Firm Resources, Ownership Type, Intellectual Property Systems, and Firm Innovation in Emerging Economies

MASTER OF SCIENCE

In ***International Business***

Nijmegen School of Management

by

Christoph Borgers

Student number 4492323
C.Borgers@student.ru.nl

Academic year 2020-2021
June 14th , 2021
Word count: 14952

Supervisor: Dr. M. Wierenga (Marleen)
2nd examiner: Prof. dr. A.U. Saka-Helmhout (Ayse)

Radboud Universiteit Nijmegen

Abstract

This study examined the effects of firm resources, ownership type and intellectual property system on the firm innovation of companies operating in emerging countries. To test the supposed hypothesis, a sample created with data Orbis was used. A sample consisting of 1682 companies (after cleaning), spread across 18 different emerging countries across the globe was used. To test the main research question, a regression analysis was performed. The results indicated that firm resources and an effective intellectual property system positively influence the levels of innovation within firms. Additionally, the moderation effects between firm resources & intellectual property system and firm resources & foreign ownership both showed a positive relation to firm innovation as well. As expected, the moderation effect of domestic ownership on firm resources to firm innovation showed a negative correlation.

This study failed to prove that the direct effects of all three ownership types and interaction effect of firm resources with state ownership of firms have a significant effect on the innovative capabilities of firms operating in emerging countries. Nevertheless, a model was created which could serve as a solid foundation for future research into the determinants of firm innovation in emerging economies.

Keywords

Emerging countries, firm resources, domestic ownership, foreign ownership, state owned, intellectual property system, firm innovation

Table of Contents

1. Introduction **5**

1.1 Background 5

1.2 Problem Statement 6

1.3 Objective 7

1.4 Relevance 7

1.5 Research Question 9

1.6 Outline 9

2. Literature Review **10**

2.1 Firm Innovation 10

2.2 Firm Resources 11

2.3 Ownership Type 12

2.3.1 Domestic Ownership ..... **Fout! Bladwijzer niet gedefinieerd.**

2.3.2 Foreign Ownership ..... **Fout! Bladwijzer niet gedefinieerd.**

2.3.3 State Ownership ..... **Fout! Bladwijzer niet gedefinieerd.**

2.4 Intellectual Property System ..... **Fout! Bladwijzer niet gedefinieerd.**

2.5 Conceptual model ..... **Fout! Bladwijzer niet gedefinieerd.**

3. Methodology **19**

3.1 Sample ..... **Fout! Bladwijzer niet gedefinieerd.**

3.2 Variables ..... **Fout! Bladwijzer niet gedefinieerd.**

3.2.1 Dependent variable 20

3.2.2. Independent variables 21

3.2.3 Control variables ..... **Fout! Bladwijzer niet gedefinieerd.**

3.3 Methods of Analysis 27

3.4 Research Ethics ..... **Fout! Bladwijzer niet gedefinieerd.4.**

Results ..... Fout! Bladwijzer niet gedefinieerd.

4.1 Sample Description ..... **Fout! Bladwijzer niet gedefinieerd.**

4.2 Data Analysis Strategy 31

4.2.1 Sample Size *31*

4.2.2 Multicollinearity *31*
4.2.3: Firm Resources as composite variable *32*
4.3 Assumptions 32
4.3.1 Independence of the error terms: *33*
4.3.2 Normality of the error terms: *33*
4.3.3 Homoscedasticity *34*
4.3.4 Linearity *34*
4.3.5 Model Fit *34*
4.4 Regression analysis ..... **Fout! Bladwijzer niet gedefinieerd.** 38
4.5 Validity and Reliability ..... **Fout! Bladwijzer niet gedefinieerd.**
5. Discussion and conclusion 40
5.1. Main findings ..... **Fout! Bladwijzer niet gedefinieerd.**0
5.1.1 Main effects 40
5.1.2 Moderating effects 41
5.2 Theoretical implications ..... 4**Fout! Bladwijzer niet gedefinieerd.**
5.3 Practical implications 45
5.4. Limitations ..... **Fout! Bladwijzer niet gedefinieerd.**6
5.5. Suggestions for future research ..... **Fout! Bladwijzer niet gedefinieerd.**6
5.6. Conclusion 48

References 49
Fout! Bladwijzer niet gedefinieerd.Appendix 1 57
Fout! Bladwijzer niet gedefinieerd. Appendix 2 63
Fout! Bladwijzer niet gedefinieerd. Appendix 3 69
Fout! Bladwijzer niet gedefinieerd. Appendix 4 70
Fout! Bladwijzer niet gedefinieerd. Appendix 5 71
Fout! Bladwijzer niet gedefinieerd.

1. Introduction

1.1 Background

The amount of time and resources firms spend on research & development has always differed between firms based in different countries and industries, firms serving different markets (e.g. Zeschky, Widenmayer & Gassmann, 2011; Enderwick, 2012), and firms of different sizes (Audretsch & Acs, 1991; Rogers, 2004). Moreover, it is of great importance who owns the firm, when comparing firms on their innovative capabilities (e.g. Choi, Lee & Williams, 2011; Guadalupe, Kuzmina & Thomas, 2012). After all, the firm's owner(s) decide to what extent and how available resources are spent on research & development. To illustrate this, take China as an example. The general consensus in prior research is that effective legal and financial institutions need to be present in order for a country to endure economic growth (Rajan & Zingales, 1998; La Porta, Lopez-de-Silanes, Shleifer & Vishny, 1998). This is what distinguishes developed markets (like Western European markets) from emerging- and developing markets, like China. Markets, where institutions are absent or function ineffectively, but where market participants are increasingly finding more efficient ways to have demand and supply meet, are classed as emerging markets (Khanna & Palepu, 2010). Despite lacking effective institutions, the China and India have endured tremendous economic growth in the past decades (Popkova et al., 2018; Wang, Su & Li, 2018).

Western countries are known to have higher innovation among privatized firms, in comparison to state owned firms (Dachs & Peters 2014). State owned firms are there for public use, often operate in monopolies and thus have little to no incentive to innovate (Bloom & Van Reenen, 2007). In emerging countries, this is not always the case, as the Chinese government utilizes a policy that is appealing to state owned firms (Morck, Yeung, & Zhao, 2008). Moreover, emerging countries have Intellectual Property Systems (IPS) that are nowhere near advanced as those of most Western countries. This creates an intriguing setting of differences and paradoxes in which a lot of questions remains unanswered as to why certain firms in emerging countries innovate more than others.

1.2 Problem Statement

Western countries like the United States generally have advanced intellectual property

systems. These have been put in place to prevent competitors from using technologies after they are invented by the innovator, thus stimulating innovation among firms (e.g. Branstetter, Fisman, Foley, 2006; Qian, 2007). As a result, the Western world has been the leader in firm innovation in the past two centuries (Pisacane & Zibetti, 2020). Even though effective intellectual property systems stimulate firm innovation, numerous developing countries see the intellectual property system as a system that is solely beneficial for Multi-National Enterprises (MNE's) that operate subsidiaries in their country, because these MNE's tend to own a lot of patents in comparison to local firms. Since most MNE's have their headquarters in developed countries, the intellectual property system is often denounced in emerging countries (Goans, 2003). Brazil, India and South Africa for example, maintain patent laws in which patenting of processes is possible, but patenting of products is not, thus opening the door for companies to exploit innovations found by companies competing in the same market (Azam, 2016). Despite the positive effects that domestic innovation brings to a country, the level of intellectual property systems in emerging countries are not maintaining the same rate of growth (International Property Rights Index, 2020). The costs of creating and maintaining an effective intellectual property system might not outweigh the benefits that it yields. Alternatively, foreign owned companies might be better at coping with the creation of an improved intellectual property system. If so, foreign owned companies take full advantage of it, gaining market share at the cost of domestic owned firms, whilst leaving the local government to pay for the system (Qian, 2007). This is where the relevance of ownership type in relation to the intellectual property system is found.

One can distinguish two different types of private ownership: foreign owned and domestically owned. In emerging countries, foreign owned companies are often owned by MNE's, whereas domestically owned companies are often smaller independent companies with just one or a couple establishments. Besides the two types of privately owned firms, a third type of ownership will be taken into account in this thesis: state owned firms. In the aforementioned 'Chinese paradox' (Bloom & Van Reenen, 2007), there is a contrast between European and American state owned firms that barely or do not innovate and Chinese state owned firms that innovate noticeably higher. Since this third type of ownership could provide possible prospects on the contradictory results, it can be inferred that a fortiori we have a more grounded reason to explore this relationship more deeply, as to whether other emerging countries have innovative state owned firms or not.

1.3 Objective

Prior research has already focused on the relations between ownership type, intellectual property system and firm innovation (e.g. Qian, 2007; Bloom & Van Reenen, 2007; Heredia Pérez, Geldes, Kunc & Flores, 2019). This thesis aims to further enrichen the literature by focusing on the underexposed context of emerging countries, where differences in ownership type are more prevalent than in developed countries and where – in comparison to developed countries- great variety in levels of intellectual property systems are present (International Property Rights Index, 2020). This variance in intellectual property systems means that emerging countries form a suitable research sample to explore the effect these intellectual property systems have on firm innovation. Moreover, we hope to help clearing up any uncertainties that are withholding governments in emerging countries from further increasing the quality of the intellectual property system. Third, this thesis aims to further explain the variance in firm innovation among firms operating in emerging countries, by also focusing on the moderation effect that the intellectual property system and ownership type might have on the relation between firm resources and firm innovation.

1.4 Relevance

A great difference in firm resources is most likely in place between firms in the research sample (as is the case in prior research). However, the rise of frugal innovations has also shown that smaller firms can innovate more than firms with a high level of resources (Zeschky, Widenmayer & Gassmann, 2011). To verify that firm resources positively influences firm innovation, this thesis will first study the relation between firm resources and firm innovation in emerging markets. After doing so, ownership type and intellectual property will be introduced into the model as moderators. As noted by Zemplinerová & Hromádková (2012, p. 436): *"Variables that are expected to determine different components of the innovation process are so numerous that the selection (and omission) of variables is very likely to influence results of empirical studies."* Thus, we hope to enrich the knowledge on the drivers of firm innovation with the introduction of this unique setting. Second, we expect a positive interaction of foreign owned firms in combination with advanced intellectual property systems on firm innovation. With this aforementioned model, the literature on firm innovation can be complemented. Considering the already limited studies on intellectual property systems are partly limited to governmental or public institutional reports, the need for research studying the relation of intellectual property systems to other concepts becomes even more prevalent. Also, most studies on firm innovation have been performed in the context of developed nations (and thus not in emerging or developing nations), as mentioned

by Heredia Pérez, et al. (2019). Moreover, they mention more future research is needed to distinguish which internal or external factors lead firms to make specific strategic choices concerning their commitment to innovate. Hence, we try to address this limitation by including both internal (ownership type and firm resources) as well as external factor (intellectual property system) in our study. In addition to that, using ownership type as moderator when studying innovation has been proven as relevant in prior literature (Liao, Zhang & Wang, 2019). The decision to include ownership type in our study is also substantiated by Schmiele (2012), who suggested that future research should look more closely at ownership type.

This study has practical relevance for governments of emerging countries, as deeper insights into the effect that the type of ownership and the intellectual property system have on firm innovation can help them make better decisions regarding whether they want to shift focus from their current division between foreign, domestic and state owned to a new balance. With the introduction or reduction of trade barriers and import tariffs, a government can easily make it more or less attractive for foreign companies to operate in their country. An increase in domestic innovation should increase the economic situation in the country (Zemplinerová & Hromádková, 2012), which should help shifting the country in question from being an emerging country to becoming a developed country. Besides, governments can opt to privatize or change their policy for state owned firms, if results show that state owned firms tend to be less innovative. Third, as shown by Luo & Tung (2007), limited protection of their property rights can be a push factor for MNE's. Therefore, governments can also alter their commitments to increasing the intellectual property system in their country, based on findings that the quality of the domestic intellectual property system increases the levels of innovation. Finally, an increased level of knowledge on the effectiveness of intellectual property system should provide governments with another option to stimulate domestic innovation, by improving their intellectual property system to a level that lies closer to that of Western counterparts.

1.5 Research question

As discussed in the preceding sections, prior research on the drivers of firm innovation has

mostly been conducted in developed countries. Moreover, an interaction effect of intellectual property systems and ownership type is new to this aspect. Thus, the overall research question of this thesis is formulated as follows:

What is the effect of firm resources, ownership type and intellectual property system on the firm innovation of firms in emerging markets?

1.6 Outline

This thesis consists of six chapters, with topics structured as follows. The foregoing chapter started with an introduction to the research study. In the following chapter, the theoretical framework will be described and hypotheses will be developed on the relations between ownership type, firm resources, intellectual property system, and firm innovation. The third chapter will discuss the research method and will provide a review of the data sample. Following the methodology, the results of the research will be presented. Last but not least, the final chapter will analyze the results, along with the limitations of this research and suggestions for further research.

2. Literature review

This literature review will provide an overview of prior studies and their results, regarding the main concepts that are used in this study. To start off, the dependent variable of firm innovation is discussed. Afterwards, the independent variables are covered one by one. ‘Firm

resources' will be handled first, followed by the three 'ownership types' and 'intellectual property system' respectively. To conclude, the conceptual model will be presented, merging all the aforementioned variables into a single model, along with how they are studied on their interrelatedness.

2.1 Firm Innovation

Firm innovation consists of two parts, namely 'firm' and 'innovation'. The concept of 'firm' is defined in this research as the (part of the) organization where the innovation takes place. Innovation is the more complex concept to define because there are multiple ways to approach, divide, measure, and thus also to define innovation. Innovation is complex, uncertain and somewhat disorderly (Kline & Rosenberg, 2010). Most importantly, innovation is important to a lot of firms, since firms need to innovate, if they want to gain an advantage over their competitors in the market(s) that they operate in (De Jong & Vermeulen, 2006). This is best visualized with the resource-based view in the Value-Rare-Imitability-Organization (VRIO) framework (Barney, 1991). Innovations are often incremental, meaning that only slight adjustments are made to the product or service. These innovations – if successful – increase at least one of the 4 components of the VRIO framework, thereby creating a competitive advantage for the firm (Mahemba & De Bruijn, 2003; Saka-Helmhout, Chappin & Vermeulen, 2020).

There are multiple ways to divide innovation into different types of innovation. A well-known division is for example the division between incremental (using existing technology in the existing market) and radical innovation (using new technology in a new market). The study by Lenssen et al., (2013) argues that there even is a superlative to incremental and radical innovation, which is the concept of game-changing innovation. Game-changing innovation or disruptive innovation (Christensen, 1997) doesn't focus solely on the products, services, processes and the interaction with stakeholders, but it also encompasses a transformation at the very core of the business. Another common way to split innovation into different types is by looking at technological and non-technological innovations (*Oslo Manuals*, 2005). This study uses the number of patents a company has, as a proxy for firm innovation. Therefore, the technological innovations are the innovations that will be featured in this study. These technological innovations consist of product innovations and process innovations (*Oslo Manuals*, 2005). Innovation is driven by factors both internal as well as external to the company (Pavitt, 2006). Amongst others, the driving factors of

innovation that are internal to the company are the size of the company, R&D expenditures and the strategies put in place (Amara, Landry, Halilem & Traore, 2010; Ketelhöhn and Ogliastri, 2013).

