Radboud Universiteit

The effect of financial inclusion on firm innovation in emerging markets

A quantitative study on the access and usage of financial services.

Master thesis International Business

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S4594436

Date: 15-06-2020

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Abstract

Firms in emerging markets experience less developed financial markets in comparison to developed countries. These constraints cause difficulties in using and accessing financial services. Financial inclusion covers these aspects and is getting more recognition the last few years. Still, firms in emerging markets experience less financial inclusion. Access and usage of financial services could boost the funds for firms to engage in innovative activities. Firm innovation is a driver for a country's economy growth rate. This study has researched the effect of financial inclusion on firm innovation in emerging markets. Additionally, this study has researched the interaction effects of informal capital and firm size with financial inclusion on firm innovation. Informal capital is a widely used way of obtaining funds in emerging markets, since the financial institutions are less developed. A larger firm size provides a firm with higher earnings which may alter the importance of being financially included. Results are obtained by using data from the World Bank Enterprise Surveys in a binominal logistic regression. First, the effect of financial inclusion on firm innovation is indicated to be positive. Second, informal capital as a direct effect is found positive, but as a moderating effect insignificant. Therefore, informal capital is suggested as a complementary way of funding instead of a substitutional way. Lastly, the interaction effect of firm size and financial inclusion is found significant and positive. The results have indicated that small size firms profit more of financial inclusion than large size firms.

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Chapter 1:

1.1 Introduction

In 2006, Muhammad Yunus from Bangladesh won the Nobel Peace Prize for his establishment of the Grameen Bank (The Nobel Prize, 2006). The belief behind this establishment was that access to credit was a fundamental human right. The bank provided micro loans between $50 and $100. The objective behind this initiative was to help people escape poverty and teach the poorest people about financial principles. Since 2011, more and more initiatives for financial inclusion have started. Financial inclusion means the access and usage of financial services that are affordable in a sustainable way (Chen & Jin, 2017; Loukoianova, Guo, & Yang, 2018). Financial inclusion has thus become an important agenda point for many countries over the world. The Worldbank (2018) states the following about financial inclusion: 'Financial inclusion is a key enabler to reducing poverty and boosting prosperity'.

People with bank accounts are more likely to use other financial services, start or expand businesses, invest in education and health and to manage risks. All these opportunities can improve the quality of their lives according to Worldbank (2018). 1.7 billion people still live without a bank account, although this number has been decreasing since 2011. This means that only 69% of the adults globally have access to a bank account. Additionally, 200 million small business are lacking access to formal financing globally (McKinsey&Company, 2018). Being connected to the formal financial system globally helps to improve businesses and lives. Improving businesses can refer to being able to expand in size, invest in new technologies and many other assets. These opportunities constitute firm innovation in its broadest sense.

Firm innovation can occur in four types of categorization according to the Oslo Manual of the OECD (Organization for Economic Co-operation and Development), namely: Product innovation, process innovation, marketing innovation and organizational innovation (Oslo Manual, 2005). However, only for product and process innovations evidence has been found that it leads to economic growth and improvements in economic performance on the long run (Canh, Liem, Thu & Khuong, 2019).

Research about firm innovation in emerging markets has risen over the last few years. Emerging markets can differ in size and complexity if looked at from an economic perspective (FTSE Russell, 2019). An emerging market can be defined as a market with institutional voids with growth potential or high growth rate. Khanna and Palepu (p. 24, 2010) provide a structural

definition, which is formulated as follows: 'those markets where specialized intermediaries are absent or poorly functioning'. In emerging markets formal institutions are not in place or acting poorly and inefficiently. Formal institutions are the rules of the game (North, 1990). Weak formal institutions indicate poorly organized rules and governance, however, firms from emerging markets play an increasingly important role in the global economy (Kumar & Pattnaik, 2014, p. 16). Firms in markets with weak formal institutions, such as emerging markets, overcome the financial constraints by relying more on informal financing (Ullah, 2019). Especially, smaller size firms are constrained by the difficulties of obtaining formal financing. Due to higher risks, high transaction costs and lack of collateral, it is harder for smaller firms to obtain external financing than larger firms (Degryse, Lu & Ongena, 2016).

1.2 Aim of thesis

The relationship between financial inclusion and firm innovation within emerging markets is significantly less observed than the effect of financial inclusion on other business aspects. For example, the effect of financial inclusion on firm performance (Fowowe, 2017), the effect of financial inclusion on a firm's sales growth (Lee, Wang & Ho, 2019) and the effect of financial inclusion on firm growth (Chauvet & Jacolin, 2017; Lakuma, Marty & Muhumuza, 2019). As a result, this study aims to explore the effect of financial inclusion on firm innovation in emerging markets, as moderated by firm size and informal financing.

1.3 Research Question

The formulation of the research question derives from the aim of the thesis and is as follows:

'*What is the effect of financial inclusion on firm innovation in emerging markets, as moderated by firm size and informal financing?'*

1.4 Added value in theory and practical sense

The aim of this study contributes to explore the effect of financial inclusion on firm innovation. The study adds value and insights to create a broader understanding of the effect of financial inclusion on firm innovation. Financial inclusion is regarded as an important topic in emerging markets, however the effects of financial inclusion on firm innovation are barely researched in comparison to other business-related topics. Filling this gap in theory also has practical relevance. The practical relevance occurs as information and support to keep

undertowing the movement for higher financial inclusion worldwide. Information about the effect of financial inclusion on firm innovation is relevant for policymakers and governments, such as politicians, business consultants and businesses, in emerging markets. The information is relevant to keep improving a nation's economy, since firm innovations are regarded as an antecedent to improve a nation's economy in the long run (Pece, Simona & Salisteanu, 2015; Iyoboyi & Na-Allah, 2014).

1.5 Thesis structure

Chapter 2 is used for explaining the theoretical frameworks of the key terms in this study. Thereafter, the methodological choices and details are discussed in chapter 3. In chapter 4, the results will be outlined and presented, which are discussed and interpreted in chapter 5. Finally, a conclusion including theoretical and practical implications, limitations and recommendations are given in chapter 6.

Chapter 2: Literature review

In chapter 2, the central concepts and linkages will be discussed based on theoretical literature. The chapter starts with the independent variable, financial inclusion and continues with the dependent variable, firm innovation, after that. Next, the link between financial inclusion and firm innovation will be explained. After that, the moderators, informal capital and firm size, and their effect will be discussed to finally conclude the chapter with the conceptual model, which contains the summary of all the hypotheses.

2.1 Financial inclusion

The concept of financial inclusion arises from the inverted concept financial exclusion. Leyshon and Thrift (p. 314, 1995) have defined this latter concept as: "those processes that serve to prevent certain social groups and individuals from gaining access to the financial system". In the current literature, financial inclusion has a common definition. Financial inclusion, as introduced, is defined as the access to and usage of financial services from financial institutions (Chen & Jin, 2017; Loukoianova et al., 2018). The third component of financial inclusion is regarded as the quality of the financial service. These three dimensions are generally used to measure the concept financial inclusion (Hannig & Jansen, 2010; Loukoianova et al., 2018). Financial inclusion could also be seen as a process to ensure that people globally have access to financial services in the formal financial system (Ozili, 2020). Credit is regarded as the most important aspect of financial inclusion, although the concept covers multiple other aspects, such as savings, payments, and insurance (Dev, 2006). Financial

inclusion is aimed at both individuals and businesses according to The World Bank (2013). Financial inclusion provides credit constrained firms with extra value added (Lee et al., 2019). Having access and the usage of financial services reduces liquidity problems and increases the likelihood of making an investment (Chauvet & Jacolin, 2017). Financial inclusion, therefore, is seen as an integral aspect of financial development (Omojolaibi & Popogbe, 2018). The development of finance has shown to improve investment in innovative projects or activities (Chauvet & Jacolin, 2017). Greater access to financing is particularly important in emerging markets in which projects are launched rapidly, due to the growing rate of these markets. Greater access provides the needed capital for these firm projects and activities (Arun & Kamath, 2015).

