.6, we find again that the positive effect of access to formal credit on firm productivity appears in male-headed enterprises only, but not in female-headed ones.

Table 4.4. Access to Finance and Firm Productivity: Subsample Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity
SUCCESS	0.195** (0.083)	0.188** (0.081)	0.242*** (0.086)	0.245*** (0.086)	0.075 (0.164)	0.016 (0.155)	-0.009 (0.159)	-0.074 (0.148)
FAIL	-0.282 (0.179)	-0.267 (0.179)	-0.260 (0.180)	-0.269 (0.180)	-0.057 (0.277)	0.003 (0.268)	0.139 (0.279)	0.010 (0.286)
AGE		-0.011*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)		0.038*** (0.004)	0.035*** (0.004)	0.034*** (0.004)
MARRIED		-0.385*** (0.064)	-0.280*** (0.082)	-0.292*** (0.083)		-1.818*** (0.101)	-1.910*** (0.118)	-1.413*** (0.130)
SCHOOLED		0.007 (0.054)	0.001 (0.056)	-0.000 (0.056)		0.058 (0.109)	0.077 (0.114)	0.053 (0.101)
OPERATION			-0.021 (0.023)	-0.021 (0.023)			0.003 (0.046)	0.017 (0.042)
WOMEN LABOR			0.243*** (0.049)	0.243*** (0.049)			0.314*** (0.100)	0.291*** (0.092)
HOUSEHOLD SIZE			0.028*** (0.008)	0.033*** (0.008)			0.078*** (0.015)	0.102*** (0.015)
TRADE				0.007 (0.059)			(0.015)	(0.015)
OTHER SERVICE				0.118* (0.065)			-0.053 (0.105)	-0.126 (0.118)
MEAL				0.058 (0.075)			-0.232 (0.146)	-0.232 (0.146)
URBAN				-0.108 (0.244)			0.187 (0.371)	0.187 (0.371)
COASTAL				-0.039 (0.310)			2.577*** (0.380)	2.577*** (0.380)
FOREST				-0.048 (0.250)			-0.232 (0.412)	-0.232 (0.412)
SAVANNAH				-0.186 (0.245)			-0.128 (0.392)	-0.128 (0.392)
Constant	4.229*** (0.021)	5.157*** (0.098)	4.711*** (0.158)	4.771*** (0.272)	4.597*** (0.048)	3.369*** (0.182)	3.081*** (0.221)	2.416*** (0.434)
Observations	3,874	3,874	3,575	3,575	2,212	2,212	2,033	2,033
R-squared	0.003	0.040	0.051	0.054	0.000	0.125	0.129	0.304

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Table 4.5. Access to Finance and Firm Productivity (Applied for Credit Only)

	(1) Productivity	(2) Productivity	(3) Productivity	(4) Productivity
SUCCESS	0.352** (0.171)	0.304* (0.167)	0.289* (0.172)	0.344** (0.170)
MALE		0.128 (0.158)	0.156 (0.165)	0.247 (0.170)
AGE		-0.004 (0.006)	-0.007 (0.006)	-0.004 (0.006)
MARRIED		-0.856*** (0.180)	-0.859*** (0.186)	-0.694*** (0.198)
SCHOOLED		0.226 (0.172)	0.191 (0.176)	0.216 (0.174)
OPERATION			-0.047 (0.075)	-0.031 (0.071)
WOMEN LABOR			0.530*** (0.162)	0.486*** (0.158)
HOUSEHOLD SIZE			0.008 (0.021)	0.027 (0.022)
TRADE				-0.024 (0.214)
OTHER SERVICE				0.312 (0.252)
MEAL				-0.033 (0.241)
URBAN				-1.723** (0.745)
COASTAL				-0.097 (0.791)
FOREST				-1.493* (0.765)
SAVANNAH				-1.712** (0.755)
Constant	4.164*** (0.153)	4.881*** (0.364)	4.721*** (0.457)	5.770*** (0.841)
Observations	635	635	577	577
R-squared	0.006	0.065	0.087	0.160

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

Table 4.6. Access to Finance and Firm Productivity: Subsample Analysis (Applied for Credit Only)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity	Productivity
SUCCESS	0.477** (0.195)	0.450** (0.199)	0.510** (0.202)	0.509** (0.205)	0.132 (0.316)	-0.008 (0.301)	-0.248 (0.328)	-0.229 (0.344)
AGE		-0.018*** (0.006)	-0.018*** (0.006)	-0.014** (0.006)		0.024* (0.013)	0.015 (0.014)	0.020 (0.015)
MARRIED		-0.210 (0.230)	-0.187 (0.271)	-0.290 (0.275)		-1.719*** (0.315)	-1.855*** (0.358)	-1.651*** (0.400)
SCHOOLED		0.165 (0.194)	0.160 (0.205)	0.155 (0.201)		0.312 (0.318)	0.371 (0.335)	0.434 (0.341)
OPERATION			-0.043 (0.080)	-0.004 (0.080)			-0.064 (0.141)	-0.079 (0.129)
WOMEN LABOR			0.244 (0.180)	0.220 (0.176)			1.136*** (0.335)	1.115*** (0.332)
HOUSEHOLD SIZE			0.016 (0.028)	0.020 (0.028)			0.049 (0.047)	0.095** (0.047)
TRADE				0.144 (0.263)				-0.140 (0.367)
OTHER SERVICE				0.502* (0.293)				0.043 (0.458)
MEAL				0.226 (0.278)				-0.217 (0.444)
URBAN				-1.934** (0.756)				1.979*** (0.549)
COASTAL				-1.118 (0.860)				3.572*** (0.628)
FOREST				-1.628** (0.776)				0.607 (0.648)
SAVANNAH				-1.875** (0.768)				1.592*** (0.572)
Constant	3.947*** (0.178)	5.092*** (0.441)	4.878*** (0.608)	6.327*** (0.922)	4.540*** (0.274)	3.990*** (0.643)	3.863*** (0.777)	1.313 (1.161)
Observations	400	400	363	363	235	235	214	214
R-squared	0.016	0.060	0.076	0.117	0.001	0.118	0.171	0.283