2.2 Firm Resources

Larger firms have a resource advantage over smaller firms (Bhattacharya and Bloch, 2004; Demirkan, 2018) However, economies of scale are not related to innovation output (Heimonen, 2012). Instead, R&D expenditures was believed to be the main indicator explaining the level of innovation in firms for a while. Since firms with more resources are able to spend more on R&D, their innovative opportunities increase (Knott & Vieregger, 2020). The use of R&D expenditures was effectuated by either a decrease in the production costs of products (process innovation) or through the increase of the availability of a wider range of products (product innovation) (Zemplinerová & Hromádková, 2012). Among the most notable examples, Barasa, Knoben, Vermeulen, Kimyu & Kinyanjui (2017) recently found that firm resources, along with effective institutions, are directly related to the generation of new technology. Moreover, Cristo-Andrade & Franco (2019) also found that the size of the firm and its resources was a prominent indicator of firm innovation for their sample of Brazilian firms. As mentioned, variables influencing firm innovation are so limited, that adding or omitting a variable can lead to different results (Zemplinerová & Hromádková, 2012). Therefore, in order to verify the expectation that the more resources a firm has, the more firm innovation takes place, we have chosen to do include firm resources as an independent variable in this study. This leads to the first hypothesis:

H1. Firm level resources have a positive effect on firm innovation in the context of emerging countries

2.3 Ownership Type

Like prior studies that studied ownership type, this study also distinguishes 3 types of ownership: Domestic owned, foreign owned, and state owned (e.g. Berger, Clarke, Cull, Klapper & Udell, 2005). Prior research indicated that family owned businesses could also be

used as a proxy to predict firm innovation (Robson, Haugh & Obeng, 2009), although due to data limitations, this study will only focus on the distinction between domestic, foreign, and state owned firms. The literature is mixed on to what extent and whether the aforementioned ownership types affect innovation.

2.3.1 Domestic ownership

Developed nations' governments often subsidize private organizations to stimulate innovation, which in turn should yield greater returns for the society as a whole (Zemplinerová & Hromádková, 2012). In practice however, subsidies for firms don't always result in benefits for the society (David, Hall & Toole, 2000; González, Jaumandreu & Pazó, 2005). Still, domestic owned SME's have the advantage over large MNE's, that they are able to react to changes in the market more efficiently. They do not have to cross the large chain for a decision to be made. In large MNE's, when funds are needed for innovation in a subsidiary, requests have to made to the headquarters. With smaller domestically owned companies, on the other hand, decisions can be made much quicker, as there are fewer intermediaries (Mahemba & Bruijn, 2003). However, in emerging markets, domestic owned firms often lack resources to adequately invest in R&D, suggesting a low degree of firm innovation, despite having a better knowledge of the market than foreign owned subsidiaries (Zulu-Chisanga, Chabala, & Mandawa-Bray, 2020). Nevertheless, the rise of frugal innovation allows smaller companies to achieve ground-breaking results with minimal input (Zeschky et al., 2011). Be that as it may, these innovations are often incremental and due to a lack of adequate resources not patented (Neto & Veiga, 2013). To add to that, the positive relation between firm resources and firm innovation may only be limited to firms of upwards of a certain size (Ettlie & Rubenstein, 1987). Consequently, we argue that, despite conflicting literature, domestic ownership will have a negative effect on the relationship between firm level resources and firm innovation (H2a). Besides, we reason that the direct effect of the domestic ownership is detrimental for firm innovation, which is formulated in hypothesis 3:

H2a: Being domestically owned negatively moderates the effect between firm level resources and firm innovation in the context of emerging countries

H3: An increase in domestic ownership will have a negative effect on firm innovation in the context of emerging countries

2.3.2 Foreign ownership

The effect of foreign ownership has been studied in various contexts, with mixed results. In developed countries, studies generally showed a positive effect of foreign ownership on firm innovation. Guadalupe et al. (2012) showed that Spanish firms innovated more after they were acquired by foreign owners and Dachs & Peters (2014) found that among foreign owned firms in their European sample, product innovation is higher. Also in emerging countries, positive correlations between foreign ownership and firm innovation were found. For example Kang (2012), Joe, Oh & Yoo (2019) and Joe, Chung & Morscheck (2020) used South Korean firms, and Kong, Zhu & Yang (2020) used Chinese firms in their study. All four of these studies concluded that firm innovation is higher amongst firms that have foreign owners.

However, being foreign owned means that firms have higher market power and accumulated experience from other countries. This might reduce the need to innovate (Frenz & Ietto-Gillies, 2007). Moreover, knowledge can transfer from foreign- to domestic owned firms (Neto & Veiga, 2013), resulting in non-patented innovations being copied by competitors. Also, operating in emerging countries can bring a lot of uncertainties with it, as the development of these countries comes with a lot of domestic reforms. This can create additional uncertainty on top of the risk that innovation in itself already is. Foreign owned firms want a long term perspective (Joe et al., 2019), and thus investing in emerging markets appear to be unfavorable. In addition to that, the positive effects of foreign ownership on firm innovation may be limited to firms that on average, own a larger part of the shares of the firm, have higher commitment to the subsidiary, and maintain long term involvement with the subsidiary (Douma, George & Kabir, 2006).

Thus, there are signs from prior studies that foreign ownership harms the ability of firms to innovate. Still, foreign owners can have a positive influence on the firm, by their increased monitoring of managers (Ahmed & Iwasaki, 2021). Besides, other evidence from both developed and emerging markets supporting the favorable position that foreign owned firms are in is manifold. Consequently, if firms are not domestically owned but owned by foreigners, we reason that this has a positive effect on their innovativeness, as formulated in hypothesis 2b and 4:

H2b: Being foreign owned positively moderates the effect between firm level resources and firm innovation in the context of emerging countries

H4: An increase in foreign ownership will have a positive effect on firm innovation in the

context of emerging countries

2.3.3 State ownership

State owned firms often operate for the public interest and thus have little to no interest to keep up with the market by innovating (Bloom & Van Reenen, 2007). Whilst governments usually try to prevent monopolies, in the case of state owned businesses, are also at times allowed to be a monopoly in the market that they operate in (European Commission, 2016). With no competition, there is significantly less need to innovate (Moszoro, 2018). However, state owned firms have access to policy information, the support of the government, and access to resources (Musacchio, 2014). Whilst this increase in resources that can be dedicated to R&D may provide state owned firms with a benefit to innovate, the fact that they are owned by a state may hinder these firms to effectively convert these resources into actual innovative output (Zhou, Gao & Zhao, 2017). Nevertheless, most of the research on state ownership as determinant of firm innovation is isolated to China. China is a unique context to perform research into state owned firms, as innovation is almost at the top of the Chinese government's agenda (Chen et al., 2014). Besides, China features a capital market that is controlled by state owned banks that not only provides state owned firms with loans, it also hinders the ability of private owned firms (especially foreign owned firms) to access capital needed for R&D (Morck et al., 2008). Thus, while in China state ownership might positively correlate with firm innovation, this may not necessarily be the case in other (emerging) countries where the government isn't focused as much on innovation.

Based on prior studies, Belloc (2014) reasons that private owned firms operate more efficient than their state owned competitors. First, state owned firms seemingly have endless financial support from their government which can be seen as an opportunity to innovate with these resources. However, the knowledge that the government will financially support the firm when financial losses are endured will create a lack of market discipline resulting in inefficiency. Second, managers poorly monitor the firm, because they have no personal motivation to manage a well operating competitive firm. This creates an excess of bureaucracy within the firm (Baldwin, 1990). This effect is strengthened by the fact that state owned firms are not always listed and thus failures within the firm become obscure for people, making it in turn more likely for them to occur (Ferreira, Manso, and Silva, 2013) Third, managers' personal interests don't always align properly with the public responsibilities that the firm carries. This difference creates a tendency for bribery to occur (Spalding, 2010). Fourth and last, politically motivated policies can direct firms towards goals

that are not in line with maintaining a competitive climate with necessary R&D investments.

The innovative state owned Chinese firms on the one hand and the inefficiencies within state owned firms from other emerging countries on the other hand, seems paradoxical. To elaborate, the expectation of this thesis is that state owned firms will show lower levels of innovation in comparison with their privatized counterparts that are not owned by states. To start, studies that demonstrated innovative state owned firms are bounded to the Chinese context. Even in this context, state ownership seems to impede innovative output, despite resources being at hand (Zhou et al., 2017). Besides, observed Chinese state owned firms that were privatized had 200-300% more patents, five years after privatization (Fang, Lerner, & Wu, 2017). On top of that, this thesis has a much broader scope, including numerous other emerging countries besides China. Besides, the general consensus is that state ownership creates a lot of inefficiencies for state owned firms, hampering their ability to innovate (Belloc, 2014). Hence, hypothesis 2c and 5 are formulated as follows:

H2c: Being state owned negatively moderates the effect between firm level resources and firm innovation in the context of emerging countries

H5: State owned firms will be less innovative than their privately owned counterparts in the context of emerging countries

2.4 Intellectual Property Systems

Intellectual property, "*very broadly, means the legal rights which result from intellectual activity in the industrial, scientific, literary and artistic fields.* "(World Intellectual Property Organization, 2004, p.3). The aim of these rights, is to stimulate innovation in the domestic market. They are essential for economic growth and maintaining or becoming competitive on a global scale (European Commission, 2020).

Intellectual property is a wide concept, but the most common types of intellectual property are copyrights (protection of written or published works), patents (protection of commercial inventions), designs (protection of designs, e.g. drawings and models), and trademarks (protection of symbol, logos, names, etc. that distinguishes a company from its competitors) (Intellectual Property Office, 2017). Intellectual property rights can be infringed through counterfeit goods (goods that use a trademark or cannot be distinguished from its original), pirated goods (goods which are a copy of a copyright or design- protected good, or contain parts of these copyrights or design), and goods infringing a parent or other certificates

(European Commission, 2010).

Effective intellectual property systems ensure that firms or people that infringe the intellectual property of others are fined or punished in another way, while at the same time making sure that it is a smooth process for firms to apply for new intellectual property rights. It is therefore not just the creation of legislation for the use of intellectual property that is important, but also allowing every inventor or creator to be able to apply for a certificate of ownership of the intellectual property. In emerging markets though, there is often a lack of a strong and effective system that protects property rights (Khanna, Palepu, & Sinha, 2005). The improvement of the protection of intellectual property has a positive effect on innovation in developing countries (Chen & Puttitanum, 2005; Mengistie, 2009). On top of that, the positive effect of an effective intellectual property system is higher for privately owned firms than it is for state owned firms (Fang et al., 2017). The existence of a 'near perfect' system can also have a tremendous effect on firms. Take the United States as an example, ranked 1st on the global ranking on the international property rights index (*International Property Rights Index*, 2020). In 2001, already 50% of the United States' export depended on intellectual property (Reid, 2003). Considering the world market has endured an incredible increase in globalization in the past two decades (Michie, 2019), this importance is probably even more significant than it used to be. Whilst the prospect of the protection of these exports has potentially led these US firms to innovate in the first place, the domestic firms operating in these markets where these US firms export to are also stimulated to innovate. Simply copying the goods that are exported will infringe the intellectual property, and thus other ways to compete are needed, like innovation (Zhao, 2006).

The effect that intellectual property systems have on innovation can be traced back to three sources of innovation: imitative, acquisitive and incubative (Mahemba & Bruijn, 2003). With imitative innovation, firms will need to be able to quickly react to innovations created by other firms, adapting to the innovation and copying the innovation or making a similar innovation themselves. This type of innovation would potentially be relevant for countries where a low level of intellectual property system is present, as a lower level of intellectual property system means that companies are freer to use innovations by others. They are freer to do so, since the intellectual property system in place does not punish companies who use innovations created by others. This source of innovation is also likely more often present within SME's in comparison to LME's, as generally speaking SME's have less funds that they can allocate to the acquisition of patents or licenses.

If the innovations come from a source external to the company, but the company

acquires the rights to use these innovations, one speaks of an acquisitive innovation (Mahemba & Bruijn, 2003). The means to acquire the rights can be either through licensing of the rights, or by acquiring the patents through a merger or an acquisition. This source of innovation would probably be more prevalent in countries where a high level of intellectual property system is in place, because simply copying innovations from others is not an option in those environments. If countries with a high level of intellectual property system, the company decides to copy an innovation where they don't own the right for) and use this innovation in their products, they will likely get sued for it, resulting in a fine.

The third and final source of innovation is incubative innovation (Mahemba & Bruijn, 2003). This is the only source of innovation where the innovation comes from within the company. This source requires the company to innovate by themselves, by for example allocating employees and funds to try and find innovative solutions, or by engaging in a joint venture with another company, thereby acquiring knowledge for innovation.

Firms are searching for ways to gain and maintain a competitive advantage. However, capabilities and strategic resources like innovations only give these firms an advantage over their competitors when there are barriers for the competitors to imitate, like an effective intellectual property system (Barney, 1991; Peteraf, 1993). This leads us to formulate hypothesis 6 and hypothesis 7, researching both the direct effect of the intellectual property system on firm innovation, as well as the moderation effect of intellectual property system on the relation between firm resources and firm innovation:

H6: A high level of intellectual property system will positively moderate the effect of firm level resource on firm innovation in the context of emerging countries

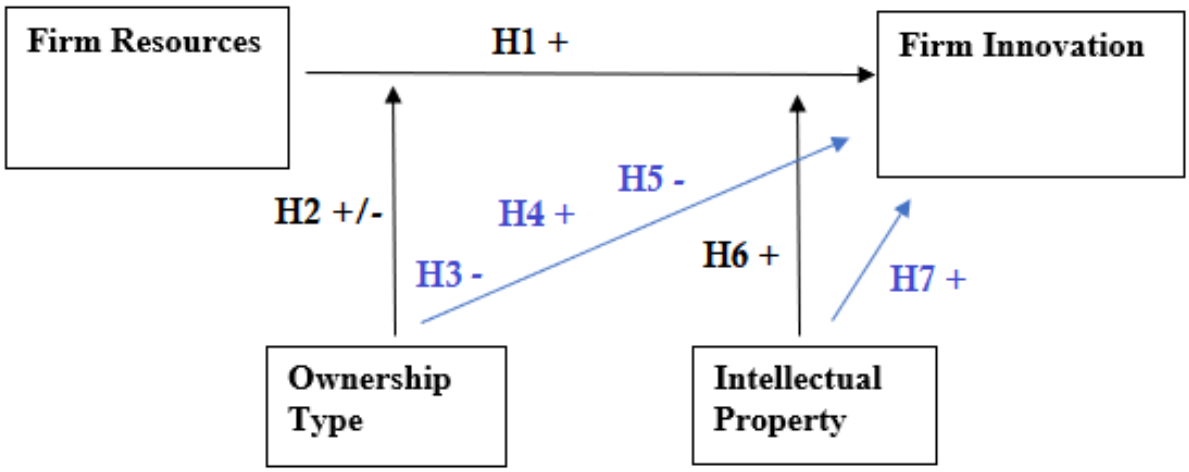
H7: Having a high level of intellectual property system in place will have a positive effect on firm innovation in the context of emerging countries

2.5 Conceptual Model

The conceptual model presented below in Figure 1 gives an overview of the 4 main concepts used in this study and how these concepts are expected to relate to one another. Exact definitions of how the concepts are interpreted in this study can be found in table 3.