2.2 Firm innovation

Growing access to financial capital in emerging markets has increased the innovation rate in the emerging markets (Haar & Ernst, 2016). Firm innovation is associated with the newest and latest aspects of knowledge, skills, and technologies (Na & Kang, 2019). However, this association is only applicable to developed markets because firms in emerging markets normally do not have the access to financial services or the internal capital to engage in these kinds of innovation. Firm innovation within emerging markets operates differently than firm innovation in developed markets due to the fact developed markets edge the technological frontier further. Emerging markets perform far from the technological frontier. In emerging markets, 'new to the firm' innovations occur mostly, whereas in developed markets original inventions happen more often (Demirgüç-Kunt & Klapper, 2013). Haar & Ernst (2016) mention that three concepts are central to innovation in emerging markets to overcome challenges, namely: affordability, flexibility, and functionality.

As mentioned in the introduction, the OECD manual categorizes innovation into four types, namely: Product, process, marketing, and organizational innovations (Oslo Manual, 2005). This differs from the distinction that Haar & Ernst (2016) apply to categorize innovation. The categorization that they use is divided in Product, Process, Service and Business model innovation. As can be seen, the overlap between both distinctions is product innovation and process innovation. Both types of innovations are the most used category to indicate firm innovation. In the case of emerging markets, product innovations are believed to offer enormous opportunities for growth (Popescu, 2013). Therefore, the focus of this study is on product innovation.

Product innovation is considered to be of great relevance for firms in emerging markets (Mateut, 2018). Product innovation is assumed to create opportunities for the growth of a firm through the increase of quality or the increase in the variance of the products (Vaona & Pianta, 2008). Product innovation can be divided into incremental and radical product innovation. Incremental innovation entails improving products step by step and radical innovation is focused on revolutionary findings (Na & Kang, 2019). Incremental product innovation is regarded as low risk – low reward, whereas radical product innovation is seen as high risk – high reward (Iyer, LaPlaca, & Sharma, 2006). In the study, the focus is on the combination of radical and incremental product innovation, however incremental innovation is referred to as significantly improved products. Since in emerging markets completely radical innovations occur less frequently, both types of product innovation are used in the study. A distinction is not made for the purpose of the study to research the effect on all types of product innovation.

2.3 Effect financial inclusion on firm innovation

Innovation is important for economic growth and development (Barasa, Knoben, Vermeulen, Kimuyu and Kinyanjui, 2017). Innovation is impacted by a broad system of different variables, to which the ever-increasing access to finance belongs (Haar & Ernst, 2016). The access of finance expands the range of opportunities and drives an economy (Campero & Kaiser, 2013). Demirgüç-Kunt and Klapper (2013) found that higher access to financial institutions encourages a higher usage of financial instruments.

For young and small firms that face quite a lot of challenges access to finance can stimulate innovation (World Bank, 2013). The challenges exist of imperfect markets, information asymmetry and high transaction costs (Mahendra, Zuhdi & Muyanto, 2015). Financial inclusion creates therefore a lot of new opportunities for individuals and businesses, but risks are also associated with these opportunities. It is important to not act reckless and be sensible.

Most emerging markets possess an underdeveloped financial system, which causes access to finance to be traditional, namely line of credit/ bank loan. Firms are dependent on loans provided by banks. Information asymmetry can cause friction on the credit market which will lead to not being able to access credit (Mahendra et al., 2015). Asymmetric information between a business and a potential investor creates extra costs to overcome the uncertainty of borrowing money. This makes it more difficult to obtain external financing as a firm.

Empirical evidence from Ayyagari, Demirgüç-Kunt and Maksimovic (2011) shows a positive relationship between financing by banks and firm innovation. Their study consisted of a sample over 19.000 firms in 47 developing countries, however including in the 47 developing countries are quite a lot of emerging countries such as Brazil, Czech Republic, Egypt etc. The difference between developing and emerging markets is a fast-growing per capita income (Roztocki & Weistroffer, 2011). Therefore, this study is regarded as representative for emerging countries as well. The study of Ayyagari et al. (2011) included a broad range of innovative activities including product innovation. The measurement of external financing was the proportion of new investment that was financed by external sources, most likely to be bank financing as they indicated themselves. This focused mainly on the usage aspect of financial inclusion and is regarded as an indirect measure of financial constraint. Like Ayyagari et al. (2011), Gorodnichenko & Schnitzer (2013) researched the effect of financial constraints on firm innovation. The difference between these two researches is that Gorodnichenko & Schnitzer (2013) used a direct measure in the form of 'Difficulty of access to external finance', whereas Ayyagari et al. (2011) used an indirect measure. However, Gorodnichenko & Schnitzer (2013) also found a positive relationship between access to finance and innovation.

Additionally, Mahendra et al. (2015) show similar results, indicating that improving the access to finance will increase the likelihood for firms to engage in innovative activities. The context of the study was Indonesian, which is regarded as an emerging market. In a similar emerging market context, Girma, Gong & Gèorg (2008) researched the effect of access of finance on innovation in China. The results were similar as access of finance was positively associated with innovation. Savignac (2008) showed that the likelihood to engage in innovative activities is decreased by the existence of financial constraints. Similarly, Agénor & Canuto (2017) found that a lack of access to finance resulted in an adverse effect on innovation activity.

To conclude, after extensive reviewing the literature on the effect of financial inclusion on firm innovation, the expectation is to see a positive impact of financial inclusion on the degree of firm innovation. Hypothesis 1 is formulated as follows:

H1: Financial inclusion has a positive impact on firm innovation in emerging markets.

2.4 Informal financing

Informal credit or informal finance can be defined as 'legal but unregulated financial activities that take place outside official financial institutions and are not directly amenable to

control by key monetary and financial policy instruments' (Ngalawa & Nicola, 2013, p. 615). The legal aspect is important to discourse because informal financing can occur illegally as well. Allen, Qian & Xie (2019) make a distinction in their study between a legal and illegal form of informal financing, namely constructive informal financing, and underground financing. A clearer definition is provided by Degryse et al. (2016, p. 38): 'informal finance is the sum of loans from family members, friends, ROSCAs (Rotating savings and credit association), moneylenders, and informal banks'. Informal finance is regarded in this study as all legal sources of financing excluding internal and formal financing.

Bank and market failure occur often in emerging markets. These failures are created by less developed financial systems. Small firms are harmed by these failures due to the fact it leads to inadequate financing (Allen et al., 2019). The usage of informal financing can alleviate the constraint of not being able to use formal financing for smaller firms (Ullah, 2019). Small firms in emerging markets are likely to borrow money and funds from friends and families due to their informal network to compensate the lack of financial access (Demirgüç-Kunt and Klapper 2013; Pearlman 2010). The research of Demirgüc-Kunt and Klapper (2013) has shown that 1 of 4 adults from emerging countries borrow money and funds from friends and family within their informal network. Borrowing money from friends and family is a way of dividing the risk over more people. Risk sharing can be beneficial for a group of people within an informal network. Informal credit or capital is often associated with emergencies and unexpected costs (Campero and Kaiser 2013; Pearlman 2010). This is caused by the advantageous attributes of informal financing like flexibility and speed (Campero & Kaiser, 2013).

Lack of access to finance causes small enterprises to rely on their limited earnings, which will provide difficulties to take advantage of certain opportunities (Demirgüc-Kunt and Klapper, 2013). The usage of informal financing happens more often in small and young firms (Allen et al., 2019). Informal financing is important for these small firms due to the lack of credit history and collateral (Degryse et al., 2016). Informal financing can therefore substitute the lack of formal financing. Allen et al. (2019) found that informal financing can support if formal financing supply lags demand, which will make informal financing a substitute for formal financing in this context.