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

We provide two possible explanations. First, diminishing marginal returns to capital may be at work. As is illustrated in Figure 4.4, female-headed enterprises are far more productive than male-headed enterprises (832.79 GH¢ per employee versus 249.49 GH¢ per employee) in our sample. This gender difference in productivity holds in both the subsample of enterprises that have applied for formal credit (540.87 GH¢ per employee versus 315.81 GH¢ per employee) and the subsample of enterprises that have not applied for formal credit (852.26 GH¢ per employee versus 244.52 GH¢ per employee). Given that female-headed household enterprises, on average, exhibit a much higher level of labor productivity than male-headed enterprises, access to credit for female-headed household enterprises may have little effect on further improving labor productivity. Second, and related to the previous remark, female-headed enterprises may still need to improve the endowment of complementary inputs, such as business knowledge, management skills, and financial literacy, in order to reap the full benefits of access to credit. In fact, the importance of having complementary inputs have been highlighted in the microfinance literature. The main idea is that a lack of access to credit may not be the key impediment to firm growth. Other factors, such as business know-how and financial knowledge, are complementary to microcredit. That is why many microfinance institutions have included business and financial literacy trainings into their lending strategy, which is often known as “microfinance-plus” strategy.¹³

We have tried to test for the potential effect of complementary inputs using available data from the survey, including household heads’ marital status (MARRIED), education (SCHOOLED), business experience (OPERATION), household size (HOUSEHOLD SIZE), and share of female workers employed in the labor force (WOMEN LABOR), all of which are assumed to indicate some of the key constraints faced by female entrepreneurs in the literature (e.g., Bardasi et al., 2011). We are interested to examine whether the impact of access to finance on firm productivity depends on whether a household head is married, has ever gone to school, has at least one-year experience of running the enterprise, has a large household (has more family members), and hires female workers. Unfortunately, we do not find any significant results with respect to either the direct effect of access to formal credit, or the conditional effect of the above complementary factors in both male- and female-headed household enterprises, except for the share of female workers hired. Estimation results are reported in Table 4.7 (full sample) and Table 4.8 (subsample with household enterprises that have tried to apply for formal credit only).

¹³ See, e.g., Garcia and Lensink (2019) for a more detailed discussion.

Plausible explanations on the insignificant results can be twofold. First, the variables we use to measure the complementary factors are not accurate. To illustrate, marital status, i.e., whether household head is married or not, only roughly captures to what extent the head is occupied for taking care of family or domestic obligations. Education, indicated by whether the household head has attended school, is not sufficient to indicate the level of knowledge the head has acquired. The number of years when the enterprise has been operating may not be a precise indicator of household head's business experiences. Since GLSS 7 only provides us with these (proxy) indicators that we can explore, we are not able to test potential conditional effects further. Second, and also related to the previous remark, the conditions based on which credit may potentially enhance labor productivity of female-headed household enterprises are not covered in GLSS7. For example, there is evidence showing that female household heads tend to have the ability to better manage household resources and generate further welfare benefits for their households, e.g., food security (Dzanku, 2019). Also, Ghanaian women learn to develop and use social relations and combine them with their capability of managing their households and enterprises to (Kuada, 2009). However, these complementary capabilities are difficult to be defined and measured in the first place, and a lack of this information in GLSS 7 means that we are not able to directly test the role of these capabilities in the effect of access to credit on firm productivity.

Figure 4.4. Labor Productivity by the Gender of Household Head (GH¢ per employee)

TABLE 4.7. Access to Finance and Firm Productivity: Subsample Analysis with Interaction Terms