Additionally, the hypotheses which were formulated in the preceding chapter are also visualized in the conceptual model.

Figure 1: Conceptual Model



3. Research Method

This chapter will present an overview of the data sample which is used in this thesis and where this data is retrieved from. A specific description of the variables will be provided thereafter. An overview of all the variable descriptions is presented in table 3. To conclude,

the chapter, the analyses used in this thesis are covered.

3.1 Sample

For this study, a quantitative research method has been used to explore the effect firm resources, ownership type and the intellectual property system have on firm innovation. The dataset consists of 2002 companies, spread across 18 different emerging countries. Despite not specifically accounting for it, these emerging countries are spread all around the globe, including countries from various continents, cultures, and consists of firms from countries that are in different stages of their economic development (Both advanced and secondary emerging countries) (FTSE, 2020). The majority of the firms in our sample are either Chinese (574) or Russian (1164). Concerning ownership type, 18.9 % of the firms are foreign owned, 75.7% are domestically owned and 5.3 % are completely or partly owned by a state. Various options and alternative measurements were considered to minimize the skewness of the non-metric variables in the data. First of all, a majority of the firms in the sample are from either Russia or China. While this in itself is not necessarily an issue, any attempt to increase the percentage of firms from other countries will have a negative impact on the skewness of the ownership type, because the Russian and Chinese governments tend to focus a lot on operating state owned enterprises, even abroad (Szarzec, Nowara & Totleben, 2020). A focus on a sample with fewer countries that have higher percentages of foreign and state ownership would also have had a negative impact on the validity of the measurements for the intellectual property system in the research. There is also a mix of large and smaller companies in the sample. Large companies were not excluded from the sample, as these are expected to have higher percentages of foreign ownership. Moreover, the percentage of foreign and state ownership used to class firms as foreign, state or domestically owned was after close consideration set at 10%, as further elaborated in section 3.2.2.2. To conclude on the skewness of the non-metric data, one must not forget that the population which the sample is supposed to represent is naturally skewed towards domestic ownership (Berger et al., 2005). Besides, China and Russia both have a large population and are among the most developed countries in our sample (FTSE, 2020; MSCI, 2020). Thus, there is more data available in the *Orbis* Databank for these 2 countries than there is for the other countries in our sample.

Most of the data used to conceptualize these constructs has been extracted from the *Orbis* Databank. *Orbis* is a combined databank featuring data on close to 400 million companies worldwide. It is created, maintained and updated frequently by Bureau van Dijk. . The data in *Orbis* is available for the majority of the countries, which makes it an excellent

source to create a sample that is representative for 'emerging countries' specifically. Besides *Orbis*, the International Property Rights Index is used to measure the quality of the intellectual property systems in the 18 emerging countries in the dataset.

In this thesis, emerging countries are classified in line with *FTSE* (2020) and *MSCI* (2020). *FTSE* (2020) classifies 90% of the global equity markets (79 in total), based on 6 factors: Quality of Market, Materiality, Consistency and Predictability, Cost Limitation, Stability & Market Access. A designated committee decides whether countries fit in one of the four categories: Developed, Advanced Emerging, Secondary Emerging or Frontier. *MSCI* (2020) uses a similar method to distinguish emerging countries from developed and frontier countries. *FTSE* (2020) ranks 24 countries as advanced Emerging or Secondary Emerging markets and *MSCI* (2021) ranks 27 countries as emerging. Since both rankings are quite similar, only the countries that are classed as emerging in both rankings will be used in this thesis. This means that Argentina, Korea, Peru, Poland (MSCI) and Romania (FTSE) are not included. Furthermore, Orbis did not provide relevant data for Kuwait, Qatar, Saudi Arabia, Taiwan and the United Arab Emirates (UAE), which has resulted in those countries also not being present in our sample.

The combination of the rigorous selection criteria and the frequent updates (most recent update: September 2020 & March 2021 for *FTSE* and *MSCI* respectively) confirms the validity of using these reports to classify countries as emerging countries. The countries classed as emerging and present in our sample are as follows: Brazil, Chile, China, Colombia, Czechia (Czech Republic), Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Philippines, Russia, South Africa, Thailand, and Turkey.

3.2.1 Dependent Variable

3.2.1.1 Firm Innovation

Innovation is a concept that can be difficult to define, let alone use appropriate measurements to capture it. Where, previously R&D expenditures have been used frequently to measure innovation (e.g. Bloom & Van Reenen, 2002), this later turned out to be too limited to measure innovation by itself. Therefore, in line with numerous recent studies (e.g. Xu et al., 2017; Heredia Pérez et al., 2019; Kong et al., 2020; Joe et al., 2020), the number of patents a firm has will be used to measure firm innovation. This data will be extracted from the databank *Orbis*. An overview of all variables with their corresponding definitions and way measurement can be found in table 3.

3.2.2 Independent Variables

3.2.2.1 Firm Resources

Firm resources will be measured by taking the firm's operating revenue and by taking the firm's size in regard to its number of employees (see Table 3). Operating revenue is measured in Euro, and the data is collected by extracting it from *Orbis*. The number of employees working for the firm is measured with the measurement 'Number of Employees'. The two measurements for firm resources will be merged into a single proxy for firm resources.

3.2.2.2 Ownership Type

The variable Ownership Type looks at who owns the firm. Firms can be owned domestically, foreign, or by a state/government. Prior research indicated that family owned businesses could also be used as a proxy to predict firm innovation. *Orbis* does provide the option to filter firms owned by 'one or more named individuals or families'. However, it is not possible to differentiate between the 'one or more individuals' owned firms and the family owned firms in this filter. Therefore, this study will only focus on the distinction between domestic, foreign, and state owned firms. The fact that firms in our sample are not defined as family owned, does therefore not necessarily mean that there are no family owned businesses in our sample.

Since this study focuses on both domestic and foreign owned firms in an emerging context, it includes subsidiaries as well as companies with just one establishment. *Orbis* allows researchers to filter firms by specific proportions (%) of the firm owned private domestic, private foreign, or by a government/state. This feature will be used to 'label' the firms which are part of the sample. Firms will be classed as state owned if more than 10% of the ownership can be traced back to 'Public authorities, States, or Governments'. Else, the firm is privately owned (foreign or domestic). A privately owned firm is considered to be foreign owned if at least 10 percent of the ownership is held by foreigners. Subsequently, if less than 10 percent is owned by foreigners, the firms is classed as domestically owned. We have opted to use a threshold of 10% to determine ownership type. For determining the type of ownership, a threshold of more than 50% (majority ownership) is also common use (e.g. Chibber & Majumdar, 2005). However, our dataset was already skewed towards private domestic firms, and a threshold of 50% would have even increased this skewness. Choosing a

lower cutoff point of 10% to determine ownership type is in line with the ENTERPRISE SURVEYS INDICATOR DESCRIPTIONS (2017). Thus, all researches that have used the *Enterprise surveys* as database and studied ownership type as main or control variable also used the threshold of 10%. Besides, it is not limited to the *Enterprise surveys* and studies based thereupon to use percentages lower than 50% to separate foreign from domestically owned firms. It is also not uncommon to have different scales (low, medium, high) of ownership (Yudaeva, Kozlov, Melentieva, & Ponomareva, 2003). In addition to that, Joe et al. (2020) concluded that foreign owned firms that are passively monitored (minority ownership), innovate more than foreign owned firms that are actively monitored. Therefore, with the knowledge that a 10% threshold to separate domestically owned firms from their state-owned and foreign owned counterparts may have a moderate effect on the results, the analysis was performed. At the same time, choosing to use this minority stake over a majority stake, ensured that the skewness for ownership type was somewhat reduced.

3.2.2.3 Intellectual Property System

Intellectual property system will measure to what extent an effective law system is in place, which punishes firms that use patents that are owned by other firms (see Table 3).
To define the quality of the intellectual property system in each country, this thesis uses the International Property Rights Index (IPRI). This is a yearly index that ranks countries based on their Legal & Political environment (LP), Physical Property Rights (PPR) and their Intellectual Property Rights (IPR). Each country can score 0-10 points on each of these categories, with 0 being the worst possible score and 10 being the best possible score. An average of these 3 scores will create the final IPRI score. For this thesis specifically, we are interested in Intellectual Property Rights. Hence, only this score (IPR) is used for each of the countries in our database. The measurements will be the same as the ones used in the index. IPR is comprised of 3 different measurements: Protection of Intellectual Property Rights, Patent Protection, and Copyright Piracy.

- *Protection of Intellectual Property Rights* is measured with an executive opinion survey, which asked the following question: “In your country, to what extent is intellectual property protected? [1 = not at all; 7 = to a great extent”

- *Patent protection* is measured on 5 extensive criteria: coverage, membership in international

treaties, restrictions on patent rights, enforcement mechanisms, and protection duration.

- *Copyright Piracy* is measured by taking an estimation of *"the volume and value of unlicensed software installed on personal computers, and also reveals attitudes and behaviors related to software licensing, intellectual property and emerging technologies"* (International Property Rights Index, 2020, p.8). This is measured in percentages, with 0% being no unlicensed software used and 100% being all PC's using unlicensed software.

The scores for all 3 of the aforementioned are combined and all account for a third of the total 0-10 based IPR score. The IPR scores for all countries in the dataset, along with the global rank and score for the IPRI score, are listed in table 1.

Table 1: Intellectual Property System ranking

Country	IPRI Score	Global Rank	IPR Score
Brazil	5.478	64	6.159
Chile	6.973	28	6.498
China	6.045	49	6.022
Colombia	5.563	62	6.246
Czechia	7.007	27	7.383
Egypt	5.506	63	5.628
Greece	5.232	75	5.550
Hungary	6.234	43	6.795
India	5.708	56	5.886
Indonesia	5.341	68	4.389
Malaysia	6.717	30	6.223
Mexico	5.261	71	5.947
Pakistan	4.142	116	3.732
Philippines	5.322	69	5.729
Russia	4.998	88	5.376
South Africa	6.213	45	6.885
Thailand	5.474	65	4.793
Turkey	5.404	66	5.648

(based on data in table 4 and figure 3a, International Property Rights Index, 2020, p. 15-16)

3.3 Control Variables

To control for side effects that might influence the firm innovation of firms, we have included several control variables. Zemplinerová & Hromádková (2012) argue that firm innovation can be influenced by firm age, the firm's size, and strategic features. The firm's size is already included in this research with the variable of firm resources. Strategic features is a very broad

construct. It includes factors like level of market competition and the economic situation of a country which aren't included yet in our analysis, but it also includes strategic features which are already measured in our study (like Ownership type and Intellectual Property System). Based on the aforementioned, control variables will be included to adjust for effects resulting from differences in industry, country, and the age of the firm will be included.

The first effect to control for is industry/sector. Differences in industry need to be controlled for, as manufacturing, knowledge-intensive services and financial service innovate more than other firms operating in other industries do (Vermeulen & De Jong, 2006; Zemplinerová & Hromádková, 2012). To control for this industry related effect, the control variable 'Industry' is added, which is based on *Orbis*' classification BvD Sector. An overview of all the industry sectors that are included, along with their frequencies, is displayed below in Table 2.

Table 2: Sector distribution

Classification	Name	Frequency	Percent	Cumulative Percent
Agriculture, Horticulture & Livestock	Sec_2	24	1,2	1,3
Banking, Insurance & Financial Services	Sec_3	83	4,1	5,5

Biotechnology and Life Sciences	Sec_4	253	12,6	18,1
Business Services	Sec_5	190	9,5	27,6
Chemicals, Petroleum, Rubber & Plastic	Sec_6	177	8,8	36,4
Communications	Sec_7	33	1,6	38,1
Computer Hardware	Sec_8	12	,6	38,7
Computer Software	Sec_9	40	2,0	40,6
Construction	Sec_10	68	3,4	44,0
Food & Tobacco Manufacturing	Sec_11	64	3,2	47,2
Industrial, Electric & Electronic Machinery	Sec_12	236	11,8	59,0
Information Services	Sec_13	2	,1	59,1
Leather, Stone, Clay & Glass products	Sec_14	34	1,7	60,8
Media & Broadcasting	Sec_15	18	,9	61,7
Metals & Metal Products	Sec_16	76	3,8	65,5
Mining & Extraction	Sec_17	60	3,0	68,5
Miscellaneous Manufacturing	Sec_18	15	,7	69,2
Printing & Publishing	Sec_19	10	,5	69,7
Property Services	Sec_20	59	2,9	72,7
Public Administration, Education, Health Social Services	Sec_21	18	,9	73,6
Retail	Sec_22	43	2,1	75,7
Textiles & Clothing Manufacturing	Sec_23	23	1,1	76,9
Transport Manufacturing	Sec_24	82	4,1	80,9
Transport, Freight & Storage	Sec_25	63	3,1	84,1
Travel, Personal & Leisure	Sec_26	16	,8	84,9
Utilities	Sec_27	65	3,2	88,1
Waste Management & Treatment	Sec_28	7	,3	88,5
Wholesale	Sec_29	207	10,3	98,8
Wood, Furniture & Paper Manufacturing	Sec_30	24	1,2	100,0
Total		2002	100,0	

The second and last control variable is the firm's age. When firms get older, they tend to innovate less, as the need to innovate becomes smaller over time (Balasubramanian & Lee, 2008). Younger firms have neither routines nor capabilities that older companies have. They try to compensate for this with (radical and risky) innovation (Coad, Segarran & Teruel, 2016). We therefore include a control variable for firm age, which is measured in the number

of years that a company is old. The table displayed below (Table 3) provides an overview of all the variables used in this thesis, along with what definition is used for.

Table 3: Variable definitions

VARIABLE	DEFINITION	DATA SOURCE	DATA TYPE
FIRM INNOVATION	Firm innovation is measured by the number of patents the firm has.	Orbis (Intellectual property -> number of publications)	Ratio
FIRM RESOURCES	Measured in the number of employees working for the firm, and the operating revenue in 2020, creating a composite variable	Orbis (number of employees & operating revenue)	Ratio
OWNERSHIP TYPE	If the ownership of a private firm exceeds 10% owned by foreigner owners, it will be classed 'foreign owned'. If less than 10%, the firms is classed domestically owned. Firms not owned by private owners but by states (more than 10%) are classed 'state owned'.	Orbis	Nominal
INTELLECTUAL PROPERTY SYSTEM	Combined score of Protection of Intellectual Property Rights, Patent Protection, and Copyright Piracy, between 0 (lowest) and 10 (highest).	Intellectual Property Rights Index	Interval
FIRM AGE	Firm age is measured by taking the numbers of years that have passed since the firm began operations.	Orbis (2020 minus the year of incorporation)	Ratio
INDUSTRY	Control variable which indicates which industry the firm operates in, displayed in the SIC code of that industry. All sectors are turned into dummies, which are compared with the largest sector (Biotechnology and Life Sciences)	Orbis (BvD Sector)	Nominal

3.3 Method of analysis

Various relationships are explored in this study, which include direct-, interaction-, and moderation effects. Therefore, the analyses that is most appropriate to test our hypothesis is the multiple regression analysis (Hair, Black, Babin & Anderson, 2009). We had to start by cleaning the data, getting rid of missing data and of the data for firms that lay outside our 18 targeted emerging countries. The regression analysis requires the data to be metrically

(interval or ratio) scaled. Moreover, there are 5 assumptions which need to be met before any analysis can be performed on the data. These assumptions are the linearity of the phenomenon measured, a constant variance of the error terms, the independence of the error terms, normality of the error term distribution, and an absence of multicollinearity.