In conclusion, informal financing can be of great value in markets, which possess less developed financial systems. Informal financing is used often in cases, where firms cannot

access formal financing. This makes informal financing a suitable substitute for the emerging markets. Therefore, the following hypotheses is formulated.

H2: Informal financing positively moderates financial inclusion on firm innovation in emerging markets.

2.5 Firm size

The size of a firm has different effects on firm innovation. A larger size is associated with greater accessibility to knowledge, skills, and expertise in comparison to smaller size firms (Rogers, 2004). The availability to access greater resources affects the business capabilities of a firm to act in innovative activities (Robson, Haugh & Obeng, 2009). Therefore, a constraint to resources can be decisive for a firm to not perform an innovative product introduction (Hausman, 2005). Herrera & Sanchez-Gonzalez (2013) mention in specific that it is argued that large size firms have an advantage in incremental innovations due to their established capacities and knowledge.

Small and medium firms are more likely to have access to finance as a major constraint than large firms (Mahendra et al., 2015). Smaller firms must overcome the disadvantage of a lack of resources. An underlying factor is the lack of adequate funds to overcome the disadvantage (Ettlie & Rubenstein, 1987). Large firms are expected to be able to finance innovative projects due to their internally generated stable flow of revenue and therefore the possibility to build up funds for future use (Corsino, Espa, & Micciolo, 2011). Ayyagari et al. (2011) found that larger firms were more innovative across a lot of different innovative activities, as well as on the combined indicator. Thus, larger firms perform more product innovation.

'Although small firms typically have resource constraints, they are often successful innovators' (Forsman, 2015, p. 42). Forsman (2015) lists three components of innovation capacity for small firms: Internal resources, capability to exploit the internal resources and external capacity acquired through networking. Furthermore, in contrast to all disadvantages, a small size firm is regarded as flexible. The absence of a bureaucratic hierarchy can provide rapid decision making to react to market opportunities (Corsino et al., 2011). The speed and flexibility that small size firms possess is an advantage.

Long term external credit for investments and innovations are scarce, which limits the opportunities for small firms (OECD, 2018). Small firms, who face a greater constraint of

capital and possibilities, profit enormously from access to finance in association with firm innovation (Sahay & IMF, 2015). In comparison to small size firms, larger size firms can rely more on internal funds, capital, and knowledge to develop innovations. Access to external finance is therefore a less important aspect for larger firms. Smaller size firms benefit more from financial inclusion relative to large size firms (Lakuma et al., 2019). This indicates that smaller size firms are greater financially constraint.

In conclusion, a larger firm size offers the availability of resources and capabilities to undertake innovation, whereas smaller size firms gain more advantage from being financial included due to greater access to finance constraints. For this reason, hypotheses 3 is formulated as follows:

H3: Firm size positively moderates the effect of financial inclusion on firm innovation in emerging markets.

2.6 Conceptual model

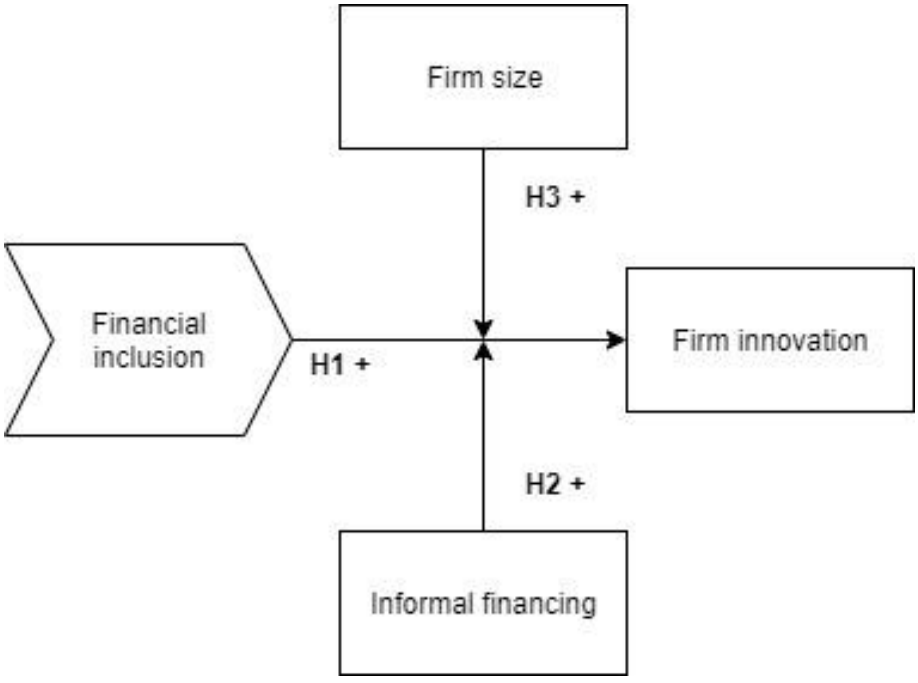

Figure 1.

Chapter 3: Methodology

In chapter 3, the methodology will be discussed. Starting the chapter, the sample of the data used will be discussed. After clarifying the sample of the data, the chapter proceeds to the operationalization of the variables included in the study. In order, the dependent variable, the independent variable, the moderators, and the control variables will be explained. Next, the method for data analysis will be expounded. Lastly, the validity, reliability and research ethics will be discussed.

3.1 Sample of the data:

A dataset provided by the Enterprise Surveys of the World Bank (2020a) is used to test the formulated hypotheses. The dataset is composed of firm-level surveys from around the globe to provide comparable data across different economies. The sample of the data that is used originates from 12 countries all indicated as emerging markets by the MSCI index (2019). This index consists of 26 countries; however, some countries are left out due to the lack of up-to-date data. Furthermore, the 12 countries are spread over most continents to cover multiple contexts and consist of a similar amount of cases to prevent bias. The organizations are small, medium, and large organizations. In this, small is seen as an organization with 5-19 employees, medium as an organization with 20-99 employees and large organizations are regarded as 100+ employees according to the World Bank Enterprise Surveys. Although the OECD (2020) wields different standards, regarding a firm with 1-9 employees as a micro organization, a firm with 10-49 employees as a small and a firm with 50-249 employees as a medium organization. This study refers to the organizations according to the World Bank Enterprise Surveys to avoid confusion within the data. The sectors provided in the dataset are the manufacturing, retail services, and 'other' services sectors. A distinction in these sectors has been made for some countries, but in this study the manufacturing, retail services and 'other' services sector will be looked at as a whole to keep the comparability across all countries. 14.411 firms in total as divided over 12 countries. 40.2% are small organizations, 32.8% are medium organizations and 27.1% are large organizations. The ratio for the sector is 66.7% for the manufacturing sector, 11.9% for the retail services sector and 21.4% for the 'other' services sector. The sample period is from 2015-2019. Every observation is independent from each other and not influenced by other observations. An overview of the division is given in Table 1.

Country:	*Year of survey:*	*Number of firms:*
Colombia	*2017*	*993*
Peru	*2017*	*1003*
Argentina	*2017*	*991*
Egypt	*2016*	*1814*
Greece	*2018*	*600*
Poland	*2019*	*1369*
Russia	*2019*	*1323*
Turkey	*2019*	*1663*
Indonesia	*2015*	*1320*
Malaysia	*2015*	*1000*
Philippines	*2015*	*1335*
Thailand	*2016*	*1000*

Table 1. Overview sample

3.2 Operationalization of the variables:

3.2.1 Dependent variable:

Firm innovation is operationalized as 'the introduction of a new or significantly improved product/service in the last three years'. This represents the product innovation in emerging markets as a good measure, since most innovations in emerging markets are regarded as incremental. The variable will be a binary measure with a Yes as 1 and a No as 0. A dummy variable is created to cover the measure, therefore a 1 represents the introduction of a new or significantly improved product/service over the last three years, whereas a 0 presents the opposite. This measure has been used in other studies as well (Barasa et al., 2017; Chadee & Roxas, 2013; Mateut, 2018). For this reason, the usage of the measure is justified.