<i>Dependent variable: labor productivity</i>	Male-headed Household Enterprises					Female-headed Household Enterprises						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SUCCESS	0.220 (0.223)	-0.142 (0.278)	0.245 (0.188)	0.285* (0.163)	0.305** (0.150)	0.083 (0.287)	-0.045 (0.196)	-0.637 (0.450)	0.237 (0.292)	-1.002*** (0.295)	-0.093 (0.228)	0.041 (0.360)
FAIL	-0.081 (0.725)	0.072 (0.591)	-0.179 (0.371)	-0.442 (0.425)	-0.371 (0.317)	-0.535 (0.393)	0.052 (0.432)	0.597 (1.168)	0.390 (0.665)	1.080** (0.461)	0.127 (0.426)	-0.424 (0.748)
AGE	-0.009*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)	0.034*** (0.004)	0.034*** (0.004)	0.034*** (0.004)	0.034*** (0.004)	0.034*** (0.004)	0.034*** (0.004)
MARRIED	-0.291*** (0.085)	-0.293*** (0.083)	-0.292*** (0.083)	-0.292*** (0.083)	-0.293*** (0.083)	-0.295*** (0.083)	-1.403*** (0.134)	-1.414*** (0.130)	-1.411*** (0.130)	-1.398*** (0.130)	-1.414*** (0.130)	-1.415*** (0.131)
SCHOOLED	-0.001 (0.056)	-0.021 (0.057)	-0.000 (0.056)	0.000 (0.056)	-0.002 (0.056)	-0.000 (0.056)	0.053 (0.101)	0.021 (0.106)	0.049 (0.101)	0.072 (0.100)	0.053 (0.101)	0.056 (0.101)
OPERATION	-0.021 (0.023)	-0.021 (0.023)	-0.020 (0.023)	-0.022 (0.023)	-0.021 (0.023)	-0.020 (0.023)	0.017 (0.042)	0.016 (0.042)	0.037 (0.045)	0.026 (0.042)	0.018 (0.042)	0.022 (0.042)
WOMEN LABOR	0.244*** (0.049)	0.241*** (0.049)	0.244*** (0.049)	0.243*** (0.051)	0.243*** (0.049)	0.243*** (0.049)	0.293*** (0.093)	0.296*** (0.092)	0.287*** (0.092)	0.221** (0.097)	0.293*** (0.092)	0.293*** (0.092)
HOUSEHOLD SIZE	0.033*** (0.008)	0.033*** (0.008)	0.033*** (0.008)	0.033*** (0.008)	0.033*** (0.009)	0.033*** (0.008)	0.102*** (0.015)	0.101*** (0.015)	0.102*** (0.015)	0.103*** (0.015)	0.102*** (0.016)	0.102*** (0.015)
TRADE	0.006 (0.058)	0.006 (0.059)	0.007 (0.059)	0.006 (0.059)	0.007 (0.059)	-0.006 (0.059)	-0.053 (0.105)	-0.051 (0.105)	-0.052 (0.105)	-0.067 (0.104)	-0.053 (0.105)	-0.051 (0.110)
OTHER SERVICE	0.118* (0.065)	0.118* (0.065)	0.118* (0.065)	0.117* (0.065)	0.118* (0.065)	0.089 (0.067)	-0.126 (0.118)	-0.123 (0.118)	-0.133 (0.118)	-0.133 (0.117)	-0.127 (0.118)	-0.142 (0.122)
MEAL	0.059 (0.075)	0.057 (0.075)	0.058 (0.075)	0.056 (0.075)	0.060 (0.075)	0.046 (0.079)	-0.231 (0.146)	-0.232 (0.146)	-0.230 (0.146)	-0.217 (0.145)	-0.232 (0.146)	-0.221 (0.156)
URBAN	-0.109 (0.244)	-0.109 (0.244)	-0.108 (0.243)	-0.108 (0.244)	-0.107 (0.244)	-0.107 (0.243)	0.187 (0.372)	0.193 (0.371)	0.189 (0.371)	0.144 (0.367)	0.179 (0.370)	0.189 (0.372)
COASTAL	-0.038 (0.310)	-0.039 (0.310)	-0.040 (0.310)	-0.038 (0.311)	-0.040 (0.311)	-0.046 (0.309)	2.577*** (0.381)	2.585*** (0.380)	2.581*** (0.380)	2.567*** (0.375)	2.568*** (0.379)	2.585*** (0.381)
FOREST	-0.048 (0.250)	-0.049 (0.249)	-0.048 (0.249)	-0.047 (0.250)	-0.046 (0.250)	-0.044 (0.249)	-0.231 (0.413)	-0.224 (0.412)	-0.234 (0.412)	-0.288 (0.408)	-0.241 (0.411)	-0.231 (0.413)
SAVANNAH	-0.187 (0.245)	-0.188 (0.245)	-0.186 (0.244)	-0.186 (0.245)	-0.184 (0.245)	-0.183 (0.244)	-0.129 (0.393)	-0.125 (0.392)	-0.126 (0.392)	-0.164 (0.387)	-0.137 (0.391)	-0.132 (0.393)

Table 4.8. Access to Finance and Firm Productivity: Subsample Analysis with Interaction Terms (Applied for Credit Only)