Considering this research uses 1 independent, 1 dependent, and 2 variables that are used as both independent as well as moderator, we will need to use multiple models to test all our hypothesis. A model will test solely the effect of firm resources on firm innovation, one will test the effect of the intellectual property system on firm innovation and one will test the effect of ownership type on firm innovation. Then, we will have models to test intellectual property system and ownership type as moderator. To conclude, we'll also have a model for testing firm resources, intellectual property system and ownership type as an interaction effect. An econometric model will be used to be able to test our hypotheses. This model will show whether any correlations exist between the interaction of the constructs (Hair et al., 2009). The econometric model is displayed below:

$$\textit{Firm Innovation} = \beta 0 + \beta 1\ \text{FIRM RESOURCES} + \beta 2\ \text{INTELLECTUAL PROPERTY SYSTEM} + \beta 3\ \text{OWNERSHIP TYPE} + \beta 5\ \text{FIRM AGE} + \beta 6\ \text{INDUSTRY} + \text{Error Term}$$

3.4 Research ethics

Like any academic research, we will need to comply with the *APA Ethics Code.* This ethics code has 5 general principles for researchers to obey: Beneficence and Nonmaleficence, Fidelity and Responsibility, Integrity, Justice & Respect for People's Rights and Dignity. This research doesn't collect data from respondents themselves but instead uses databank *Orbis.* The data that is publicized on these databanks is anonymized. These databanks have their

ethical code and they are considered trustworthy and legitimate. Therefore, we can conclude that the data which is gathered meets the aforementioned principles.

For the remainder of this thesis, we will comply with the *APA Ethics Code* to the best of our ability and knowledge. Besides collecting data for our dataset, this research will also work with this data. First, the data is cleaned of missing data and cleaned of data not relevant for this research. Afterwards, several analyses will be performed to ensure the assumptions are met for our further analysis. No data will be manipulated, and none of the firms and the countries they originate from will be misrepresented in an unfair or unethical way. In line with the *RDM support guidelines*, the cleaned dataset will be stored on the cloud in the University Network Drive. Access will be granted to parties who are concerned about the validity of our research. Storing a password-protected copy of our dataset in the cloud should ensure that anyone in doubt of the legitimacy of our dataset and how it was cleaned, is able to gain access to the dataset to test their claims. At the same time, we can maintain the limited availability to only those who should have access to the data. This limited availability is in line with the approval procedure which we had to go through in order to gain access to the *Orbis*' data.

4. Results

4.1 Sample description

For our sample, we have solely used the most recent data from Orbis, which is the data from 2020. This has resulted in 2002 (1682 after cleaning) firms that were selected, spread across 18 different emerging countries. The majority of the firms are located in China and Russia, making up 28,7% and 58,0% of the sample respectively. As mentioned in the preceding

chapter, no entries are present for Kuwait, Qatar, Saudi Arabia, Taiwan and the United Arab Emirates (UAE). Remarkably, 4 of these 5 are Islamic, Middle-Eastern countries that have become rich in the past decades from the sale of oil, which could potentially explain the absence of entries. An overview of our sample is provided below in table 4, depicting where all of the firms originate from and what percentage of the sample they represent.

Table 4: Sample overview

Country	Number of firms	Percent of total
BRAZIL	30	1,5
CHILE	22	1,1
CHINA	574	28,7
COLOMBIA	4	,2
CZECHIA	11	,5
EGYPT	10	,5
GREECE	4	,2
HUNGARY	8	,4
INDONESIA	12	,6
INDIA	11	,5
MEXICO	3	,1
MALAYSIA	25	1,2
PHILLIPINES	5	,2
PAKISTAN	4	,2
RUSSIA	1162	58,0
SOUTH AFRICA	50	2,5
THAILAND	2	,1
TURKEY	65	3,2
Total	2002	100,0

The sample extracted from *Orbis* consisted of 2002 firms before cleaning. To test whether there are any missing values and if so whether these are Missing At Random (MAR) or Missing Completely At Random (MCAR), Little MCAR's test was performed (see Appendix 2). Preferably Little MCAR's test is not significant and the missing values are below 10% (Hair et al., 2019). Little MCAR's test did turn out to be significant. However, after having a closer look, the conclusion could be drawn that negative values and values equal to 0 were

considered as missing by the test. However, for the only variable which had significant missing values according to the test (operating revenue), negative values or values equal to 0 are not uncommon. Hence, the decision was made to exclude the invalid entries listwise.

First, 8 entries for year of foundation were 0, which for obvious reasons were excluded. Besides, number of publications had 10 negative entries. These were excluded because the lowest possible value is 0, and any value below that is invalid. Last, operating revenue had 303 entries which were negative or equal to zero. There is a possibility that the value is equal to 0, because the information is not known, or that the company does not want to disclose this information. Moreover, companies that actually have an operating revenue of 0 are excluded, because keeping these companies in the study would've meant that the study was partly focused on firms that do not sell anything, and therefore likely do not innovate either. This is partly in line with Robson et al. (2009), where also a minimum firm size was used to exclude subsistence entrepreneurs from the study. After the dataset was cleaned, a total of 1682 firms with valid data remained. Another thing to take into consideration while cleaning the data are outliers in the metric data. There were some obvious outliers for Operating Revenue and for the Number of Employees. By removing the invalid entries in the data, we already removed most outliers as well. However, the transformation of some of these two aforementioned variables should remove the necessity to exclude outliers, in case some outliers would still have been present in the data (Hair et al., 2009).

Table 5: Descriptive Statistics

	Mean	Std. Deviation	N	Missing/invalid
Operating Revenue	1,741,299,325	25,478,103.3	1699	303 (15.1%)
Number of Employees	6788,5	657.15	2002	0
Number of Publications	560.81	117.698	1992	10 (0.5%)
IPR Score	5.7034	0.01050	2002	0
Year of foundation	25.7051	0.60547	1994	8 (0.3%)

BVD Sector*	-	-	2002	0
Ownership Type*	-	-	2002	0

** Note: No mean and Std. Deviation listed for BVD sector and Ownership type as these variables are non-metric.*

4.2 Data Analysis Strategy

4.2.1 Sample Size:

In a single regression analysis, a sample size of 20 can be enough. However, with a multiple regression analysis a minimum sample size of 50 and preferably even one of 100 is needed (Hair et al., 2009). With a sample size of 2002, this criteria is met easily. Moreover, a minimum of 5 observations per independent variable are needed, preferably even 15 to 20. 3 independent variables are used in this study, therefore this criteria is also met. The large positive difference between the required and the actual observations means that the degrees of freedom are high, and thus there is a lot of room for the observed values to vary.

4.2.2 Multicollinearity:

The regression model that is used in this study consists of 3 predictors of innovation. If 2 or more predictors are present, the researcher will need to test whether there is no correlation between the predictors present. The Variance Inflation Factor (VIF) is one of the ways to measure multicollinearity, where any value lower than 10 is acceptable, but the lower the better in terms of absence of multicollinearity. Besides, tolerance is also a way to determine the degree of multicollinearity. With multicollinearity, the values can range from -1 to 1, where the closer to 1, the less multicollinearity (Hair et al., 2009). Appendix 2 shows the coefficients table. All predictors in all models display values less than 3 for VIF (highest value is 2,403), and all above 0,4 for tolerance. This means that there is no significant presence of multicollinearity in the sample, and thus no further action needs to be taken.

4.2.3. Firm resources as a composite variable

Combining the log operating revenue and the log number of employees into a single variable that measures firm innovation, is justified in chapter 3 by showing other similar researches using identical measurements. Nevertheless, a factor analysis was performed, to further justify the combination of the two aforementioned items into a single composite variable. The

correlation matrix already shows positive signs, with a correlation of 0.913 between the two factors. According to Hair et al. (2009), we are able to perform a factor analysis, if KMO's test of sampling adequacy is <0.50, and if Bartlett's test of sphericity is significant at p>0.05 (5%). As shown in Appendix 3, the benchmark for Bartlett's test is easily met at p=0.000, whilst KMO's test is the exact minimum (0.5). The low value for KMO's test is mainly explained by the fact that only 2 items were included.

The next step in a factor analysis is to determine the number of factors. A priori, we determined that only 1 factor (firm resources) would be used. This decision is further justified by the cumulative percentage being above 60% (95.636%) at 1 factor, and the eigenvalue is above the minimum of 1 (1.913). Considering both Bartlett's test of sphericity and KMO's test of sampling adequacy are met, and there are just 2 items that highly correlate on 1 factor, no further action is necessary in regard to removing factors, items, crossloaders, etc. Hence, the suggested combination of the (log) number of employees and the (log) operating revenue, is confirmed in the high correlations that these two items showed, after performing a factor analysis.

4.3 Assumptions

To test the hypothesis, a multiple regression analysis has been performed on our data. Before a multiple regression analysis can be performed, a few assumptions will need to be met. For regression analyses, the 4 assumptions are: Linearity, Homoscedasticity (constant variance), Independence of the error terms, and Normality of the error terms. It is crucial for the researcher to make sure that these assumptions have been met before attempting to build a model that predicts the variation in the variables. If any of the assumptions are not met, incorrect conclusions can be drawn from the results of the analysis (Hair et al., 2009).

4.3.1 Independence of the error terms:

The first assumption is used to test whether there is an independence of the error terms. In other words, each predicted value must not be related to another value. The fact that the data is collected independently from one another and firms do not know or do not alter their own data based on the data provided by other firms, already suffices to meet this assumption. Besides, the mean and the standard deviation of the standardized predicted value can be

checked to test for an independence of the error terms. The mean needs to be 0.0 and the standard deviation needs to be 1.000 (Hair et al., 2009). Besides, the residuals plot was checked, which showed no consistent patterns or anything out of the ordinary (Appendix 2).

4.3.2 Normality of the error terms:

The second assumption in regression analyses is the assumption that the error terms are normally distributed. To test whether there is a normal distribution of the error terms, Kurtosis and Skewness are used. These need to be within -3 and 3, else the data is skewed to the left or right (skewness), or the peak of the frequency distribution is too sharp or to shallow (kurtosis) (Hair et al., 2009). As seen in table 6, operating revenue, number of employees, and number of employees all showed high skewness and kurtosis of the data.. For skewness and kurtosis respectively, operating revenue showed values of 15.267 and 285.352, number of employees 9.96 and 126.032, and number of publications 21.173 and 565.316. As a result, the decision was made to- in line with other studies- (e.g. Dahlquist & Robertsson, 2001; Yudaeva et al., 2003) use square root log transformation. As seen in table 6, after the log transformation was performed, the skewness is virtually vanished with values of -0.312, 0.185, and 0.859, for operating revenue, number of employees, and number of publications respectively. The values for kurtosis also dropped significantly, to -0.890 (operating revenue), -0.0899 (number of employees), and 0.191 (number of publications).

IPR score has a skewness of 0.465 and kurtosis of 1.580, so no further action is needed for this variable. Company age as expected, has a lot of firms that were founded in the last 1-2 decades. The value for skewness is also barely outside the suggested benchmark of 3 and -3 (3.103). Moreover, in contrast to the aforementioned 3 variables that were transformed, company age is not a main variable, but a control variable. Hence, the decision was made to not use transformation on company age. Last, since sector and ownership type are variables that are non-metrical, no data is displayed in this table for these 2 variables.

Table 6: Descriptive variable values

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
		Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Operating Revenue	1682	99.27	2.34*E^11	1,741,299,325	25,478,103.3	15.267	0.06	285.352	0.119
Log Operating Revenue	1682	4.6	26.18	16.3396	0.10809	-0.312	0.06	-0.890	0.119

Number of Employees	1682	1	439787	6788.50	657.147	9.96	0.06	126.032	0.119
Log Number of Employees	1682	0	12.99	5.9043	0.06559	0.185	0.06	-.0899	0.119
Number of Publications	1682	1	147927	560.81	117.698	21.173	0.06	565.316	0.119
Log Number of Publications	1682	0	11.9	2.6129	0.05782	0.859	0.06	0.191	0.119
IPR Score	1682	3.73	7.01	5.7034	0.01050	0.465	0.06	1.580	0.119
Company Age	1682	0	294	25.7051	0.60547	3.103	0.06	15.522	0.119
Sector	1682	-	-	-	-	-	-	-	-
Ownership Type	1682	-	-	-	-	-	-	-	-

4.3.3 Homoscedasticity (constant variance of the error term):

The third assumption is the assumption that there is a homogeneity of the variance. If this is not the case (heteroscedasticity), there is a higher chance that the coefficients in the regression model are incorrect. Hence, the scatterplots needed to be analyzed to assume homoscedasticity. There is a homogeneity in the scatterplots if there is not a clear shape (e.g. a triangle), they are more or less evenly dispersed among the scatterplot, and there are not a significant number of outliers (Hair et al., 2009).

4.3.4 Linearity:

The scatterplots are also used to test for the linearity of the phenomenon. One speaks of linearity if there is an absence of a clear pattern in the dots in the scatterplots. If there is a curve or parabola in the dots, the researcher has an indication that there is no linearity of the error terms. An analyzation of the residuals plot of the transformed data did not show any nonlinear data.

4.3.5 Model Fit

The model fit is tested, in order to see how well the model explains the variance in the dependent variable of innovation (Log Number of publications). In order to see how well the model explains the variance, the R^2 value is used. Table X displays the model summary. The R^2 value is 0,5422, which means that the model explains 54.22% of the variance in the number of publications. Moreover, the F-test is significant at 0.000, which means that the model is significantly improving the intercept only model R, which explained 73.64% of the variance in the number of publications.

Table 7: Model Summary

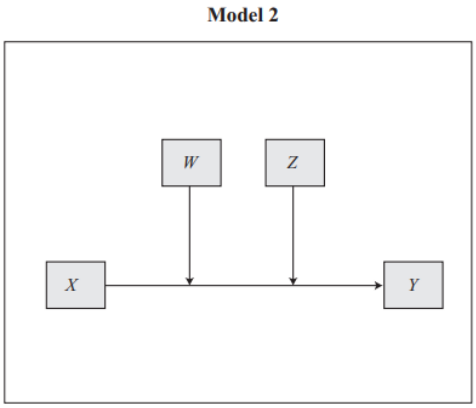
```
OUTCOME VARIABLE:
 LN_Pub

Model Summary
       R        R-sq         MSE          F         df1         df2          p
    ,7364       ,5422      2,6537     54,1289     36,0000  1645,0000       ,0000
```

4.4 Regression Model:

To test the hypotheses, a regression analysis will be performed based on the Process software by Hayes (2017). Using this software in accordance with the peripheral publication allows us to simplify our somewhat complicated conceptual model with relative ease. The conceptual model used in this model is the same as what Hayes (2017) names 'model 2'. As seen below in figure 2, model 2 uses one dependent and one independent variable, along with 2 moderators. In our conceptual model, firm resources = X, ownership type = W, IPR score = Z, and firm innovation = Y.