3.2.2 Independent (explanatory) variable:

A measurement for all aspects of the concept needs to be included to create a representative picture of the independent variable. To cover the dimension of access to financial services, the variable 'does this establishment have a checking and\or saving account?' provided by the World Bank Enterprise Surveys is used. To cover the dimension of the use of financial services the variable 'establishment has a line of credit or loan from a financial institution?' is used. This variable provides a representation of the usage of formal financing and is also derived from the World Bank Enterprise Surveys. Both variables are binary measured. A composite variable of the two dimensions is created to reflect the financial inclusion. Out of the composite variable

are dummies created because the composite variable is a categorical variable. The categories are No inclusion, Intermittent inclusion, and Full inclusion. The reference category is No inclusion and two dummies are used for the other categories. No financial inclusion covers a score of 0, which translates to a 'no' both dimensions. Intermittent financial inclusion covers a score of 1, which translates to a 'yes' on one of the dimensions and full financial inclusion covers a score of 2, which translates to a 'yes' on both of the dimensions.

3.2.3 Moderators:

Informal capital or informal finance is used as a moderator. This measure is composed by 'Percent of firms using supplier/customer credit to finance working capital' and 'Percent of Working capital borrowed from non-bank financial institutions'. This measure is chosen in accordance to Ullah (2019), which uses the same measure for informal finance. The variable is composed by adding the scores of the two separate variables. It creates a metric variable which ranges from 0% to a 100%.

Firm size is also used as a moderator. This measure is a composite measure of permanent and temporary workers. The number of temporary workers is adjusted to the number of months worked in a year (World Bank Enterprise Surveys, 2017). The scale is ordinal with the categories small (5-19), medium (20-99) and large (100+). Three dummy variables are used to measure the firm size. The reference category will be the small organizations. Two dummy variables are used to measure the medium organizations and large organizations.

3.2.4 Control variables:

Control variables are included in the study to consider effects that are also possible influences on firm innovation. Firm age, firm sector, managerial experience, and exporting are used as control variables. Firm age is included since Ayyagari et al. (2011) found that younger firms are more likely to perform innovative activities than older firms. Firm age is measured by the year of the establishment of the firm.

Sector of the firm is included as control variable because sector specific effects can influence innovation (Barasa et al., 2017). Sector specific effects contain the differences in finished product or service, type of businesses and size of the sector. A distinction will be made between the manufacturing, retail services, and the 'other' services sector. Dummy variables

are created for measurement. The reference category is the other services sectors. Two dummies for the manufacturing and the retail services sector are used.

Managerial experience is considered as a possible influence on firm innovation as well. Both Barasa et al. (2017) and Ayyagari et al. (2011) found an effect of managerial experience on firm innovation. Managerial experience is measured using a metric variable called: 'How many years of experience working in this sector does the top manager have?'. The variable ranges from 1 to 70 years.

Exporting is added as a control variable in this study since Ayyagari et al. (2011) suggested that exporting firms were more likely to innovate than nonexporters. Exporting is measured by a composite variable consisting of '% of sales: indirect exports' and '% of sales: direct exports'. This is a metric variable and it ranges from 0 to a 100%.

3.3 Method of analysis:

The method of analysis in this study is binominal logistic regression since the dependent variable exists of a binary measure with only two outcomes, 'Yes or No'. Binominal logistic regression is wielded to predict the probability of a successful outcome by using the values of the independent variables (Hair, Black, Babin & Anderson, 2010). The binary measure is transformed in the odds of occurrence and after that a logit value is created that acts as the dependent variable measure (Hair et al., 2010, p. 316). The coefficients will be representative of the effects on the likelihood of introduction of a new product/service by coding the introduction of a new product/service as a '1'. Maximum Likelihood is used to estimate the model. Next, the model fit is reviewed using the likelihood value and pseudo R^2 measures. The Wald statistic is used to test the significance of each individual coefficients. The use of a categorical measured independent variable causes that multiple groups are formed. All these groups need enough sample size, otherwise a group is effectively eliminated from the analysis. The sample sizes of the independent variable groups are $N>5$, thus sufficient, hence no sample group must be eliminated (Hair et al., 2010).

3.4 Summary of variables

Variable:	**Measure:**	**Source:**
Firm innovation: *Introduction of a new or significantly improved product/service in the last three years*	1 for Yes, 0 for No	*World Bank Enterprise Surveys*
Financial inclusion: *Percent of firms with a checking or savings account* *Percent of firms with a bank loan/line of credit*	Composite variable of k6+k8, reference category is no financial inclusion, two dummies for intermittent financial inclusion and full financial inclusion	*World Bank Enterprise Surveys* *World Bank Enterprise Surveys*
Firm resources: *Firm size*	Reference category is Small, Two dummy's for Medium and Large size	*World Bank Enterprise Surveys*
Informal capital/ Informal finance: *Percent of firms using supplier/customer credit to finance working capital + Percent of Working capital borrowed from non-bank financial institutions*	Composite variable of k3e +k3f	*World Bank Enterprise Surveys*
Control variables: *Firm age* *Sector* *Managerial experience* *Exporting*	Year of establishment of the firm Reference category is Other services sectors, two dummies for Manufacturing and Retail services How many years of experience working in this sector does the top manager have? Composite variable of d3b+d3c	*World Bank Enterprise Surveys* *World Bank Enterprise Surveys* *World Bank Enterprise Surveys* *World Bank Enterprise Surveys*

3.5 Validity & Reliability

Validity of the dataset is considered high, because of the procedure, completeness, and thoroughness of the World Bank. The World Bank (2020b) strives to ensure that the quality and integrity of the collected data is achieved. As an example, private contractors are hired to collect the data to ensure the confidentiality for the survey respondents. Governments or organizations associated with governments are not hired due to the sensitivity of the questions. The topic of business-government relations is seen as an extremely sensitive subject for many firms around the globe. Furthermore, the usage of internationally accepted standards, sources and definitions contribute to the result of consistent and reliable sources of information. The World Bank has outlined their Global Methodology on their website (The World Bank, 2020b).

3.6 Research ethics

Concerning the research ethics, openness, carefulness, and honesty are aspects of importance. By using the data from the World Bank, a commitment is made to meet all principles and standards. Agreeing to the written terms of the World Bank allows an insight into the raw data. For this reason, carefulness and appropriate usage of the data is required. Furthermore, a research integrity form of the Radboud University Nijmegen is signed and provided in the Appendix.

Chapter 4: Data analysis

The results, obtained using a binary logistic regression, are presented in this chapter. The chapter starts with an analysis of the data using the descriptives and an analysis of the missing values. The method of use is explained shortly and subsequent, the assumptions of the method are discussed and checked. After confirming all prior necessities before being able to conduct the actual analysis, then the chapter moves onto the results.

4.1 Descriptives

A first look at the descriptives shows that no variable has any significant amount of missing values. All variables are missing less than 10% of missing values and the missing data does not occur in a nonrandom fashion (Hair et al., 2010). The choice for listwise deletion or complete case approach was therefore made. After listwise deletion, the number of cases is 12,542 out of the original 14,411. 14,90% is deleted by using this approach. Listwise deletion or complete case approach is disadvantageous for analyses where the number of cases is reduced drastically.

For this analysis, the approach of listwise deletion is possible due to the high number of cases. The number of cases remain sufficient, which is further discussed at the assumptions of the used method of analysis.

Variable	**N**	**Missing**	**%**
New product/service	14218	193	1,36
Financial inclusion	13688	723	5,02
Informal capital	13871	540	3,75
Firm size	14411	0	0
Sector	14411	0	0
Firm age	14202	209	1,47
Managerial experience	13768	643	4,46
Exporting	14222	189	1,33
Total (listwise)	12542	1869	14,90

Figure 2.