Dependent variable: labor productivity	Male-headed Household Enterprises					Female-headed Household Enterprises						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SUCCESS	0.398 (0.750)	-0.290 (0.642)	0.355 (0.420)	0.801* (0.471)	0.606* (0.358)	0.598 (0.497)	-0.313 (0.510)	-1.580 (1.229)	-0.286 (0.773)	-2.089*** (0.550)	-0.416 (0.518)	0.269 (0.891)
AGE	-0.014** (0.006)	-0.014** (0.006)	-0.014** (0.006)	-0.015** (0.006)	-0.014** (0.006)	-0.015** (0.006)	0.020 (0.015)	0.022 (0.014)	0.020 (0.015)	0.017 (0.014)	0.020 (0.015)	0.020 (0.015)
MARRIED	-0.396 (0.767)	-0.288 (0.274)	-0.287 (0.275)	-0.288 (0.275)	-0.297 (0.275)	-0.297 (0.271)	-1.805*** (0.653)	-1.690*** (0.393)	-1.648*** (0.402)	-1.451*** (0.400)	-1.664*** (0.406)	-1.682*** (0.407)
SCHOOLED	0.153 (0.203)	-0.362 (0.469)	0.155 (0.201)	0.167 (0.202)	0.146 (0.201)	0.165 (0.202)	0.437 (0.343)	-0.577 (1.033)	0.430 (0.342)	0.555* (0.318)	0.429 (0.342)	0.451 (0.341)
OPERATION	-0.003 (0.081)	-0.004 (0.080)	-0.075 (0.215)	-0.011 (0.082)	-0.003 (0.080)	-0.009 (0.081)	-0.075 (0.130)	-0.097 (0.130)	-0.103 (0.321)	-0.051 (0.125)	-0.074 (0.129)	-0.055 (0.129)
WOMEN LABOR	0.220 (0.176)	0.202 (0.177)	0.224 (0.178)	0.563 (0.470)	0.220 (0.176)	0.207 (0.177)	1.124*** (0.342)	1.127*** (0.331)	1.116*** (0.334)	-1.197* (0.628)	1.133*** (0.332)	1.149*** (0.338)
HOUSEHOLD SIZE	0.021 (0.028)	0.024 (0.028)	0.020 (0.028)	0.019 (0.028)	0.042 (0.062)	0.020 (0.028)	0.093* (0.048)	0.094** (0.047)	0.095** (0.047)	0.108** (0.048)	0.039 (0.097)	0.102*** (0.048)
TRADE	0.137 (0.258)	0.133 (0.259)	0.143 (0.263)	0.120 (0.267)	0.149 (0.262)	0.092 (0.222)	-0.156 (0.371)	-0.086 (0.362)	-0.143 (0.366)	-0.365 (0.355)	-0.145 (0.371)	0.208 (0.930)
OTHER SERVICE	0.499** (0.291)	0.500* (0.288)	0.504* (0.293)	0.477 (0.291)	0.505* (0.294)	0.433 (0.355)	0.024 (0.467)	0.097 (0.453)	0.038 (0.463)	-0.084 (0.447)	0.039 (0.461)	-0.023 (0.504)
MEAL	0.223 (0.277)	0.202 (0.275)	0.229 (0.278)	0.194 (0.282)	0.235 (0.278)	0.563 (0.446)	-0.223 (0.448)	-0.187 (0.444)	-0.222 (0.443)	-0.340 (0.429)	-0.222 (0.446)	1.349 (1.093)
URBAN	-1.934** (0.755)	-1.940** (0.749)	-1.940** (0.763)	-1.937*** (0.746)	-1.930** (0.760)	-1.948** (0.771)	2.044*** (0.610)	2.152*** (0.534)	1.972*** (0.554)	0.924 (0.616)	1.760*** (0.569)	2.014*** (0.628)
COASTAL	-1.111 (0.860)	-1.101 (0.862)	-1.125 (0.867)	-1.100 (0.854)	-1.124 (0.864)	-1.146 (0.877)	3.634*** (0.697)	3.745*** (0.588)	3.564*** (0.630)	2.828*** (0.653)	3.346*** (0.650)	3.641*** (0.731)
FOREST	-1.628** (0.775)	-1.633** (0.770)	-1.632** (0.783)	-1.620** (0.766)	-1.623** (0.780)	-1.629** (0.790)	0.678 (0.713)	0.744 (0.641)	0.600 (0.651)	-0.491 (0.710)	0.367 (0.687)	0.592 (0.721)
SAVANNAH	-1.877** (0.767)	-1.883** (0.762)	-1.881** (0.776)	-1.882** (0.758)	-1.867** (0.773)	-1.882** (0.783)	1.654** (0.655)	1.711*** (0.566)	1.582*** (0.578)	0.648 (0.555)	1.378** (0.560)	1.569** (0.693)
SUCCESS × MARRIED	0.129 (0.779)						0.198 (0.691)					
SUCCESS × SCHOOLED		0.658 (0.518)						1.181 (1.077)				
SUCCESS × OPERATION			0.087 (0.230)						0.029 (0.350)			

Table 4.8 (Continued)

<i>Dependent variable: labor productivity</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		Male-headed Household Enterprises				Female-headed Household Enterprises						
SUCCESS × WOMEN LABOR				-0.432 (0.510)						2.910*** (0.696)		
SUCCESS × HOUSEHOLD SIZE					-0.026 (0.064)						0.067 (0.106)	
SUCCESS × TRADE						0.043 (0.601)						-0.467 (1.003)
SUCCESS × OTHER SERVICE						-0.412 (0.550)						-1.807 (1.171)
SUCCESS × MEAL						0.220 (0.619)						0.335 (1.152)
Constant	6.406*** (1.106)	6.463*** (0.926)	6.455*** (0.962)	6.163*** (0.961)	6.243*** (0.961)	6.326*** (0.963)	1.332 (1.167)	1.191 (1.127)	1.376 (1.354)	3.856*** (1.284)	1.676 (1.197)	0.820 (1.576)
Observations	363	363	363	363	363	363	214	214	214	214	214	214
R-squared	0.117	0.122	0.118	0.120	0.118	0.119	0.283	0.288	0.283	0.337	0.284	0.291

Note: All specifications are estimated using OLS. Robust standard errors in parentheses, *** = significant at 1% level, ** = significant at 5% level, * = significant at 10% level.

4.6 Conclusion and Discussion

In this chapter, we investigate the impact of accessing credit from bank and other formal financial institutions on labor productivity of non-farm household enterprises in Ghana. Based on a sample of 6,959 non-farm household enterprises collected from Ghana Living Standard Survey 2016/2017, our empirical analysis has established two main findings. First, access to formal credit has a positive and significant effect on labor productivity of household enterprises. This is in line with the literature that highlights the indispensable role of finance in firm growth and firm performances (e.g., Ayyagari et al., 2008; 2011). Second, we find that the positive effect of accessing credit only appears in male-headed household enterprises, but not in female-headed ones. In fact, the gender dimension in the link between financial access and firm performance is also found in other country studies, where randomized control trials are employed to examine the impact of financial capital, together with other interventions, on the business outcomes of microenterprises, e.g., in Sri Lanka (De Mel et al., 2008; 2009), Ghana (Fafchamps et al., 2014), and Tanzania (Berge, Bjorvatn and Tungodden, 2015).