Figure 2: Hayes Model



Source: Hayes, 2017, p.584

Ownership type is divided into the reference category domestic ownership, as this is the largest group (75.7% of total). The model includes 3 interactions:

Int_1	:	Firm_R	x	W1 (Foreign ownership)
Int_2	:	Firm_R	x	W2 (State Ownership)
Int_3	:	Firm_R	x	IPR_Scor (IPR Score)

Afterwards, the model was ran again to test the reference category of domestic ownership:

Int_4 : Firm_R x Dom_Own (Domestic Ownership)

4.4.1 Coefficient table

The table displays the coefficient, standard error, t-value, significance, and the 95% coincidence intervals.

Table 8: Coefficients Table

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,8265	,1597	17,6999	,0000	2,5133	3,1397
Firm_R	1,4500	,0669	21,6685	,0000	1,3187	1,5812
W1	-,0228	,1346	-,1694	,8655	-,2869	,2413
W2	-,0391	,2614	-,1494	,8812	-,5519	,4737
Int_1	,5368	,1303	4,1187	,0000	,2812	,7925
Int_2	-,2225	,2314	-,9614	,3365	-,6764	,2314
IPR_Scor	,5128	,1214	4,2239	,0000	,2747	,7509
Int_3	,4173	,1183	3,5279	,0004	,1853	,6493
Sec_2	-,5696	,3732	-1,5261	,1272	-1,3016	,1625
Sec_3	-1,8367	,2579	-7,1205	,0000	-2,3426	-1,3307
Sec_5	-,4204	,1955	-2,1497	,0317	-,8039	-,0368
Sec_6	,3045	,1967	1,5484	,1217	-,0812	,6903
Sec_7	,2586	,3297	,7843	,4330	-,3882	,9054
Sec_8	,2068	,5401	,3828	,7019	-,8526	1,2661
Sec_9	-,4295	,3200	-1,3424	,1797	-1,0571	,1981
Sec_10	-,1297	,2751	-,4714	,6374	-,6693	,4099
Sec_11	-1,0743	,2655	-4,0466	,0001	-1,5951	-,5536
Sec_12	,7920	,1851	4,2785	,0000	,4289	1,1550
Sec_13	-,6427	1,1602	-,5539	,5797	-2,9183	1,6329
Sec_14	,1364	,3206	,4257	,6704	-,4923	,7652
Sec_15	,0320	,4259	,0751	,9401	-,8034	,8674
Sec_16	,2228	,2502	,8905	,3733	-,2679	,7134
Sec_17	-,7508	,2733	-2,7476	,0061	-1,2868	-,2149
Sec_18	,7765	,4472	1,7363	,0827	-,1007	1,6536
Sec_19	-1,2829	,5374	-2,3872	,0171	-2,3370	-,2288
Sec_20	-,2920	,2813	-1,0381	,2994	-,8438	,2597
Sec_21	-,7530	,4572	-1,6471	,0997	-1,6496	,1437
Sec_22	-1,3105	,3009	-4,3553	,0000	-1,9007	-,7203
Sec_23	-,4349	,3804	-1,1434	,2531	-1,1810	,3112
Sec_24	1,0049	,2439	4,1202	,0000	,5265	1,4833
Sec_25	-,8076	,2614	-3,0892	,0020	-1,3204	-,2948
Sec_26	-,6242	,4435	-1,4073	,1595	-1,4941	,2457
Sec_27	-,8542	,2588	-3,3008	,0010	-1,3618	-,3466
Sec_28	-,1031	,6818	-,1512	,8799	-1,4404	1,2342
Sec_29	-,4945	,1896	-2,6075	,0092	-,8664	-,1225
Sec_30	,0784	,3810	,2059	,8369	-,6688	,8256
Age	-,0082	,0018	-4,4663	,0000	-,0119	-,0046
Dom_Own	,0656	,1245	,5271	,5982	-,1786	,3099
Int_4	-,4138	,1210	-3,4203	,0006	-,6511	-,1765

4.4.2. Testing of the hypotheses

The results displayed in the coefficients table (table 8) will be used to test the hypotheses that we set out in chapter 2. To start off, we expected firm resources to have a positive effect on firm innovation in the context of emerging countries. The results indicate that firm resources is significant at 0% significance, with a coefficient of 1.4500. Since the effect is positive, this supports the expectation depicted in hypothesis 1, that more firm resources lead to higher innovation among firm. We also predicted domestic, foreign, and state owned firms to have a direct effect on firm innovation. In the regression model, there are 2 dummies for foreign- and state owned firms. Domestic owned firms are the reference category and therefore the model had to be ran a second time for domestic owned firms. With a coefficient of 0.5982, the hypothesis that domestically owned firms innovate less than foreign or state owned firms, cannot be accepted. The results for foreign ownership are also insignificant at 95% certainty (0.8655), and therefore hypothesis 4 can also be accepted. With hypothesis 5, we hoped to exhibit that in the context of emerging countries, state owned firms will be less innovative than their privately owned counterparts. Similar foreign owned firms, no significant results were found for state owned firms (p = 0.8812). As a result of the insignificant findings, hypothesis H5 can also not be accepted.

With hypothesis 2, we wished to display a positive moderation effect of foreign owned firms (H2b), and a negative moderation effect of domestic- (H2a) and state owned firms (H2c). Domestic owned firms indeed seems to be a negative moderator of the relation between firm resources and firm innovation, because the results in the model display a coefficient of -0.4138. The interaction effect between foreign ownership and firm resources is also significant and has a coefficient of 0,5368. In line with the expectation, this means that foreign owned firms have a larger effect on firm innovation than domestic owned firms. The interaction effect predicted in hypothesis 2c, that combined the state ownership with firm resources is not significant (p = 0.3365). Therefore, the hypothesis that state owned companies have a negative effect on the relation between firm resources cannot be accepted, despite the coefficient being negative (-0.2225).

Hypothesis 6 and 7 looked into the intellectual property systems in place. The direct effect portrayed in hypothesis 7 tested whether a high level of intellectual property system in itself has a positive effect on the innovation that takes place within a firm. At 0,0000 significance, this hypothesis is accepted with a coefficient of 0,5128. The moderation effect This effect is significant at 0.004, and has a coefficient of 0,4173. The hypothesis that

intellectual property positive moderates firm resources with firm innovation can therefore be accepted. An overview of the hypotheses is provided below in table 9.

Table 9: Hypotheses summary

Hypothesis	Coefficient	Significance (p value)	Accepted or Rejected
Firm Resources			
H1	1.4500	0.0000	Accepted
Ownership Type			
H3	0.0656	0.5982	Insignificant
H4	-0.228	0.8655	Insignificant
H5	-0.0391	0.8812	Insignificant
IPR Score			
H7	0.5128	0.0000	Accepted
Moderators			
H2a	-0.4138	0.0006	Accepted
H2b	0.5368	0.0000	Accepted
H2c	-0.225	0.3365	Insignificant
H6	0.4173	0.0004	Accepted

4.4.3 Control variables within the model

Industry and Firm age were used as control variables in this study, and therefore no theoretical framework was developed around these 2 variables. However, it is interesting to have a look at their relation to firm innovation. For industry, a few sectors stand out: Banking, Insurance & Financial Services (Sec_3), Food & Tobacco (Sec_11), Printing & Publishing (Sec_19), Retail (Sec_22), and Transport Manufacturing (Sec_24). Sector 3, 11, 19 and 22 all have a high negative relation to firm innovation (between -1.8367 and -1.2829). Sector 24 has a high positive relation to firm innovation (1.0049). This is likely a result of a division between manufacturing showing high levels of innovation and non-manufacturing firms failing to innovate a lot. However, this does not explain the high negative coefficient for the food & tobacco sector, which is considered a manufacturing sector.

Besides, Sec_13 (Information Services), showed a surprisingly high stand deviation (1.1602). This suggests a relative high difference in levels of innovation between firms that

provide information services. However, the p-value for Sec_13 is not significant (0,5797), and hence no definitive conclusions can be drawn from this finding. Moreover, the age of the firm does not seem to really play a role in the innovation within the firm. With a coefficient of -0,0082, the conclusion can be drawn that firms generally speaking only slightly decrease innovation over time, as the firm becomes older.

4.5 Validity and reliability

To ensure that the reliability and validity within the study is ensured, control variables can be added besides the independent and dependent variables (Field, 2013) . Therefore, the control variables sector and firm age were included in the model. As discussed in section 4.3.3, the created model explains 54.22% of the variance. Besides, no disproportionately high levels of multicollinearity were found in the data (discussed in section 4.2.2). From both the model fit and the level of multicollinearity, we can conclude that no further action or caution needs to be taken in regard to the validity and the reliability of the study.

5. Discussion

This section will elaborate on the main findings of this study. More specifically, how firm resources, ownership type and intellectual property influence the firm innovation in emerging countries. After the insights into the findings of this study are provided, they are compared with prior studies in the academic field. Thereafter, some concluding remarks will be provided, followed by the theoretical- and managerial implications of this study. Then, the

limitations will be touched upon, before this thesis will be concluded with suggestions for future research.

5.1 Main Findings

5.1.1 Main effects

In line with several prior studies (Chun et al., 2015; Demirkan, 2018; Cristo-Andrade & Franco, 2019), the expectation of this study was that firm level resources have a positive effect on firm innovation in emerging countries. The results of this study showed that firm resources indeed has a positive effect on firm innovation. This suggests, that in firms generating a relatively high operating revenue and that have a relatively high number of employees, more innovation will take place than in the smaller firms that generate lower levels of operating revenue. This suggests that innovation is more about committing resources to innovating, by investing in research and development (which firms are better able to do when they have higher operating revenues) and by hiring more employees so firms can allocate more man-hours on improving the production process and/or the product. In this regard, many hands do make light work.

Second, differences in the 3 ownership type were expected to have different effects on the levels of innovation within firms. As portrayed in chapter 2, private domestically owned firms were expected to show a relative low level of firm innovation, whilst their private foreign owned counterparts were expected to show a relative high level of innovation in the firm. Besides, firms owned by governments or states were expected to innovate less than firms owned by private owners. The results of the study were insignificant for the direct effects of the 3 ownership types, and thus no decisive conclusions can be drawn from this.

Third, a better intellectual property system in place was expected to positively influence innovation within the firm. As outlined by Luo & Tung (2007), companies tend to divest from countries where their intellectual properties are not protected adequately. The findings of this thesis suggest that companies are more willing to and/or better able to innovate in countries where their intellectual properties are better protected with an effective intellectual property system.

5.1.2 Moderating effects

Besides the five main effects of which this study consists, four moderating effects were studied. To start off, the expectation for hypothesis 2a was that domestic ownership had a negative moderation effect on the relation between firm resources and innovation within

firms, in emerging economies. The fact that firms that have domestic owners indeed harms the positive correlation between firm resources and firm innovation, implies that the positive effect that more resources have on the innovative activity in firms, is less when the owners are from the same country as the firm.

Second, in contrast to domestic owners, foreign ownership of a firm was expected to positively moderate the effect firm resources has on firm innovation. The results found are in line with this expectation, which confirms that findings in China (Joe et al., 2019) and Korea (Kong et al., 2020) are representative for other emerging countries. Besides, it may confirm the idea proposed by Ahmed & Iwasaki (2021), that due to increased monitoring, the effects of poor management (Belloc, 2014) on firm innovation may be limited.

Third, if firms were not owned by private owners, but instead by a government or state, this would have a negative moderation effect, if our expectations were correct. The results did show a negative moderation effect. However, this effect was insignificant and can therefore not be accepted as empirical evidence supporting the expected effect. A possible explanation for the insignificance of this effect is the limited number of state owned firms that were included in this study (5.3% of the sample). Moreover, it may be a result of the contradictory findings in literature among various contexts (e.g. Belloc, 2014; Chen et al., 2014; Zhou et al., 2017).

The fourth and final moderation effect was tested in hypothesis 7. As expected, when there was an effective intellectual property system in place, this positively moderated the relation between firm resources and firm innovation. This is likely the cause of the fact that there is less chance of innovations being copied by competitors when there is an effective system that protects the patented innovations. This reinvigorates the idea that effective intellectual property systems are vital for emerging countries to arouse companies to innovate rather than copying innovations from competitors or not innovating at all (Chen & Puttitanum, 2005; Mengistie, 2009).

In addition to the overall moderation effects, we've created a graph (figure 3) that displays all four main variables and their relations. This graph is generated based on the data in table 10. The graph somewhat visualizes and provides a more complete picture of the model that we've created. First thing to note is that all lines are increasing, which means that for all ownership types and all levels of intellectual property systems, firms innovate more when they have more resources at their disposal.

Besides, the difference in the number of publications is the highest between foreign owned firms operating in a country with a high intellectual property system in place. When

these foreign owned firms have low levels of firm resources, they average 0.4884 publications per unit of firm resources. Whereas with high firm resources, they average 4.8248, which is almost tenfold.

Third, regardless of ownership type, firms which have firm resources that are below average, the level of intellectual property system seems to have little to no effect on the innovation. As seen in figure 3, state owned firms average a coefficient of slightly above 1, domestically owned firms of around 1, and foreign owned firms of around 0.5. However, for firms with a lot of firm resources, the level of the intellectual property system becomes an important indicator of firm innovation. For domestically owned firms, the difference in the coefficient is 3.5090 when the IPR Score is low, and 4.3104 when it is high. For foreign owned firms this is 4.0234 with low and 4.8248 with high. State owned firms 3.2473 and 4.0486 for above and below average respectively. These findings are in line with the findings by Fang et al. (2017), who found that an effective intellectual property system is more beneficial for private owned firms than for state owned firms.