A further look at the descriptives after listwise deletion of the missing values shows a transgressing value of kurtosis and skewness on the variables exporting and age of the establishment. Exporting is skewed with 2.387 and has a kurtosis value of 4.680. This surpasses the critical value levels of both skewness (-1 - +1) and kurtosis (-3 - +3). A closer look at the frequencies and the histogram of this variable shows that 74 percent has 0 percent of export (Appendix 1). The variable is transformed using the natural log of the variable. The transformation was formed as ln(exporting+1). The +1 is necessary since the minimum value is 0 and the log of 0 is indeterminate. The constant of 1 can be added without affecting the original data. The transformation reduces the skewness to 1.400 and the kurtosis to 0.200. The skewness is still above the threshold value, but it has solved the problem of the kurtosis. The slightly positive skewed distribution of the variable is not detrimental due to the large sample size. Large sample sizes reduce the concerns about nonnormal distributed variables (Hair et al., 2010). In case of the variable age of the establishment, a skewness value of -2.266 and a kurtosis value of 10.546 is noticed at first. These values transgress the threshold value. A detailed look at the histogram, normal curve and the boxplot of the variable show some outliers that are established from 1805 till 1970, which together only form 6.4 cumulative percent (Appendix 2). After deleting these outliers, the skewness and kurtosis level reduced to -0.449 and -0.369 respectively. The deletion of these outliers, however effected the total valid N. The valid N reduced to 11,720 from 12,542. Lastly, the variable %Informal capital has a transgressing

threshold value on skewness, which is 1.720. A look at the histogram shows a high percentage of 0% (Appendix 3). This variable is also transformed using the log. The transformation was formed as ln(InformalCapital+1). The constant is also added again due to the minimum value being 0. The variable after transformation has a skewness value of 0.567 and a kurtosis value of -1.496. The final descriptives are shown in figure 3. All other variables are nonmetric variables in the form of binary or categorical variables. For these types of variables kurtosis and skewness have meaningless importance, since normal distribution is only measured for metric variables (Hair et al., 2010).

N = 11720

Variable	Mean	SD	Skew.	Kurt.	Min.	Max.
New product/service	0.25	0.435	1.131	-0.721	0	1
Financial inclusion	1.27	0.628	-0.278	-0.659	0	2
Informal capital	1.3840	1.74063	0.567	-1.496	0	4.62
Firm size	1.83	0.799	0.324	-1.364	1	3
Firm sector	1.57	0.833	0.951	-0.888	1	3
Year of establishment	1998.10	10.341	-0.449	-0.369	1971	2018
Managerial experience	20.43	11.077	0.605	0.025	1	70
Exporting	0.8778	1.58899	1.400	0.200	0	4.62

Figure 3: Final descriptives

4.2 Binary logistic regression assumptions

Before carrying out the binary logistic regression, it must be ensured that all assumptions are met that are needed to perform the analysis. There are five assumptions that need to be analyzed. (1) Binary level dependent variable, (2) Sample size, (3) Multicollinearity among variables, (4) Independent observations and (5) Linearity of independent variables and log odds. At first, the dependent variable needs to be a binary level variable. This is ensured, because the dependent variable 'new product/service in the last 3 years' is measured with Yes or No.

Secondly, the sample size needs to be examined. The overall sample size is recommended to exceed 400 (Hosmer & Lemeshow, 2000). Since this analysis contains a total valid cases of 11720, the overall sample size is ensured. A second consideration about sample size is the sample size per group of the dependent variable. It is recommended to have 10 observations per estimated parameter per group of the dependent variable (Hair et al., 2010). The dependent variable is binary and has therefore two categories. The number of parameters

in the analysis is 8 (including interaction effect and excluding control variables). This results in a recommendation of at least 80 observations per group. Since the smallest group of the dependent variable has a frequency of 3601, this requirement is easily met. A last consideration in connection to sample size is the impact of nonmetric independent variables. An inclusion of nonmetric independent variables subdivides the combination between the dependent variable and the independent variable in multiple cells. One categorical independent variable and one binary dependent variable result in 6 subdivided cells or possibilities. There are no requirements, but if there are too many cells that have no observations then the model can have troubles to converge and find a solution. This is checked and not one of the six cells have zero observations.

Thirdly, multicollinearity exists when there is a strong correlation between predictors. The requirement for a binary logistic regression is that multicollinearity is nonexistent or little. A correlation matrix is used to check for first signs of multicollinearity. Subsequent, VIF and tolerance values are checked for more subtle multicollinearity. The values of VIF and tolerance are received by performing a simple linear regression. The correlation matrix is based on Spearman's rho, since the variables consists of continuous, categorical, and binary variables. Spearman's rho is also quite robust against outliers in continuous data. (Schober, Boer & Schwarte, 2018). Since there is only one independent variable, namely financial inclusion, the multicollinearity is checked for all variables in the model. The correlations are found in table 2. No correlations are further noteworthy, since they all are lower than the critical value of 0.80. The independent variable is noticed to have a VIF value of 1.064, which is lower than the recommended threshold value of 10 (Myers, 1990). The tolerance level is 0.940, which is higher than the threshold level of 0.1/0.2 (Menard, 1995). The remaining Tolerance and VIF values are also not exceeding the threshold levels. All values are displayed in table 3. This assumption is met since the correlation, VIF and tolerance values do not exceed their recommended threshold level.

Variable	1	2	3	4	5	6	7	8
1. New product/service								
2. Financial inclusion	0.252							
3. Informal capital	0.172	0.194						
4. Firm size	0.025	0.094	0.018					
5. Firm age	-0.057	-0.071	0.009	-0.191				
6. Firm Sector	-0.024	0.003	-0.003	-0.137	0.090			
7. Managerial experience	0.114	0.103	-0.006	0.059	-0.427	-0.029		
8. Exporting	0.105	0.119	0.059	0.277	-0.128	-0.205	0.040	

Table 2. Correlation matrix

N = 11720. Spearman's correlation coefficients are shown

Table 3. Tolerance and VIF

Variable	Tolerance	VIF
1. Financial inclusion	0.940	1.064
2. Informal capital	0.963	1.039
3. Firm size	0.888	1.126
4. Firm age	0.786	1.272
5. Firm sector	0.956	1.046
6. Managerial experience	0.811	1.232
7. Exporting	0.888	1.127

Fourthly, observations need to be independent of each other. The event of one observation should not influence other observations. Since all observations are measured at a single point of time, it is unrelated to other observations. None of the observations provide information for other observations.

Lastly, the linearity of independent variables and log odds needs to be checked. This assumption is tested by running a binary logistic regression including the independent variables and the interaction term of those variables with the log of itself (Homer & Lemeshow, 1989). Since the independent variable is categorical, the variables do not need to be checked for the linearity. The linearity of independent variables needs to be checked when using continuous variables.

4.3 The binary logistic regression analysis

Different models are run to test the formulated hypotheses. First, model 1 includes all control variables. For model 2, all main effects are added. Interaction effects are checked in separate models thereafter. In the tables is included the B, Standard Error, Wald statistic and the Exp(B). The Exp(B) is known as the odds ratio (Field, 2013). The Hosmer and Lemeshow test, -2Log likelihood, the Nagelkerke Rsquare and the Omnibus Tests of Model Coefficients (OTMC) are checked for every model to assess the goodness of fit and to assess if the new model is an improvement to the base model. A significant OTMC suggests that the model with the included variables fits better than a model without the included variables. Every step in the models show a significant effect on the OTMC, which indicates that every new block is an improvement to the baseline model. An insignificant Hosmer and Lemeshow test indicates that the model fits the data well. In all four models, the Hosmer and Lemeshow test is found insignificant. Therefore, all models fit the dataset well.