Nevertheless, two questions remain unclear: 1) why does the credit effect disappear for female-headed household enterprises; and 2) under what conditions may access to formal credit enhance labor productivity of female-headed household enterprises? We suspect that for credit to generate productivity-enhancing effect the head of household enterprises should possess certain skills, knowledge, experiences, and capabilities. Since women in general, less endowed with these conditional factors compared with men, the impact of accessing formal credit on productivity may be too small to be significant. We have tried to test for the potential effect of complementary inputs using available data from GLSS7. Unfortunately, we do not find any significant results with respect to either the direct effect of access to formal credit, or the conditional effect of the above complementary factors, except for the share of female workers employed.

One direction for future research may be to further explore the complementary factors that may potentially moderate the impact of access to formal finance on labor productivity of non-farm household enterprises in Ghana. However, this will have to rely on future waves of Ghanaian Living Standard Survey, which can provide researchers with deeper information and more accurate measures to capture, e.g., the level of household head's formal education, informal education, such as business training, apprenticeship, financial literacy, and the degree to which he/she has to take care of responsibilities that are not

directly associated with their enterprise.¹⁴ In addition, future research may look into the potential social and psychological complementary factors. The intuition is that the effect of accessing formal credit on firm labor productivity may depend on household heads' endowment with respect to his/her entrepreneurial ambition, commitment to business, preference of risks, acceptability of new ideas and concepts, conscientiousness, and interpersonal skills, to name a few. In fact, these social and psychological factors may be able to explain the heterogeneity in the productivity-enhancing effect of credit between male and female-headed enterprises, which we are not able to explicitly answer in this study. Once again, this will depend on future waves of the Ghanaian Living Standard Surveys, which can incorporate relevant social and psychological questions into the questionnaire.

¹⁴ For example, apprenticeship is an important form of professional trainings in Ghana. Usually, an apprentice learns the technology and business practices that are specific to the firm, in which the apprenticeship takes place. As the knowledge and skills acquired from the apprenticeship cannot be easily transferred and applied to other firms, most apprentices choose to establish their own enterprise after the apprenticeship, as self-employment allows them to replicate the knowledge and skills and reap the most benefits (Frazer, 2006).

4.A Data Description and Sources

Table 4.A.1

Variable	Variable name	Definition	Source
Dependent variable			
Labor productivity	PRODUCTIVITY	Total value of sales divided by the number of workers employed by the enterprise.	S10, P(d); P(b), Q2
Explanatory variable			
Not applied	NOTAPPLIED	=1, if a respondent answers "No" to "During the past 12 months, has this enterprise tried to get credit from banks, and other financial institutions?"; otherwise 0.	S10, P(a), Q15
Success	SUCCESS	=1, if a respondent answers "Yes, successfully" to "During the past 12 months, has this enterprise tried to get credit from banks, and other financial institutions?"; otherwise 0.	S10, P(a), Q15
Fail	FAIL	=1, if a respondent answers "Yes, unsuccessfully" to "During the past 12 months, has this enterprise tried to get credit from banks, and other financial institutions?"; otherwise 0.	S10, P(a), Q15
Control variables			
<i>Entrepreneur characteristics</i>			
Age	AGE	Answer to "How old is (NAME)?"	S1,Q5
Male	MALE	=1, if a respondent answers "Male" to "SEX?"; otherwise 0.	S1,Q2
Female	FEMALE	=1, if a respondent answers "Female" to "SEX?"; otherwise 0.	S1,Q2
Schooled	SCHOOLED	=1, if a respondent answers "Yes" to "Has (NAME) ever attended school?"; otherwise 0.	S1, P(2), Q1
Not schooled	NOTSCHOOLED	=1, if a respondent answers "No" to "Has (NAME) ever attended school?"; otherwise 0.	S1, P(2), Q1
Married	MARRIED	=1, if a respondent answers "Married" to "What is (NAME'S) present marital status?"; otherwise 0.	S1,Q6
<i>Enterprise characteristics</i>			
Years operating	OPERATION	Answer to "How long has this enterprise been actively operating?"	S10, P(a), Q7
Female participation	WOMEN LABOR	Share of female workers in total number of labor force.	S10, P(d); P(b), Q2
Household size	HOUSEHOLD SIZE	Sum of respondent, who answers "YES" to "Household member?"	S1,Q24
<i>Enterprise location</i>			
Accra	ACCRA	=1, if the household enterprise is located in Accra area; otherwise 0.	GLSS 7
Other urban	URBAN	=1, if the household enterprise is located in other urban area; otherwise 0.	GLSS 7
Rural coastal	COASTAL	=1, if the household enterprise is located in rural coastal area; otherwise 0.	GLSS 7
Rural forest	FOREST	=1, if the household enterprise is located in rural forest area; otherwise 0.	GLSS 7
Rural savannah	SAVANNAH	=1, if the household enterprise is located in rural savannah area; otherwise 0.	GLSS 7
<i>Industry characteristics</i>			
Manufacturing	MANUFACTURING		GLSS 7
Wholesale/Retail trade	TRADE	=1, if the enterprise is in the sector "wholesale/retail trade"; otherwise 0.	S10, P(d)
Other services	OTHER SERVICES	=1, if the enterprise is in the sector "services other than wholesale/retail trade (e.g., Running Transport, Hairdressing, Barbering, Repairing, Exchanging of foreign currency, Estate agents, etc.); otherwise 0.	S10, P(d)
Meals	MEAL	=1, if the enterprise is in the sector "preparation and sales of meals"; otherwise 0.	S10, P(d)