Figure 3: Interaction effects graph

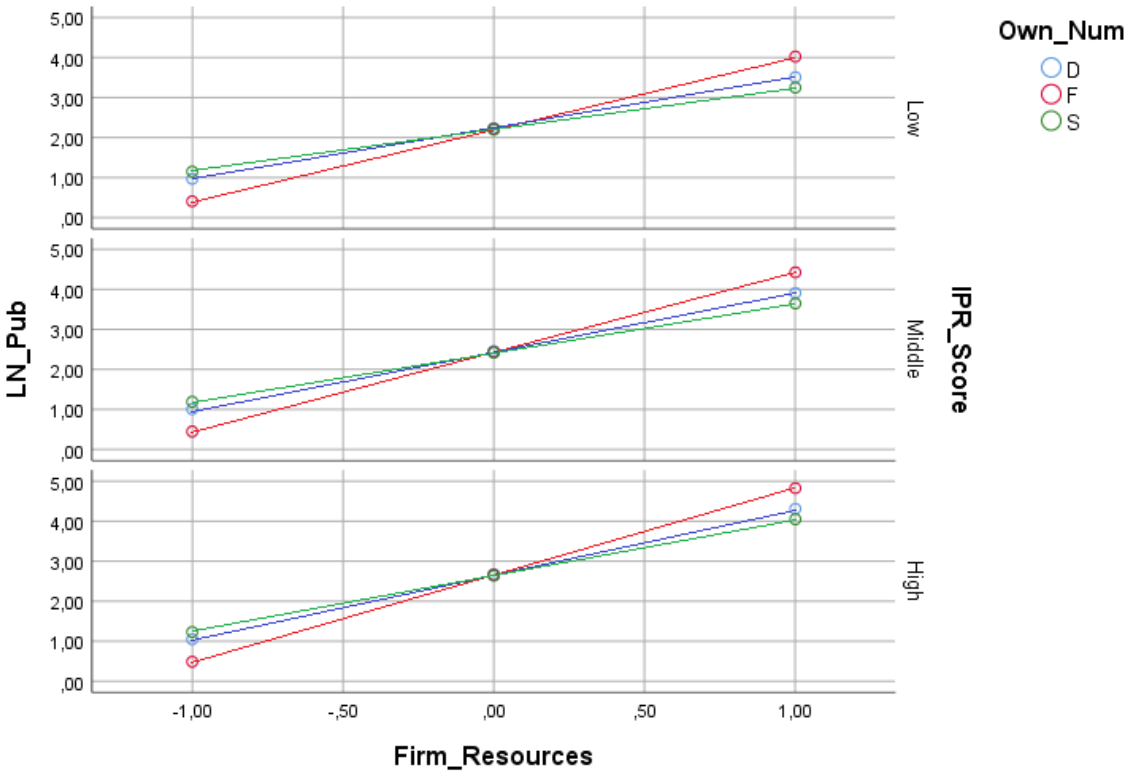


Table 10: Interaction effects statistics

Firm_R	Own_Num	IPR_Scor	LN_Pub	.
-1,0008	1,0000	-,4306	,9665	
,0000	1,0000	-,4306	2,2377	
1,0008	1,0000	-,4306	3,5090	
-1,0008	1,0000	,0000	1,0074	
,0000	1,0000	,0000	2,4586	
1,0008	1,0000	,0000	3,9097	
-1,0008	1,0000	,4306	1,0484	
,0000	1,0000	,4306	2,6794	
1,0008	1,0000	,4306	4,3104	
-1,0008	2,0000	-,4306	,4064	
,0000	2,0000	-,4306	2,2149	
1,0008	2,0000	-,4306	4,0234	
-1,0008	2,0000	,0000	,4474	
,0000	2,0000	,0000	2,4358	
1,0008	2,0000	,0000	4,4241	
-1,0008	2,0000	,4306	,4884	
,0000	2,0000	,4306	2,6566	
1,0008	2,0000	,4306	4,8248	
-1,0008	3,0000	-,4306	1,1500	
,0000	3,0000	-,4306	2,1987	

1,0008	3,0000	-,4306	3,2473
-1,0008	3,0000	,0000	1,1910
,0000	3,0000	,0000	2,4195
1,0008	3,0000	,0000	3,6479
-1,0008	3,0000	,4306	1,2320
,0000	3,0000	,4306	2,6403
1,0008	3,0000	,4306	4,0486

Firm Resources: -1.0008 = low, 0.000 = medium, 1.0008 = high
Ownership Type: 1 = domestic, 2 = foreign, 3 = state
IPR Score: -0.4306 = low, 0.000 = medium, 0.4306 = high

5.2 Theoretical Implications

This thesis has resulted in several implications for the knowledge and existing theory on the determinants of firm innovation. To start off, the existing literature on the determinants of firm innovation is in some aspects still scarce in the context of emerging countries. The recent study by Heredia Pérez, et al. (2019) stated more research is needed to distinguish which internal and external factors lead firms to make specific strategic choices regarding their commitment to innovate. This thesis built a model consisting of both internal as well as external factors, which explained 54.22% of the variance in firm innovation. The internal factor of firm resources has been proven by numerous studies in the past to positively correlate with firm innovation (e.g. Chrisman et al., 2015; De Massis et al., 2018; Demirkan, 2018) and was used as a foundation in the model. Moreover, ownership type and the external factor of intellectual property system were included in the model. This thesis showed that it is crucial to consider interaction effects, when examining the determinants of firm innovation. We have shown that interaction effects seem to have more explanatory power than single effects when studying firm innovation. Our analysis concluded with insignificant relations for all three types of ownership. On the other hand, two out of the three interaction effects were significant. This shows that the approach to build a model consisting of turned out to be a proper addition to our knowledge and understanding firm innovation.

5.3 Practical Implications

Besides the implications that can be made based on the findings in this thesis, there are some practical implications that can be made too. These practical implications are relevant for governing bodies in emerging countries, as well as for firm's managers.

Firstly, innovation is linked to economic development (Fagerberg, Srholec & Verspagen, 2010). Therefore, any attempt by policymakers in emerging countries to stimulate domestic innovation will consequently result in a boost to the economic development of the country. The results of this thesis indicated that firms that have a lot of resources at their disposal and which operate in an environment with a high level of intellectual property in place, are the firms that innovate the most. Under these circumstances, the levels of innovation were the highest for firms with foreign owners. It is thus in the policymakers best interest to allow smaller firms to grow, besides increasing the protection of intellectual property and attracting foreign investors for local firms. Moreover, when solely focusing on stimulating innovation from the governments' perspective, the results of this thesis suggest that governments might be better off privatizing larger firms that are state owned, preferably to foreign owners. At the same time, firms with fewer resources that have foreign owners should be privatized. This does however, have two sidenotes. First, governments have more responsibilities than the stimulation of domestic innovation. Hence, there are always more (important) things to consider when privatizing or nationalizing firms. Besides, if a government has ownership over a firm, they also have the power to implement policies in the firm that will increase innovation.

Second, MNE's managers that want to stimulate innovation within the firm by acquiring another business can use the findings in this thesis as a roadmap to help them make the right decision. Overall, countries with higher levels of intellectual property systems are preferred. For smaller firms, state owned firms seem to be better options than private firms. As firms get larger, firms that already have foreign owners become more suitable for acquisition.

5.4 Limitations

Now that the implications of the study are discussed, it is time to highlight the most notable caveats of this study. To start off, the measurements of firm innovation may be a bit too scarce to capture the actual levels of innovation. The initial intention of this study was to use a broader array of indicators for the main variables, by using the *Enterprise Surveys* (ENTERPRISE SURVEYS INDICATOR DESCRIPTIONS, 2017). For firm innovation for example, these surveys offered for example indicators whether the firm in question, in the past 3 had introduced a product that was new to the market, and an indicator which measured whether the firm had introduced a new work process in the past 3 years. Whilst these indicators are somewhat subjective, they do provide a decent example of an additional possibility to measure innovation. Since a lot of the innovation in small firms that are administered in emerging markets is incremental and therefore not captured by solely using the number of patents, we feel that we've been unable to capture a considerable amount of the innovation in especially smaller firms that are unable or not willing to patent their innovations.

Moreover, the dataset was mostly comprised of Russian and Chinese firms, and besides mostly of firms that were for more than 90% owned by fellow countrymen. It makes sense that two of the largest countries, that have developed more in comparison to most of the other emerging countries make up most of the sample size. Also, the fact that most firms in the sample size are domestically owned is not more than logical, as most firms in the world are owned domestically. However, there is still some overrepresentation of certain subgroups in the sample. Whilst this does not necessarily mean that the results found in this study are incorrect, it does harm the statistical power of the analysis.

5.5 Suggestions for Future Research

Future research could focus on using a wider variety of measurements for firm innovation. Especially the companies with low levels of firm resources likely do not have the resources to apply for a patent when they've found an innovative improvement to their product or work process. If more indicators are used to measure firm innovation, a picture that more closely resembles the reality can be created, which should also increase the validity of the findings.

Second, due to limitations on the database used, this thesis could not incorporate family ownership, a 4th type of ownership. Self-evidently, a study could be conducted that broadens the ownership types by dividing domestic ownership into domestic family owned

and domestic non-family owned. Future research could further dive into this, as countless studies have shown that family owned businesses significantly have higher levels of innovation (e.g. Kammerlander & Van Essen, 2017; Villaluz, & Hechanova, 2019). Besides, the various ownership types can be divided into different samples, as there might be statistical differences in the control variables for domestic and foreign owned firms (Un & Rodríguez, 2018)

Moreover, this thesis managed to build a model that explains 54.22% of the variance in firm innovation. In itself, this is already quite an accomplishment, considering a model with just 5 explaining variables was used. This does however, open the door for other variables to be added to the model, thereby further increasing its statistical power. Future studies could try to add more internal and external factors than the two internal factors and a single external factor that were taken into consideration in this study. For example, Heredia et al. (2020) recently found evidence supporting the claim that stable government policy invigorates domestic innovation. If a substantial number of both internal and external factors are included, it might even be an idea to compare these two sets of factors against one another.

Fourth, this thesis did not focus on specific sectors. Prior studies have indicated that manufacturing sectors innovate more than non-manufacturing sectors (Chun et al., 2015). Hence, future research could elaborate on the findings of the thesis, by using an extended version of the model which is built in this thesis and applying it to the sectors in which the most innovation takes place. Excluding sectors that are not prone to innovation, like sectors where no products are manufactured, should further increase the validity of the model and our understanding of the determinants of firm innovation.

Last, despite using a 10% cut off point to distinguish whether a firm was domestically, foreign, or state owned, the dataset in this thesis consisted mostly of domestically owned firms (75.7%). A future study could come up with a way to create a sample that is more evenly distributed amongst the three types of ownership, whilst maintaining the integrity of the population that the sample represents. A good start would be to divide domestic owned businesses into the aforementioned family owned and non-family owned businesses. Besides, using a majority stake (51%) as a cut-off point would be another interesting case. Alternatively, future research could, if the data allows, compare the actual percentage of certain ownership with the degree to which this correlates with firm innovation, as done in some previous studies (e.g. Choi, Park & Hong, 2012).

5.6 Conclusion

Innovation has been a topic of interest for scholars for several decades and will likely remain to be one for the coming decades as well. In the context of emerging countries, innovation can help boost economic development. Research on firm innovation in this context however, is limited and to a certain inconclusive. This paper has demonstrated that for emerging countries where firms are small and firm resources low, the level of intellectual property system is not that relevant to determine the levels of firm innovation. Even though not much innovation is taking place in these countries, the innovation that is taking place, tends to mostly take place in state owned firms and to a lesser degree domestic owned firms. Whilst firms on average get larger during the economic development of the country, a high level of intellectual property system becomes more important for firm innovation. At the same time, foreign ownership of firms becomes more important in comparison to state and domestic owned firms.

References:

Adu-Danso, E., & Abbey, E. (2020). Does foreign ownership enhance technological innovation amongst manufacturing firms in Sub-Saharan Africa?. *Journal of Small Business & Entrepreneurship,* 1-27.

Ahmed, A. S., & Iwasaki, T. (2021). Foreign ownership, appointment of independent directors, and firm value: Evidence from Japanese firms. *Journal of International Accounting, Auditing and Taxation*, 43, 100401.

Amara, N., Landry, R., Halilem, N., & Traore, N. (2010). Patterns of innovation capabilities in KIBS firms: Evidence from the 2003 Statistics *Canada Innovation Survey on Services. Industry and Innovation,* 17(2), 163-192.

Audretsch, D. B., & Acs, Z. J. (1991). Innovation and size at the firm level. *Southern Economic Journal*, 739-744.

Azam, M. (2016). *Intellectual property and public health in the developing world*. Open Book Publishers.

APA Ethics Code (n.d.) Retrieved from: https://www.apa.org/ethics/code

Barasa, L., Knoben, J., Vermeulen, P., Kimuyu, P., & Kinyanjui, B. (2017). Institutions, resources and innovation in East Africa: A firm level approach. *Research Policy*, *46*(1), 280-291.

Balasubramanian, N., & Lee, J. (2008). Firm age and innovation. *Industrial and Corporate Change*, *17*(5), 1019-1047.

Baldwin, P. (1990). The politics of social solidarity: class bases of the European welfare state, 1875-1975. *Cambridge University Press.*

Barney, J.B. (1991), "Firm resources and sustained competitive advantage*", Journal of Management*, Vol. 17 No. 1, pp. 99-12

Belloc, F. (2014). Innovation in state-owned enterprises: Reconsidering the conventional wisdom. Journal of Economic Issues, 48(3), 821-848.

Berger, A. N., Clarke, G. R., Cull, R., Klapper, L., & Udell, G. F. (2005). Corporate governance and bank performance: A joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership. *Journal of Banking & Finance,* 29(8-9), 2179-2221.0.

Bhattacharya, M. and Bloch, H. (2004), "Determinants of innovation", *Small Business Economics*, Vol. 22 No. 2, pp. 155-62.

Bloom, N., & Van Reenen, J. (2007). Measuring and explaining management practices across firms and countries. *The quarterly journal of Economics,* 122(4), 1351-1408.

Bogliacino, F., & Pianta, M. (2013). Profits, R&D, and innovation—a model and a test. *Industrial and Corporate Change,* 22(3), 649-678.

Bradley, D., Kim, I., & Tian, X. (2017). Do unions affect innovation?. *Management Science,* 63(7), 2251-2271.

Branstetter L.G., Fisman R., Foley, C.F. (2006) Do stronger intellectual property rights increase international technology transfer? Empirical evidence from US firm-level panel data. *Q J Econ* 121(1):321–349

Chen Y., Puttitanum, T. (2005). Intellectual property rights and innovation in developing countries. *J Dev Econ* 78(2):474–493

Chen, V. Z., Li, J., Shapiro, D. M., & Zhang, X. (2014). Ownership structure and innovation: An emerging market perspective. *Asia Pacific Journal of Management,* 31(1), 1-24.

Chibber, P. K., & Majumdar, S. K. (2005). Property rights and the control of strategy: Foreign ownership rules and domestic firm globalization in Indian industry. *Law & Policy,* 27(1), 52-80

Choi, S. B., Lee, S. H., & Williams, C. (2011). Ownership and firm innovation in a transition economy: Evidence from China. *Research Policy*, *40*(3), 441-452.

Choi, S. B., Park, B. I., & Hong, P. (2012). Does ownership structure matter for firm technological innovation performance? The case of Korean firms. *Corporate Governance: An International Review,* 20(3), 267-288.

Chrisman, J. J., Chua, J. H., De Massis, A., Frattini, F., & Wright, M. (2015). The ability and willingness paradox in family firm innovation. *Journal of Product Innovation Management,* 32(3), 310-318.

Christensen, C. (1997). Patterns in the evolution of product competition. *European Management Journal,* 15(2), 117-127.

Chun, D., Chung, Y., & Bang, S. (2015). Impact of firm size and industry type on R&D efficiency throughout innovation and commercialisation stages: evidence from Korean manufacturing firms. *Technology Analysis & Strategic Management,* 27(8), 895-909.

Ciabuschi, F., & Martín, O. M. (2012). Knowledge ambiguity, innovation and subsidiary performance. *Baltic Journal of Management*.