Model 1 shows that two of the four control variables are found significant. The variable Managerial experience shows a significant value (Wald = 126.292, $p < 0{,}001$). This indicates that a firm is more likely to have innovated when the top manager has more experience in the sector. The odds increase with 2.3% for every extra year of experience that the top manager has in the sector. The other significant control variable is Exporting (Wald = 72.257, $p < 0{,}001$). The effect is found significant, which indicates that exporting firms are more likely to innovate than non-exporting firms. Since the variable exporting is natural log transformed, the interpretation is different. The base of the natural logarithm is approximately 2.71828. Therefore, for every 2.7128-fold increase of the exporting variable, the odds to innovate increase with 11.7%.

Hypothesis 1 is confirmed for financial inclusion. Intermittent financial inclusion results in a greater likelihood to have innovated in the last three years than no financial inclusion (Wald = 28.559, p < 0,001). The odds of to have innovated in the last three years are 1.577 times higher for firms who are intermittent financial included. Additionally, full financial inclusion also results in a greater likelihood to have innovated in the last three years than firms, which are not financial included (Wald = 258.155, p <0,001). The odds ratio is 3.957 higher. A further significant direct effect is informal capital (Wald = 168.755, p < 0,001). This indicates that an increase in informal capital suggests a higher likelihood to have innovated. This variable was natural log transformed resulting in a different interpretation. Per 2.71828-fold increase of informal capital, the odds ratio is 1.175 higher. This model again shows significant effects of the control variables of managerial experience and exporting. However, the effects have reduced slightly in comparison to model 1.

Model 3 assesses hypothesis 2. The direct effects of intermittent financial inclusion and full financial inclusion remain significant different from no financial inclusion. The values and effects have stayed relatively similar. The direct effect of informal capital shows a positive significant effect (Wald = 11.171, p <0,001). As stated earlier, per 2.71828-fold increase of informal capital, the odds are 1.161 higher that a firm has innovated in the last three years. This indicates that as the more informal capital a firm possesses, the more likely it is that a firm has innovated. However, the moderating effect of informal capital with both levels of financial inclusion does not show any significant effects. Informal capital in interaction with intermittent or full financial inclusion does not significantly differ from informal capital with no financial inclusion. Therefore, informal capital does not positively moderate the effect of financial inclusion on firm innovation. As a result, hypothesis 2 is rejected.

Hypothesis 3 is evaluated in model 4. The direct effect of intermittent financial inclusion and full financial inclusion have increased and remain significant in comparison to no financial inclusion. Also, informal capital increased slightly in effect in the model. The interesting finding in main effects is that a large firm size became positively significant relative to small firm size (Wald = 6.834, p<0,01). The finding suggests that large firms were more likely to have innovated in the last three years in comparison to small firms. The odds ratio is 1.693 higher for large firms than for small firms. Since both financial inclusion and firm size are categorical variable with 3 levels, the interaction effects are measured by using four interactions. To fully capture the interactions between the two categorical variables, there is need to create four dummies, since 3-1 x 3-1 = 4 dummies.

Three of the four dummies are found significant, but negative in comparison to the reference category. Medium size firms in interaction with intermittent financial inclusion show an odds ratio of 0.602 times less likely to have innovated than small firms with intermittent financial inclusion. The effect is significant and negative (Wald = 6.445, $p < 0.05$). This indicates that smaller firms profit more from being financial included. Medium size firms in interaction with full financial inclusion is found to be insignificant, which suggests that medium and small size firms with full financial inclusion do not differ significantly in terms of having innovated in the last three years.

Large size firms in interaction with intermittent financial inclusion showed a significant and negative effect (Wald = 7.612, $p < 0.01$). The odds ratio is found to be 0.550 times lower to have innovated in comparison to the reference category of small firms in interaction with intermittent financial inclusion. This suggests again that small firms do profit more of financial inclusion than large size firms. This indication is strengthened by the significant and negative effect of the interaction of large size firms and full financial inclusion (Wald = 10.686, $p <$ 0,001). The odds ratio is found to be 0.494 times less likely. These significant effects suggest that smaller firms gain more advantage of being financial included than larger firms. Therefore, hypothesis 3 is confirmed, since larger firm size moderates the effect of financial inclusion on firm innovation. It matters less for larger size firms to be financial included.

Further interesting results are the significant effects of the managerial experience and exporting over all four models. It shows that the more experience the top manager has in the sector in which the firms is operating, the more likely the firm is to have innovated in the last three years. Additionally, if a firm has a higher exporting % than it is more likely to have innovated. All results are shown in table 4 on the next page.

	Model 1				*Model 2*				*Model 3*				*Model 4*			
Variables	SE	B	Wald	Exp(B)	SE	B	Wald	Exp(B)	SE	B	Wald	Exp(B)	SE	B	Wald	Exp(B)
Constant	4.554	1.563	0.118	4.771	4.771	0.781	0.027	2.184	4.772	0.979	0.042	2.661	4.777	0.703	0.022	2.021
Control variables																
Age	0.002	-0.002	0.522	0.998	0.002	-0.002	0.529	0.998	0.002	-0.002	0.585	0.998	0.002	-0.002	0.587	0.998
Managerial experience	0.002	0.023	126.292***	1.023	0.002	0.020	91.037***	1.021	0.002	0.020	91.074***	1.021	0.002	0.020	89.707***	1.020
Exporting	0.013	0.111	72.257***	1.117	0.014	0.087	37.962***	1.091	0.014	0.087	37.754***	1.090	0.014	0.087	38.003***	1.091
Other services sectors[a]																
Manufacturing	0.054	0.027	0.247	1.027	0.056	0.085	2.315	1.088	0,056	0.083	2.210	1.086	0.056	0.086	2.392	1.090
Retail services	0.077	0.082	1.146	1.086	0.080	0.134	2.804	1.144	0.080	0.132	2.732	1.142	0.080	0.130	2.612	1.138
Main effect																
No financial inclusion[a]																
Intermittent financial inclusion					0.085	0.456	28.559***	1.577	0.109	0.406	14.022***	1.501	0.139	0.771	30.636***	2.162
Full financial inclusion					0.085	1.370	258.155***	3.937	0.111	1.389	157.257***	4.012	0.140	1.643	136.956***	5.170
Informal capital					0.012	0.161	168.755***	1.175	0.045	0.149	11.171***	1.161	0.012	0.160	165.761***	1.174
Small size[a]																
Medium size					0.052	-0.066	1.572	0.937	0.052	-0.064	1.507	0.938	0.184	0.289	2.459	1.335
Large size					0.059	-0.084	2.034	0.920	0.059	-0.085	2.082	0.919	0.201	0.527	6.834**	1.693
Moderating effect																
InCa x no financial inclusion[a]																
Inca x Intermittent inclusion									0.048	0.035	0.529	1.036				
Inca x Full inclusion									0.048	-0.006	0.016	0.994				
Small x Intermittent inclusion[a]																
Small x Full inclusion[a]																
Medium x Intermittent inclusion													0.200	-0.508	6.445*	0.602
Medium x Full inclusion													0.199	-0.277	1.945	0.758
Large x Intermittent inclusion													0.217	-0.598	7.612**	0.550
Large x Full inclusion													0.216	-0.705	10.686***	0.494
Model summary		Sig.				Sig.				Sig.				Sig.		
OTMC	245.461	0.000			1084.108	0.000			1086.736	0.000			1103.148	0.000		
-2Log likelihood	13422.769				12584.122				12581.494				12565.081			
Nagelkerke R Square	0.030				0.127				0.127				0.129			
Hosmer and Lemeshow	14.695	0.065			14.496	0.070			10.789	0.214			3.837	0.872		

Table 4.

*p < .05; ** P < .01; *** p < .001

[a] is reference category

Chapter 5. Discussion

In this chapter, the results of the analysis will be discussed by comparing and evaluating the theory with the practical results. All hypotheses are discussed in order as introduced in chapter 2. Furthermore, other remarkable results are discussed to finish the chapter.