4.B Descriptive Statistics: Applied for Credit Only

Table 4.A.2

Variable	Variable name	Obs	Mean	Std	Min	Max
Dependent variable						
Labor productivity	PRODUCTIVITY	637	4.453	1.747	-0.916	9.105
Explanatory variable						
Success	SUCCESS	732	0.807	0.395	0.000	1.000
Fail	FAIL	732	0.193	0.395	0.000	1.000
Control variables						
<i>Household head characteristics</i>						
Age	AGE	735	53.103	14.062	20.000	90.000
Male	MALE	735	0.616	0.487	0.000	1.000
Female	FEMALE	735	0.384	0.487	0.000	1.000
Schooled	SCHOOLED	735	0.810	0.393	0.000	1.000
Not schooled	NOTSCHOOLED	735	0.190	0.393	0.000	1.000
Married	MARRIED	735	0.356	0.479	0.000	1.000
Unmarried		735	0.644	0.479	0.000	1.000
<i>Enterprise characteristics</i>						
Years operating	OPERATION	669	1.813	0.937	0.000	3.850
Women labor	WOMEN LABOR	735	0.687	0.446	0.000	1.000
Household size	HOUSEHOLD SIZE	735	3.850	2.990	1.000	15.000
<i>Enterprise location</i>						
Accra	ACCRA	735	0.012	0.110	0.000	1.000
Other urban	URBAN	735	0.503	0.500	0.000	1.000
Rural coastal	COASTAL	735	0.086	0.280	0.000	1.000
Rural forest	FOREST	735	0.161	0.367	0.000	1.000
Rural savannah	SAVVANNAH	735	0.238	0.426	0.000	1.000
<i>Industry characteristics</i>						
Manufacturing	MANUFACTURING	732	0.146	0.354	0.000	1.000
Wholesale/Retail trade	TRADE	732	0.531	0.499	0.000	1.000
Other services	OTHER SERVICES	732	0.120	0.325	0.000	1.000
Meals	MEAL	732	0.202	0.402	0.000	1.000

4.C Descriptive Statistics by Gender: Full Sample

TABLE 4.A.3

	MALE GROUP					FEMALE GROUP					T-TEST	
	Obs	Mean	Std	Min	Max	Obs	Mean	Std	Min	Max	t-statistic	p-value
Dependent variable												
Labor productivity (log)	3875	4.240	1.288	-0.799	10.645	2213	4.604	2.133	-0.916	11.695	8.310***	0.000
Explanatory variable												
Not applied	4362	0.896	0.305	0.000	1.000	2597	0.892	0.310	0.000	1.000	-0.552	0.581
Success	4362	0.083	0.276	0.000	1.000	2597	0.088	0.283	0.000	1.000	0.662	0.508
Fail	4362	0.020	0.141	0.000	1.000	2597	0.020	0.140	0.000	1.000	-0.109	0.913
Control variables												
<i>Entrepreneur characteristics</i>												
age	4363	55.127	13.840	17.000	95.000	2599	50.098	13.616	18.000	97.000	-14.753***	0.000
Schooled	4363	0.807	0.395	0.000	1.000	2599	0.816	0.387	0.000	1.000	0.997	0.319
Not schooled	4363	0.193	0.395	0.000	1.000	2599	0.184	0.387	0.000	1.000	-0.997	0.319
Married	4363	0.845	0.362	0.000	1.000	2599	0.316	0.465	0.000	1.000	-52.847***	0.000
Unmarried	4363	0.155	0.362	0.000	1.000	2599	0.684	0.465	0.000	1.000	52.847***	0.000
<i>Enterprise characteristics</i>												
Years operating	4018	1.735	0.925	0.000	4.357	2390	1.745	0.937	0.000	4.595	0.657	0.445
Women labor	4362	0.710	0.435	0.000	1.000	2597	0.713	0.434	0.000	1.000	0.806	0.245
Household size	4363	4.612	3.393	1.000	18.000	2599	3.166	2.687	1.000	28.000	-18.539***	0.000
<i>Enterprise location</i>												
Accra	4363	0.012	0.109	0.000	1.000	2599	0.008	0.092	0.000	1.000	-1.539	0.174
Other urban	4363	0.430	0.495	0.000	1.000	2599	0.600	0.490	0.000	1.000	13.970***	0.000
Rural coastal	4363	0.020	0.141	0.000	1.000	2599	0.152	0.359	0.000	1.000	21.517***	0.000
Rural forest	4363	0.217	0.412	0.000	1.000	2599	0.043	0.204	0.000	1.000	-20.031***	0.000
Rural savannah	4363	0.321	0.467	0.000	1.000	2599	0.196	0.397	0.000	1.000	-11.416***	0.000
<i>Industrial characteristics</i>												
Manufacturing	4362	0.185	0.389	0.000	1.000	2597	0.193	0.394	0.000	1.000	0.729	0.466
Wholesale/Retail trade	4362	0.448	0.497	0.000	1.000	2597	0.449	0.498	0.000	1.000	0.151	0.880
Other services	4362	0.221	0.415	0.000	1.000	2597	0.219	0.413	0.000	1.000	-0.267	0.789
Meals	4362	0.146	0.353	0.000	1.000	2597	0.139	0.346	0.000	1.000	-0.712	0.476