Coad, A., Segarra, A., & Teruel, M. (2016). Innovation and firm growth: does firm age play a role?. *Research policy*, *45*(2), 387-400.

Cristo-Andrade, S., & Franco, M. J. (2019). Cooperation as a vehicle for innovation: a study

of the effects of firm size and industry type. *European Journal of Innovation Management.*

Dachs, B., & Peters, B. (2014). Innovation, employment growth, and foreign ownership of firms: A European perspective. *Research Policy*, 43(1), 214-232.

David, P. A., Hall, B. H., Toole, A. A. (2000), "Is Public R&D a Complement or Substitute for Private R&D? A Review of the Econometric Evidence." *Research Policy*, 29(4-5), pp. 497–529.

Dahlquist, M., & Robertsson, G. (2001). Direct foreign ownership, institutional investors, and firm characteristics. *Journal of financial economics,* 59(3), 413-440.

De Jong, J. P., & Vermeulen, P. A. (2006). Determinants of product innovation in small firms: A comparison across industries. *International small business journal*, *24*(6), 587-609.

De Massis, A., Audretsch, D., Uhlaner, L., & Kammerlander, N. (2018). Innovation with Limited Resources: Management Lessons from the German Mittelstand.

Demirkan, I. (2018). The impact of firm resources on innovation. *European Journal of Innovation Management.*

Douma, S., George, R., & Kabir, R. (2006). Foreign and domestic ownership, business groups, and firm performance: Evidence from a large emerging market. *Strategic Management Journal*, 27(7), 637-657.

Enderwick, P. (2012). *Understanding emerging markets: China and India*. Routledge.

ENTERPRISE SURVEYS INDICATOR DESCRIPTIONS (September 11, 2017) [PDF file] https://www.enterprisesurveys.org/content/dam/enterprisesurveys/documents/Indicator-Descriptions.pdf

Ettlie, J. E., & Rubenstein, A. H. (1987). Firm size and product innovation. *Journal of product innovation management,* 4(2), 89-108.

European Commission (2010). Evaluation of the IPR Enforcement Strategy in Third Countries [PDF File] https://trade.ec.europa.eu/doclib/docs/2011/october/tradoc_148284.pdf

European Commission (2016). State-Owned Enterprises in the EU: Lessons Learnt and Ways Forward in a Post-Crisis Context [PDF File] https://ec.europa.eu/info/sites/default/files/file_import/ip031_en_2.pdf

European Commission (2020). Report on the protection and enforcement of intellectual property rights in third countries [PDF File] https://trade.ec.europa.eu/doclib/docs/2020/january/tradoc_158561.pdf

Ferreira, D., Manso, G., & Silva, A. C. (2014). Incentives to innovate and the decision to go public or private. *The Review of Financial Studies,* 27(1), 256-300.

Fagerberg, J., Srholec, M., & Verspagen, B. (2010). Innovation and economic development. *In Handbook of the Economics of Innovation* (Vol. 2, pp. 833-872). North-Holland.

Fang, L. H., Lerner, J., & Wu, C. (2017). Intellectual property rights protection, ownership, and innovation: Evidence from China. *The Review of Financial Studies*, *30*(7), 2446-2477.

Frenz, M., & Ietto-Gillies, G. (2007). Does multinationality affect the propensity to innovate? An analysis of the third UK Community Innovation Survey. *International Review of Applied Economics*, *21*(1), 99-117.

FTSE (2020). FTSE Equity Country Classification Process [PDF file]. Retrieved from: https://research.ftserussell.com/products/downloads/FTSE_Equity_Country_Classification_Paper.pdf

Goans, J. W. (2003). Intellectual property and developing countries: An overview. *Briefing Paper.*

González, X., Jaumandreu, J., Pazó, C. (2005). "Barriers to Innovation and Subsidy Effectiveness." *The RAND Journal of Economics,* 36(4), pp. 930–950.

Guadalupe, M., Kuzmina, O., & Thomas, C. (2012). Innovation and foreign ownership. *American Economic Review*, *102*(7), 3594-3627.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). Multivariate Data Analysis 7th Edition, *Pearson Prentice Hall.*

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. *Guilford publications.*

Heimonen, T. (2012). What are the factors that affect innovation in growing SMEs?. *European Journal of Innovation Management*, 15(1), 122-144.

Heredia, J., Yang, X., Flores, A., Rubiños, C., & Heredia, W. (2020). What drives new product innovation in China? An integrative strategy tripod approach. *Thunderbird International Business Review*, 62(4), 393-409.

Heredia Pérez, J.A., Geldes, C., Kunc, M.H., Flores, A. (2019). New approach to the innovation process in emerging economies: The manufacturing sector case in Chile and Peru. *Technovation*. 79(1). 35-55.

Intellectual Property Office (2017). Intellectual property rights in India [PDF FILE] Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627956/IP-Rights-in-India.pdf

International Property Rights Index (2020). [PDF file]. Retrieved from: https://atr-ipri2017.s3.amazonaws.com/uploads/IPRI+2020+Full+Report.pdf

Joe, D. Y., Oh, F. D., & Yoo, H. (2019). Foreign Ownership and Firm Innovation: Evidence from Korea. *Global Economic Review*, 48(3), 284-302.

Joe, D. Y., Chung, C. Y., & Morscheck, J. (2020). When Do Foreign Institutional Blockholders Passively Promote Firm Innovation in a Local Market? Evidence from Korea. *Asia-Pacific Journal of Financial Studies*, 49(2), 196-233.

Kammerlander, N., & van Essen, M. (2017). Family firms are more innovative than other companies. *Harvard Business Review.*

Kang, S. A. (2012). The impact of foreign block investors and information asymmetry on R&D investment. *International Business Review,* 16(4), 127-147.

Ketelhöhn, N., & Ogliastri, E. (2013). Introduction: innovation in Latin America. *Academia Revista Latinoamericana de Administración*.

Khanna, T., Palepu, K. G., & Sinha, J. (2005). Strategies that fit emerging markets. *Harvard business review*, 83(6), 4-19.

Khanna, T., & Palepu, K. G. (2010). Winning in emerging markets: A road map for strategy and execution. *Harvard Business Press.*

Kline, S. J., & Rosenberg, N. (2010). An overview of innovation. *Studies on science and the innovation process: Selected works of Nathan Rosenberg*, 173-203.

Knott, A. M., & Vieregger, C. (2020). Reconciling the firm size and innovation puzzle. *Organization Science*, 31(2), 477-488.

Kong, D., Zhu, L., & Yang, Z. (2020). Effects of foreign investors on energy firms' innovation: Evidence from a natural experiment in China. *Energy Economics*, 92, 105011.

La Porta, R., Lopez-de-Silanes, F. Shleifer, A. and Vishny. R. (1998). Law and finance. *Journal of Political Economy,* 106:1113–55.

Lenssen, G., Painter, M., Ionescu-Somers, A., Pickard, S., Szekely, F., & Strebel, H. (2013). Incremental, radical and game-changing: strategic innovation for sustainability. *Corporate governance*.

Liao, Z., Zhang, M., & Wang, X. (2019). Do female directors influence firms' environmental innovation? The moderating role of ownership type. *Corporate Social Responsibility and Environmental Management,* 26(1), 257-263.

Lodh, S., Nandy, M., & Chen, J. (2014). Innovation and family ownership: empirical evidence from India. *Corporate governance: An international review*, *22*(1), 4-23.

Luo, Y., & Tung, R. L. (2007). International expansion of emerging market enterprises: A springboard perspective.

Mahemba, C. M., & Bruijn, E. J. D. (2003). Innovation activities by small and medium-sized manufacturing enterprises in Tanzania. *Creativity and innovation management*, *12*(3), 162- 173.

Mengistie, G. (2009). The impact of the international patent system on developing countries. *Journal of Ethiopian Law*, *23*(1), 161–219.

Michie, J. (Ed.). (2019). The handbook of globalisation. *Edward Elgar Publishing.*

Morck, R., Yeung, B., & Zhao, M. (2008). Perspectives on China's outward foreign direct investment. *Journal of International Business Studies*, 39(3), 337-350.

Moszoro, M. W. (2018). Public–private monopoly. *The B.e. Journal of Economic Analysis & Policy,* 18(2).

Musacchio, A. (2014). Reinventing state capitalism. *Harvard University Press.*

Neto, D. G., & Veiga, F. J. (2013). Financial globalization, convergence and growth: The role of foreign direct investment. *Journal of International Money and Finance*, 37, 161-186.

OECD (2005). Oslo manual: proposed guidelines for collecting and interpreting technological innovation data. *Paris: OECD.*

Pavitt, K., (2006). Innovation processes. In: Fegerberg, J., Mowery, D.C., Nelson, R.R. (Eds.), The Oxford Handbook of Innovation. *Oxford University Press, Oxford*, pp. 86–114.

Peteraf, M.A. (1993). "The cornerstones of competitive advantage: a resource based view", *Strategic Management Journal,* Vol. 14 No. 3, pp. 179-91.

Pisacane, G., & Zibetti, D. (2020). Intellectual Property in China. *Springer.*

Popkova, E. G., Bogoviz, A. V., Ragulina, Y. V., & Alekseev, A. N. (2018). Perspective model of activation of economic growth in modern Russia. In Management of Changes in Socio-Economic Systems (pp. 171-177). *Springer, Cham.*

Qian, Y. (2007). Do national patent laws stimulate domestic innovation in a global patenting environment? A cross-country analysis of pharmaceutical patent protection 1978–2002. *Rev Econ Stat* 89(3):436–453

Rajan, R., and Zingales. L. (1998). Financial dependence and growth. *American Economic Review*, 88:559–86.

RDM support guidelines (n.d.) Retrieved on 25-3-2020 from: https://www.ru.nl/rdm/processing-data/storing-sharing-data/

Reid, A. S. (2003). Enforcement of Intellectual Property Rights in Developing Countries: China as a Case Study, *13 DePaul J. Art, Tech. & Intell. Prop. L. 63*

Robson, P. J., Haugh, H. M., & Obeng, B. A. (2009). Entrepreneurship and innovation in Ghana: enterprising Africa. *Small business economics,* 32(3), 331-350.

Rogers, M. (2004). Networks, firm size and innovation. *Small business economics*, *22*(2), 141-153.

Saka-Helmhout, A., Chappin, M., & Vermeulen, P. (2020). Multiple paths to firm innovation in Sub-Saharan Africa: How informal institutions matter. *Organization studies*, *41*(11), 1551-1575.

Schmiele, A. (2012). Drivers for international innovation activities in developed and emerging countries. *Journal of Technology Transfer,* 37, 98–123.

Spalding, A. B. (2010). Unwitting sanctions: understanding anti-bribery legislation as economic sanctions against emerging markets. *Fla. L. Rev*., 62, 351.

Szarzec, K., Nowara, W., & Totleben, B. (2020). State-owned enterprises as foreign direct investors: insights from EU countries. *Post-Communist Economies,* 1-24.

Un, C. A., & Rodríguez, A. (2018). Local and global knowledge complementarity: R&D collaborations and innovation of foreign and domestic firms. *Journal of International Management*, 24(2), 137-152.

Varadarajan, R. (2018). Innovation, innovation strategy, and strategic innovation. In *Innovation and Strategy*. Emerald Publishing Limited.

Villaluz, V. C., & Hechanova, M. R. M. (2019). Ownership and leadership in building an innovation culture. *Leadership & Organization Development Journal.*

Wang, Q., Su, M., & Li, R. (2018). Toward to economic growth without emission growth: The role of urbanization and industrialization in China and India. *Journal of cleaner production,* 205, 499-511.

World Intellectual Property Organization. (2004). *WIPO intellectual property handbook: Policy, law and use* (Vol. 489). WIPO.

Yudaeva, K., Kozlov, K., Melentieva, N., & Ponomareva, N. (2003). Does foreign ownership matter? The Russian experience. *Economics of transition*, 11(3), 383-409.

Zemplinerová, A., & Hromádková, E. (2012). Determinants of firms innovation. *Prague Economic Papers,* 21(4), 487-503.

Zeschky, M., Widenmayer, B., & Gassmann, O. (2011). Frugal innovation in emerging markets. *Research-Technology Management*, *54*(4), 38-45.

Zhao, M. (2006). Conducting R&D in countries with weak intellectual property rights protection. *Management science,* 52(8), 1185-1199.

Zhou, K. Z., Gao, G. Y., & Zhao, H. (2017). State ownership and firm innovation in China: An integrated view of institutional and efficiency logics. *Administrative Science Quarterly*, *62*(2), 375-404.

Zulu-Chisanga, S., Chabala, M., & Mandawa-Bray, B. (2020). The differential effects of government support, inter-firm collaboration and firm resources on SME performance in a developing economy. *Journal of Entrepreneurship in Emerging Economies.*

APPENDIX 1: Descriptive tables

Descriptives before transformation

			Statistic	Std. Error
Operating revenue	Mean		1741299325,365152000000000	254678103,261724830000000
	95% Confidence Interval for Mean	Lower Bound	1241779752,390044700000000	
		Upper Bound	2240818898,340259000000000	
	5% Trimmed Mean		463456250,638524350000000	
	Median		26158030,385841900000000	
	Variance		1090960948246247800000,000	
	Std. Deviation		10444907602,493418000000000	
	Minimum		99,279871162137600	
	Maximum		2,342632096191760E+11	
	Range		234263209519,896120000000000	
	Interquartile Range		471969527,333937350000000	
	Skewness		15,195	,060
	Kurtosis		285,017	,119
Number of employees	Mean		6788,50	657,147
	95% Confidence Interval for Mean	Lower Bound	5499,58	
		Upper Bound	8077,41	
	5% Trimmed Mean		2772,77	
	Median		285,00	
	Variance		726358880,944	
	Std. Deviation		26951,046	
	Minimum		1	
	Maximum		439787	
	Range		439786	
	Interquartile Range		3382	
	Skewness		9,954	,060
	Kurtosis		125,887	,119

Number of publications	Mean		560,81	117,698
	95% Confidence Interval for Mean	Lower Bound	329,96	
		Upper Bound	791,66	
	5% Trimmed Mean		78,53	
	Median		9,00	
	Variance		23300470,072	
	Std. Deviation		4827,056	
	Minimum		1	
	Maximum		147928	
	Range		147927	
	Interquartile Range		59	
	Skewness		21,173	,060
	Kurtosis		565,316	,119
IPR	Mean		5,7034	,01050
	95% Confidence Interval for Mean	Lower Bound	5,6828	
		Upper Bound	5,7240	
	5% Trimmed Mean		5,6726	
	Median		5,3760	
	Variance		,185	
	Std. Deviation		,43065	
	Minimum		3,73	
	Maximum		7,01	
	Range		3,27	
	Interquartile Range		,65	
	Skewness		,465	,060
	Kurtosis		1,580	,119
Company Age	Mean		25,7051	,60547
	95% Confidence Interval for Mean	Lower Bound	24,5176	
		Upper Bound	26,8927	
	5% Trimmed Mean		22,4884	
	Median		19,0000	
	Variance		616,619	
	Std. Deviation		24,83180	
	Minimum		,00	
	Maximum		294,00	
	Range		294,00	
	Interquartile Range		16,00	
	Skewness		3,103	,060
	Kurtosis		15,522	,119
BvD sectors	Mean		14,13	,217
		Lower Bound	13,71	