5.1 Interpretations

The findings in chapter 4 indicate that financial inclusion does in fact have a positive effect on firm innovation in the chosen emerging countries. Across all models intermittent and full financial inclusion variables are found positive and significant in comparison to the reference category of no financial inclusion. This implies that the more financially included with formal financial services does in fact have a positive influence on firm innovation. This effect was expected since other authors found the same positive effect of financial inclusion on firm innovation (Ayyagari et al., 2011; Gorodnichenko & Schnitzer, 2013). This work adds to these studies in the way that direct measures of financial inclusion is used. The use of access and usage of financial inclusion are objective variables. Ayyagari et al. (2011) used an indirect measure in the form of 'the proportion of new investments that are financed by all external sources of financing other than internal funds' and Gorodnichenko & Schnitzer (2013) used a variable 'difficulty of access to finance', which is subjective to a firm. The use of direct and objective variables adds more clarity to the effect of financial inclusion on firm innovation. Additionally, the results indicate that full financial inclusion has a higher odds ratio in comparison to no financial inclusion than intermittent financial inclusion to no financial inclusion. These results are logical in the sense that the more financially included a firm is, the more the firm is likely to have innovated.

Furthermore, the results indicate that informal capital does have a direct effect on firm innovation, but the interaction effect of informal capital on financial conclusion is non-significant. This contrasts with the formulated hypothesis, which suggested that informal capital would moderate financial inclusion. The results have shown an exceedingly small change in odds. It appears that informal capital only has a direct effect on firm innovation. By adding a 2.71828-fold increase of informal capital, the odds to have innovated in the last three years were rising. An explanation for this is that informal financing complements formal financing more than that it substitutes formal financing. This is in line with Allen et al. (2019), who also found that informal and formal financing can both be a substitution and complementary aspect to each other.

The direct effect is contradictory in comparison to the study of Ullah (2019). In his study, there was no significant effect of informal financing on firm innovation. He used a metric variable containing supplier credit, non-bank institutions and other as composite variable and a dummy variable with 1 for >50% of informal financing and 0 for <50%. In this study, only a metric variable is used due to the possibility of losing valuable information by using a dummy of the variable. The metric variable of both studies is composed of the same aspects. Therefore, it is interesting to see the contradiction in the result. This is possibly caused by the selection of countries in the sample. Ullah (2019) has used a lot of Eastern European and old Soviet Union, whereas the sample in this study is spread over multiple continents and less bonded to a certain area of the world. This suggests that informal financing plays a greater role in the selected countries of this study. In particular, the countries in the Asia-Pacific region (Thailand, Indonesia, Malaysia, and Philippines) rely minimally on formal finance and the prevalence of informal financing is still remarkably high (Jahan, De, Jamaludin, & Sodsriwiboon, 2019).

The results show that the effect of firm size on firm innovation has no significant difference between the categories. Small, medium, and large size firms do not significantly differ across all models in terms of direct effect. Only in model 4 does large size firms differ significantly from small size firms. This is in contradiction to Ayyagari et al. (2011), since they found that larger firms engage more in innovative activities. The results show a slight fit in the supposed theory. These results may indicate that all sizes of firms have advantages and disadvantages for firm innovation. Small firms are indicated as being flexible and could therefore react quicker on market opportunities (Corsino et al., 2011), whereas large size firms possess greater amounts of knowledge and resources (Robson et al., 2009). When looking at the interaction with financial inclusion, it shows that three out of four interaction effects are found to be significant in the model. Model 4 shows the interactions. It is interesting to see that medium and large firms in combination with a degree of financial inclusion show a lower probability of having innovated in comparison to the reference category small size firms. It shows that small size firms gain more from being financially included than large size firms in terms of likelihood to have innovated in the last three years. Especially, large size firms gain less from being financial included than small size firms. This is line with the suggestion of Mahendra et al. (2015) that access to finance is more critical for smaller size firms than for large size firms. Large size firms are expected to have higher amounts of internal funds and income, which is used for innovative activities.

The control variables also showed some interesting results. Managerial experience and exporting are found significant over all four models. The positive significant effect of managerial experience indicates that the more experience the top manager has in the sector of the firm, the more likely the firm was to have innovated in the last three years. This in line with the work of Barasa et al. (2017), which also found a positive effect of managerial experience on firm innovation. Although, the variable used for managerial experience in their study was a dummy variable. The dummy was based on managerial experience greater or lesser than 10 years. The variable in this study adds more valuable information since it is based on a metric scale.

Exporting was found positively and significant related to firm innovation. The results were expected since Ayyagari et al. (2011) had found the same effect. In their study, they used the variable 'percentage of sales sold domestically', which measured export indirect. By using a direct measure of percentage of sales sold with exporting the effect is examined clearer than using an indirect measure.

Chapter 6. Conclusion

The study aimed to explain the effect of financial inclusion on firm innovation as moderated by informal financing and firm resources. Based on a quantitative analysis using a binary logistic regression, it can be concluded that financial inclusion has a positive effect on firm innovation. The study used firm level data of the database of the Enterprise Surveys for 12 countries totalling 11720 firms, all observed in the period of 2015-2019. All countries used are acknowledged as emerging markets. Literature on the effect of financial inclusion on firm innovation in emerging markets is still underdeveloped, despite the importance of these markets around the globe. To enhance the literature, the research question of the study was as followed: '*What is the effect of financial inclusion on firm innovation in emerging markets, as moderated by firm size and informal financing?'*

The study used a direct and objective measure of financial inclusion, which provides additional information to the literature since financial inclusion was mainly measured with indirect and subjective measures. Next to the direct effect of financial inclusion, this study also looked at the possible interaction effects with informal capital and firm size. Informal capital is regarded as an important and widely used way to gain finance in emerging markets. Firm size indicates

the availability of resources and knowledge to use for innovative activities. The findings of the study indicate the important role that financial inclusion plays in the innovativeness of a firm in emerging markets.

6.1 Theoretical implications

Several theoretical implications are found by the study. Financial inclusion was indeed found significant and positive on firm innovation. This study confirmed and enlarged the current literature of the effect of financial inclusion on firm innovation in emerging markets. Until this study, the effect was measured by indirect and subjective measures. By using objective and direct measures of financial inclusion, the literature is expanded. The literature is further extended by using multiple different emerging markets over the globe. Many studies have focused on a particular area or country of the world, such as South-East Asia (Mahendra et al., 2015), Eastern Europe and former Soviet Union (Gorodnichenko & Schnitzer, 2013). The use of multiple different emerging markets has increased the generalizability of the results.

Furthermore, informal capital is still an important way of obtaining capital in emerging markets. However, the prediction and assumption that it can substitute formal financing is inaccurate and wrongfully suggested. This study displayed a direct effect, but not a moderating effect. Therefore, informal capital is regarded as a complementary way of obtaining capital next to formal financing.

Lastly, firm size is regarded as a factor for firm innovation. However, a larger size firm did not appear to be significantly different from small size firms. The study mainly focused on the interaction effect with financial inclusion and it appeared that smaller size firms are affected greater by financial constraints than larger size firms. This result is logical, since large size firms are predicted to have more internal funds and income.

6.2 Practical implications

The study offers multiple practical implications additionally to the theoretical implications. The implications are generally for policymakers, such as governments and for entrepreneurs/firms in emerging markets. The results have shown that firms that are financially included are more engaged in innovative activities. Innovative activities are known to increase a country's economy growth (Pece et al., 2015). Policymakers gain additional information over the importance of financial inclusion of firms. The aim for further guidelines in financial services should be around making financial services accessible and affordable. The study further

suggests that informal capital is still an important way of obtaining funds for innovative activities. The change of the financial landscape within emerging markets is long and gradually. Informal capital remains important until formal capital is available to all and is considered easier to obtain than informal capital. This change is governed by policymakers and it is important to withheld from promises that exaggerate the pace of change.