4.D Descriptive Statistics by Gender: Applied for Credit Only

TABLE 4.A.4

	MALE GROUP						FEMALE GROUP				T-TEST	
	Obs	Mean	Std	Min	Max	Obs	Mean	Std	Min	Max	t-statistic	p-value
Dependent variable Labor productivity (log)	401	4.330	1.478	0.460	9.105	236	4.662	2.116	-0.916	8.854	2.318**	0.021
Explanatory variable Success	452	0.803	0.398	0.000	1.000	280	0.814	0.390	0.000	1.000	0.373	0.710
Fail	452	0.197	0.398	0.000	1.000	280	0.186	0.390	0.000	1.000	-0.373	0.710
Control variables <i>Entrepreneur characteristics</i> age	453	54.907	14.217	20.000	90.000	282	50.206	13.331	20.000	80.000	-4.464***	0.000
Schooled	453	0.799	0.401	0.000	1.000	282	0.826	0.380	0.000	1.000	0.910	0.363
Not schooled	453	0.201	0.401	0.000	1.000	282	0.174	0.380	0.000	1.000	-0.910	0.363
Married	453	0.148	0.355	0.000	1.000	282	0.691	0.463	0.000	1.000	17.918***	0.000
Unmarried	453	0.852	0.355	0.000	1.000	282	0.309	0.463	0.000	1.000	-17.918***	0.000
<i>Enterprise characteristics</i> Years operating	412	1.812	0.923	0.000	3.850	257	1.815	0.962	0.000	3.807	0.657	0.445
Women labor	453	0.673	0.452	0.000	1.000	282	0.709	0.437	0.000	1.000	0.806	0.245
Household size	453	4.302	3.136	1.000	15.000	282	3.124	2.584	1.000	12.000	-5.289***	0.000
<i>Enterprise location</i> Accra	453	0.013	0.114	0.000	1.000	282	0.011	0.103	0.000	1.000	-0.312	0.755
Other urban	453	0.457	0.499	0.000	1.000	282	0.578	0.495	0.000	1.000	3.210***	0.001
Rural coastal	453	0.024	0.154	0.000	1.000	282	0.184	0.388	0.000	1.000	7.839***	0.000
Rural forest	453	0.243	0.429	0.000	1.000	282	0.028	0.166	0.000	1.000	-8.021***	0.000
Rural savannah	453	0.263	0.441	0.000	1.000	282	0.199	0.400	0.000	1.000	-1.987**	0.047
<i>Industrial characteristics</i> Manufacturing	452	0.137	0.344	0.000	1.000	280	0.161	0.368	0.000	1.000	0.876	0.382
Wholesale/Retail trade	452	0.531	0.500	0.000	1.000	280	0.532	0.500	0.000	1.000	0.031	0.976
Other services	452	0.131	0.337	0.000	1.000	280	0.104	0.305	0.000	1.000	-1.089	0.276
Meals	452	0.201	0.401	0.000	1.000	280	0.204	0.403	0.000	1.000	0.073	0.942

4.E Descriptive Statistics: Credit Applied & Succeeded

Table 4.A.5

	MALE GROUP					FEMALE GROUP					T-TEST	
	Obs	Mean	Std	Min	Max	Obs	Mean	Std	Min	Max	t-statistic	p-value
Dependent variable												
Labor productivity (log)	322	4.424	1.443	0.693	9.105	190	4.672	2.168	-0.916	8.854	1.552	0.123
Explanatory variable												
Success	363	1.000	0.000	1.000	1.000	228	1.000	0.000	1.000	1.000		
Control variables												
<i>Entrepreneur characteristics</i>												
age	363	54.642	14.109	20.000	90.000	228	49.877	13.222	20.000	80.000	-4.094***	0.000
Schooled	363	0.799	0.401	0.000	1.000	228	0.816	0.389	0.000	1.000	0.504	0.614
Not schooled	363	0.201	0.401	0.000	1.000	228	0.184	0.389	0.000	1.000	-0.504	0.614
Married	363	0.149	0.356	0.000	1.000	228	0.711	0.455	0.000	1.000	16.743***	0.000
Unmarried	363	0.851	0.356	0.000	1.000	228	0.289	0.455	0.000	1.000	-16.743***	0.000
<i>Enterprise characteristics</i>												
Years operating	330	1.835	0.933	0.000	3.850	208	1.783	0.950	0.000	3.807	-0.630	0.529
Women labor	363	0.675	0.454	0.000	1.000	228	0.722	0.431	0.000	1.000	1.247	0.213
Household size	363	4.512	3.220	1.000	15.000	228	3.096	2.550	1.000	12.000	-5.624***	0.000
<i>Enterprise location</i>												
Accra	363	0.017	0.128	0.000	1.000	228	0.004	0.066	0.000	1.000	-0.312	0.755
Other urban	363	0.452	0.498	0.000	1.000	228	0.579	0.495	0.000	1.000	3.028***	0.003
Rural coastal	363	0.019	0.138	0.000	1.000	228	0.180	0.385	0.000	1.000	7.246***	0.000
Rural forest	363	0.231	0.422	0.000	1.000	228	0.035	0.184	0.000	1.000	-6.632***	0.000
Rural savannah	363	0.281	0.450	0.000	1.000	228	0.202	0.402	0.000	1.000	-2.169**	0.031
<i>Industrial characteristics</i>												
Manufacturing	363	0.124	0.330	0.000	1.000	228	0.154	0.361	0.000	1.000	1.021	0.308
Wholesale/Retail trade	363	0.554	0.498	0.000	1.000	228	0.539	0.500	0.000	1.000	-0.338	0.735
Other services	363	0.105	0.307	0.000	1.000	228	0.096	0.296	0.000	1.000	-0.321	0.749
Meals	363	0.218	0.413	0.000	1.000	228	0.211	0.409	0.000	1.000	-0.204	0.838

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Samenvatting (Summary in Dutch)

Dit proefschrift draagt bij aan ons begrip met betrekking tot de oorzaken en gevolgen van financiële ontwikkeling, waarbij de nadruk ligt op drie hoofdthema's: (1) het verband tussen financiële verdieping en financiële stabiliteit; (2) de determinanten van de toegang tot financiële diensten (*financial inclusion*) en (3) het effect van de toegang tot financiële diensten op het verbeteren van de economische welvaart. Deze onderwerpen hebben tot op heden in de literatuur relatief weinig aandacht gekregen.

In verreweg de meeste studies naar de gevolgen van financiële ontwikkeling worden de voordelen benadrukt. Maar hoe zit het met de mogelijke nadelen? Kan financiële ontwikkeling eventueel ook aanleiding geven tot ongewenste economische resultaten? In de literatuur hierover wordt het risico op een bankencrisis het meest genoemd als een mogelijk negatief gevolg van financiële ontwikkeling. De hoofdgedachte is dat een (sterk) groeiende omvang van de kredietverlening (*credit deepening*) vaak een voorbode blijkt te zijn van een bankencrisis. Er ontbreken echter verklaringen over hoe een bankencrisis en de groei van de kredietverlening met elkaar samenhangen. Daarom onderzoeken we in hoofdstuk 2 van dit proefschrift de volgende vraag: *In hoeverre leidt groeiende kredietverlening tot het ontstaan van een kwetsbare bancaire sector? In hoeverre hebben kredietverlening aan het niet-financiële bedrijfsleven en kredietverlening aan huishoudens een verschillende uitwerking op de bancaire kwetsbaarheid?* De resultaten van ons onderzoek laten zien dat een groei van de kredietverlening samenhangt met een grotere kwetsbaarheid van banken, wat kan leiden tot een grotere kans op een bankencrisis. Bovendien stellen we vast dat de kwetsbaarheid van banken alleen verband houdt met de groei van de

kredietverlening aan niet-financiële ondernemingen en niet met de kredietverlening aan huishoudens.

Het tweede hoofdthema waaraan we in dit proefschrift aandacht schenken betreft de determinanten van de toegang tot financiële diensten. In de literatuur over dit thema wordt onder meer onderzocht in hoeverre formele instituties financiële ontwikkeling kunnen beïnvloeden. Daarbij wordt onder andere gekeken naar het belang van het juridische kader in een land. Het onderzoek toont aan dat er over het algemeen een positief verband bestaat tussen het bestaan van sterke formele instituties en financiële ontwikkeling. Het onderzoek in hoofdstuk 3 van dit proefschrift bouwt voort op bestaand onderzoek en tracht antwoord te vinden op de volgende vragen: *Bevorderen betere formele instituties, en dan met name de kwaliteit van het bestaande juridische kader, de toegang tot financiële diensten (financial inclusion)? In hoeverre wordt het positieve verband tussen formele instituties en toegang tot financiële dienstverlening bepaald door het bestaan en de omvang van factoren die de toegang tot financiële dienstverlening mogelijk kunnen beperken, zoals de kosten van de dienstverlening, het ontbreken van de juiste documentatie om gebruik te kunnen maken van financiële dienstverlening, het wantrouwen met betrekking tot financiële instellingen, religieuze bezwaren tegen het gebruik van financiële diensten, etc.?* De resultaten in hoofdstuk 3 laten zien dat er een sterk positief verband bestaat tussen sterke formele (juridische) instituties en de toegang tot financiële dienstverlening in een land. Deze bevinding is robuust voor verschillende maatstaven van formele juridische instituties en voor verschillende modelspecificaties. Daarnaast suggereren de resultaten in dit hoofdstuk dat het positieve verband tussen sterke formele instituties en toegang tot financiële dienstverlening zwakker is naarmate factoren die toegang tot financiële diensten belemmeren hoger zijn.

In hoofdstuk 4 van dit proefschrift bestuderen we de gevolgen van een gebrek aan toegang tot financiële middelen voor de groeimogelijkheden van zogenaamde micro-ondernemingen. Diverse studies hebben aangetoond dat toegang tot financiering de prestaties van ondernemingen verbetert. De meeste studies hebben echter betrekking hebben op formeel geregistreerde bedrijven. In veel ontwikkelingslanden zijn echter juist veel micro-ondernemingen actief. Deze ondernemingen zijn niet formeel geregistreerd bij de autoriteiten en zijn vooral actief in de informele sector. Ondanks hun belang voor de economie is er niet veel bekend over de invloed van toegang tot financiering op de prestaties van deze ondernemingen. Daarom onderzoeken we in hoofdstuk 4 de volgende vraag: *Verbetert toegang tot financiering de prestaties van micro-ondernemingen? Verschilt de invloed van toegang tot financiering op de bedrijfsprestaties tussen bedrijven die worden geleid door mannelijke versus vrouwelijke ondernemers?* In het onderzoek richten wij ons op

ondernemingen buiten de agrarische sector. Onze resultaten laten allereerst zien dat ondernemingen die hebben geprobeerd krediet aan te vragen bij banken en andere financiële instellingen en er uiteindelijk in zijn geslaagd krediet te krijgen, een hogere arbeidsproductiviteit hebben dan ondernemingen die niet geprobeerd hebben om krediet te krijgen. Daarnaast vinden we aanwijzingen voor het bestaan van een genderkloof in het productiviteitsverhogende effect van toegang tot krediet. Het positieve effect van toegang tot krediet op de arbeidsproductiviteit doet zich alleen voor bij bedrijven die worden geleid door een man, maar niet bij bedrijven die worden geleid door een vrouw. Dit impliceert dat toegang tot financiering niet doeltreffend is als instrument om de prestaties (gemeten in termen van de behaalde arbeidsproductiviteit) van bedrijven die worden geleid door een vrouw te verbeteren.