The firms must acknowledge the fact that financial inclusion is a factor of importance. The study shows that informal capital does not substitute financial exclusion, but it complements the way of funding for the firms. Firms in emerging markets may use both ways of financing but must consider the advantages and disadvantages of both ways before engaging.

6.3 Limitations and recommendations

The amount of binary and categorical variables limits the study in a way that much information cannot be reached. Further research could emphasize the use of metric variables to dig deeper into the effect of financial inclusion on firm innovation. For this study though, the use of binary and categorical variables was not a problem, because it shows the effect in the form of odds. This is to show the top layer of the effect of financial inclusion on firm innovation. Further research is recommended to explore deeper layers of the effect.

Further research should explore the effects in different contexts. This study focused on the context of emerging countries, but the effect could be even more important in developing countries. This should be investigated and could improve the importance of understanding the effect of financial inclusion. Furthermore, other moderating effects should be tested. A lot of concepts have effect on firm innovation, but the interaction effect with financial inclusion could provide different understanding of these effects. Financial inclusion consists of the access, usage, and quality of financial services. In this study, only access and usage are used. For further research, the third component could be included to assess the importance of the quality of the financial services. This could be done by using the measures of institutional quality, which are subdivided in six components: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. (Kaufmann, Kraay & Mastruzzi, 2011).

A further limitation of the study is the use of only one aspect of firm innovation as dependent variable. There are multiple ways of innovating as a firm since the concept is wider than just one aspect. The study excludes all possible effects of financial inclusion on different

types of innovation by only using innovation on products and services. For further research, other innovation aspects or an all including study is recommended.

To conclude, the importance of financial inclusion has gained attention over the last few years, yet a lot must be discovered still.

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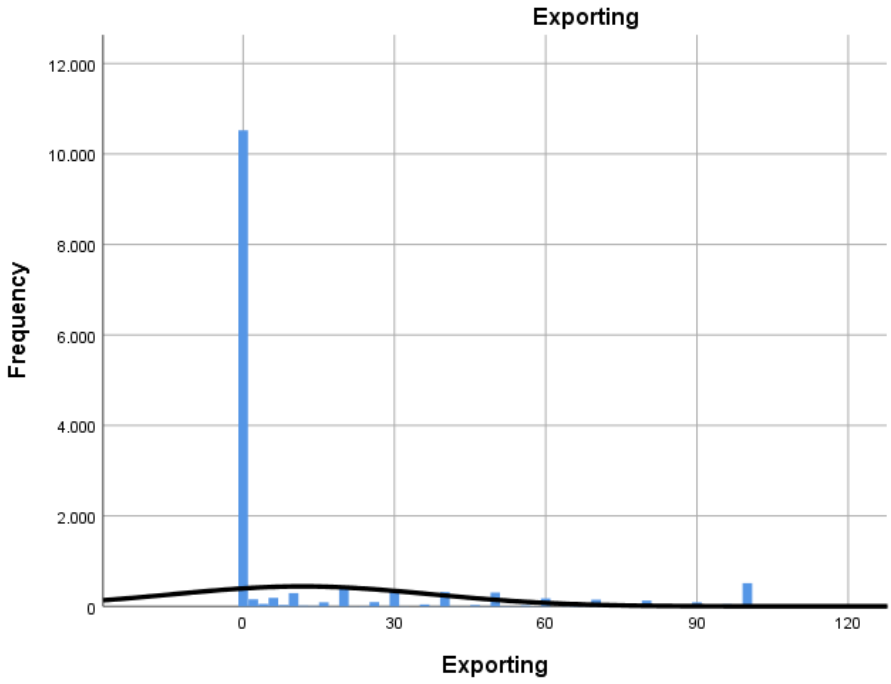
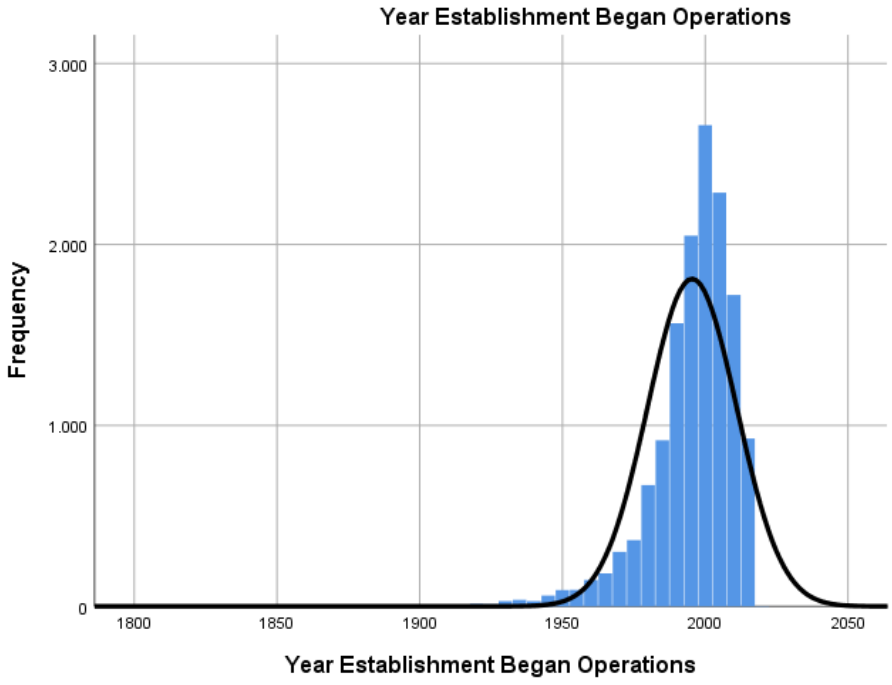
Appendix

1. Histogram exporting

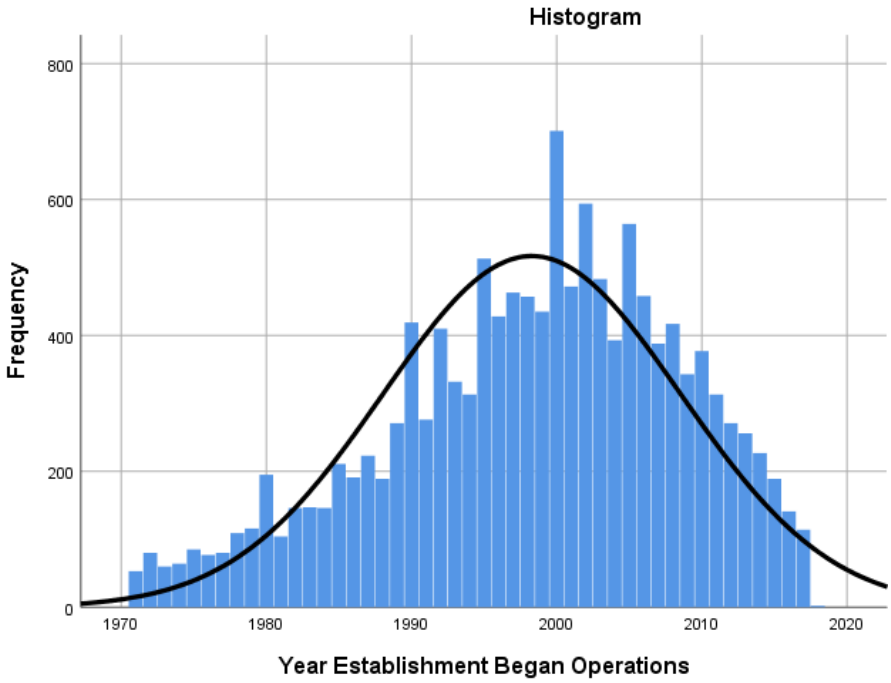


2. Histogram age of the firm

Before deleting outliers:



After deleting outliers:



3. Histogram % informal capital