	95% Confidence Interval for Mean	Upper Bound	14,56	
	5% Trimmed Mean		13,93	
	Median		12,00	
	Variance		79,040	
	Std. Deviation		8,890	
	Minimum		2	
	Maximum		30	
	Range		28	
	Interquartile Range		17	
	Skewness		,410	,060
	Kurtosis		-1,238	,119
Ownership Type	Mean		1,34	,014
	95% Confidence Interval for Mean	Lower Bound	1,31	
		Upper Bound	1,37	
	5% Trimmed Mean		1,27	
	Median		1,00	
	Variance		,351	
	Std. Deviation		,592	
	Minimum		1	
	Maximum		3	
	Range		2	
	Interquartile Range		1	
	Skewness		1,543	,060
	Kurtosis		1,292	,119

Descriptives after transformation

Descriptive Statistics

	Mean	Std. Deviation	N
LN_Pub	2,6205	2,38181	1682
REGR factor score 1 for analysis 1	,0000167	1,00079738	1682
Own_D	,7218	,44827	1682
Own_F	,2152	,41110	1682
Own_S	,0630	,24307	1682
IPR	5,7034	,43065	1682
Company Age	25,7051	24,83180	1682

			Statistic	Std. Error
LN_OR	Mean		16,3396	,10809
	95% Confidence Interval for Mean	Lower Bound	16,1276	
		Upper Bound	16,5516	
	5% Trimmed Mean		16,4258	
	Median		17,1119	
	Variance		19,767	
	Std. Deviation		4,44597	
	Minimum		4,60	
	Maximum		26,18	
	Range		21,58	
	Interquartile Range		7,41	
	Skewness		-,312	,059
	Kurtosis		-,890	,119
LN_Emp	Mean		5,9043	,06559
	95% Confidence Interval for Mean	Lower Bound	5,7757	
		Upper Bound	6,0329	
	5% Trimmed Mean		5,8846	
	Median		5,6612	
	Variance		7,279	
	Std. Deviation		2,69797	
	Minimum		,00	
	Maximum		12,99	
	Range		12,99	
	Interquartile Range		4,56	
	Skewness		,185	,059
	Kurtosis		-,899	,119
LN_Pub	Mean		2,6129	,05782
	95% Confidence Interval for Mean	Lower Bound	2,4995	
		Upper Bound	2,7263	
	5% Trimmed Mean		2,4335	
	Median		2,1972	
	Variance		5,656	
	Std. Deviation		2,37825	
	Minimum		,00	
	Maximum		11,90	
	Range		11,90	
	Interquartile Range		3,41	
	Skewness		,859	,059
	Kurtosis		,191	,119

.

			Statistic	Std. Error
Operating revenue	Mean		1739231438	254379745,4
	95% Confidence Interval for Mean	Lower Bound	1240297485	
		Upper Bound	2238165392	
	5% Trimmed Mean		462476111,8	
	Median		25847266,24	
	Variance		1,090E+20	
	Std. Deviation		1,04389E+10	
	Minimum		99,27987116	
	Maximum		2,34263E+11	
	Range		2,34263E+11	
	Interquartile Range		470301211,9	
	Skewness		15,204	,060
	Kurtosis		285,352	,119
Number of employees	Mean		6780,45	656,391
	95% Confidence Interval for Mean	Lower Bound	5493,03	
		Upper Bound	8067,88	
	5% Trimmed Mean		2767,57	
	Median		285,00	
	Variance		725550150,6	
	Std. Deviation		26936,038	
	Minimum		1	
	Maximum		439787	
	Range		439786	
	Interquartile Range		3377	
	Skewness		9,960	,060
	Kurtosis		126,032	,119
Number of publications	Mean		560,15	117,559
	95% Confidence Interval for Mean	Lower Bound	329,57	
		Upper Bound	790,72	
	5% Trimmed Mean		78,34	
	Median		9,00	
	Variance		23273151,51	
	Std. Deviation		4824,225	
	Minimum		1	
	Maximum		147928	
	Range		147927	
	Interquartile Range		59	
	Skewness		21,185	,060
	Kurtosis		565,983	,119

IPR	Mean		5,7040	,01052
	95% Confidence Interval for Mean	Lower Bound	5,6834	
		Upper Bound	5,7246	
	5% Trimmed Mean		5,6729	
	Median		5,3760	
	Variance		,186	
	Std. Deviation		,43164	
	Minimum		3,73	
	Maximum		7,01	
	Range		3,27	
	Interquartile Range		,65	
	Skewness		,473	,060
	Kurtosis		1,579	,119
Company Age	Mean		25,6865	,60491
	95% Confidence Interval for Mean	Lower Bound	24,5000	
		Upper Bound	26,8729	
	5% Trimmed Mean		22,4696	
	Median		19,0000	
	Variance		616,208	
	Std. Deviation		24,82354	
	Minimum		,00	
	Maximum		294,00	
	Range		294,00	
	Interquartile Range		15,75	
	Skewness		3,104	,060
	Kurtosis		15,534	,119

Correlations[b]

		LN_Pub	REGR factor score 1 for analysis 1	Own_D	Own_F	Own_S	IPR	Company Age
LN_Pub	Pearson Correlation	1	,654**	-,332**	,316**	,078**	,425**	,147**
	Sig. (2-tailed)		,000	,000	,000	,001	,000	,000
REGR factor score 1 for analysis 1	Pearson Correlation	,654**	1	-,500**	,409**	,230**	,509**	,376**
	Sig. (2-tailed)	,000		,000	,000	,000	,000	,000
Own_D	Pearson Correlation	-,332**	-,500**	1	-,843**	-,418**	-,308**	-,227**
	Sig. (2-tailed)	,000	,000		,000	,000	,000	,000
Own_F	Pearson Correlation	,316**	,409**	-,843**	1	-,136**	,190**	,078**
	Sig. (2-tailed)	,000	,000	,000		,000	,000	,001
Own_S	Pearson Correlation	,078**	,230**	-,418**	-,136**	1	,247**	,287**
	Sig. (2-tailed)	,001	,000	,000	,000		,000	,000
IPR	Pearson Correlation	,425**	,509**	-,308**	,190**	,247**	1	,086**
	Sig. (2-tailed)	,000	,000	,000	,000	,000		,000
Company Age	Pearson Correlation	,147**	,376**	-,227**	,078**	,287**	,086**	1
	Sig. (2-tailed)	,000	,000	,000	,001	,000	,000	

**. Correlation is significant at the 0.01 level (2-tailed).

b. Listwise N=1682

Overview of Sectors

	1
Agriculture, Horticulture & Livestock	2
Banking, Insurance & Financial Services	3
Biotechnology and Life Sciences	4
Business Services	5
Chemicals, Petroleum, Rubber & Plastic	6
Communications	7
Computer Hardware	8
Computer Software	9
Construction	10
Food & Tobacco Manufacturing	11
Industrial, Electric & Electronic Machinery	12
Information Services	13
Leather, Stone, Clay & Glass products	14
Media & Broadcasting	15
Metals & Metal Products	16
Mining & Extraction	17
Miscellaneous Manufacturing	18
Printing & Publishing	19
Property Services	20
Public Administration, Education, Health Social Services	21
Retail	22
Textiles & Clothing Manufacturing	23
Transport Manufacturing	24
Transport, Freight & Storage	25
Travel, Personal & Leisure	26
Utilities	27
Waste Management & Treatment	28
Wholesale	29
Wood, Furniture & Paper Manufacturing	30

APPENDIX 2: ASSUMPTIONS

Little MCAR's test:

Univariate Statistics

	N	Mean	Std. Deviation	Missing Count	Missing Percent	No. of Extremes[a] Low	No. of Extremes[a] High
Operatingrevenue	1698	1731077622,969095700000000	10388128581,577390000000000	304	15,2	0	290
Numberofemployees	2002	5753,89	24846,171	0	,0	0	307
Numberofpublications	1992	473,57	4436,656	10	,5	0	336
IPR_Score	2002	5,6555	,41495	0	,0	16	12
Age	1994	28,5243	102,59914	8	,4	0	196

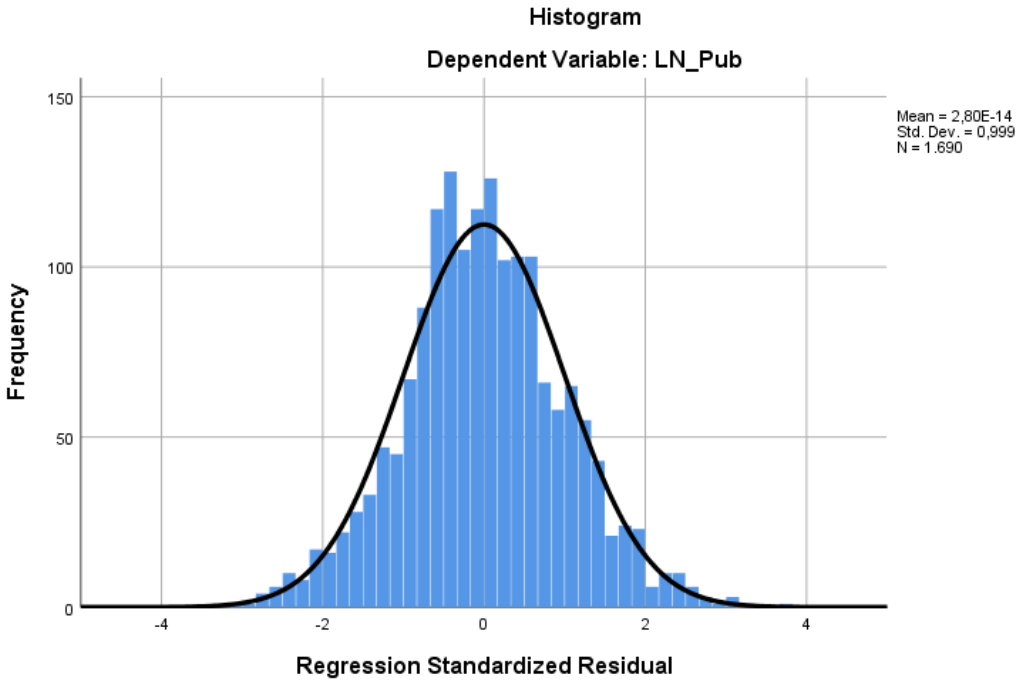
a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

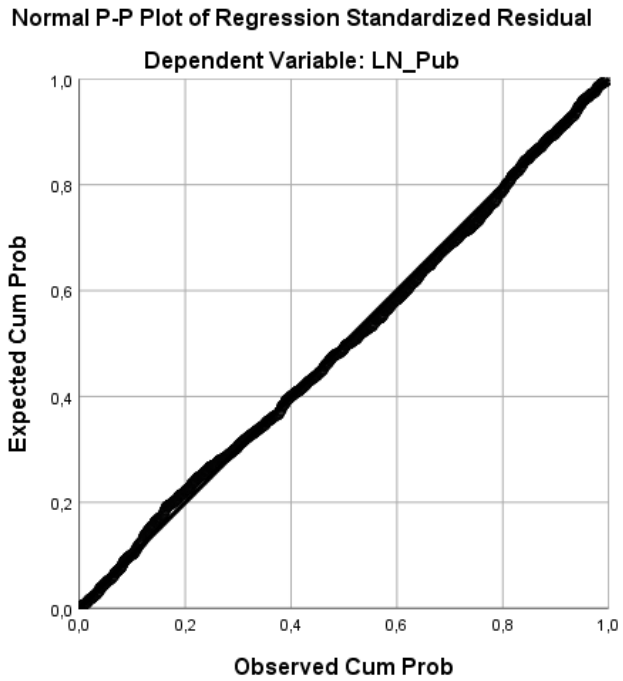
Coefficients[a]

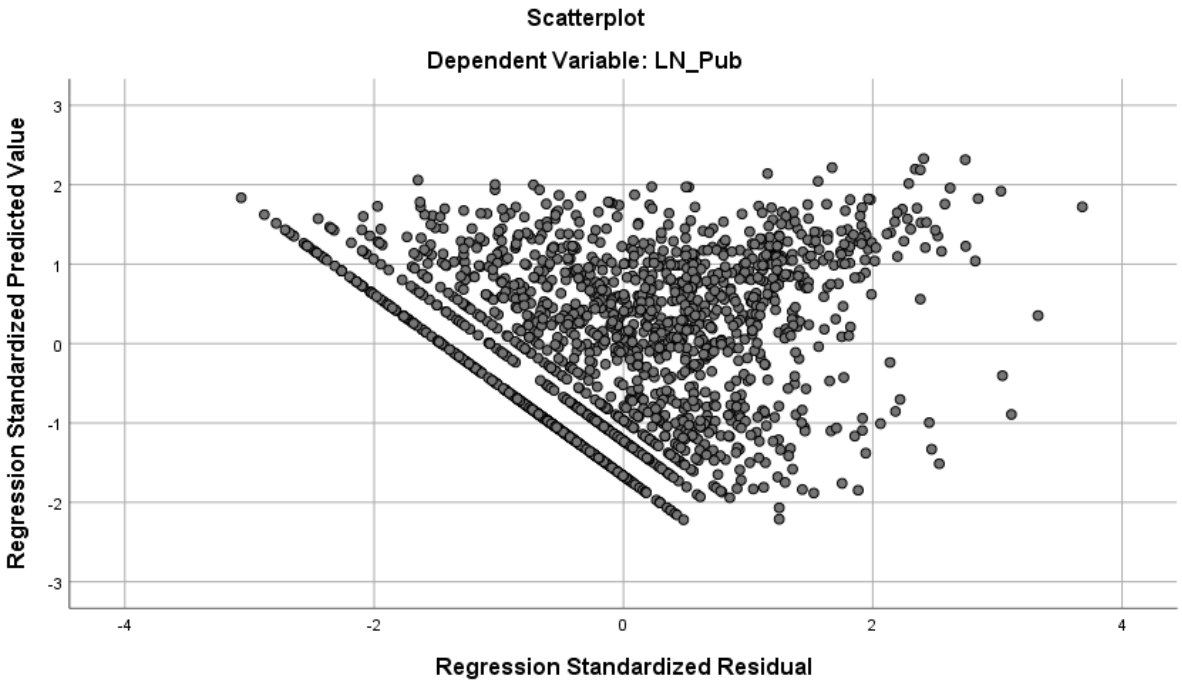
Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-,904	,647		-1,396	,163		
	REGR factor score 1 for analysis 1	1,484	,058	,625	25,693	,000	,491	2,038
	Company Age	-,002	,000	-,070	-4,033	,000	,955	1,047
	BvDsectors=Agriculture, Horticulture & Livestock	-,917	,377	-,045	-2,432	,015	,858	1,165
	BvDsectors=Banking, Insurance & Financial Services	-1,941	,259	-,165	-7,495	,000	,599	1,669
	BvDsectors=Business Services	-,540	,198	-,063	-2,719	,007	,538	1,860
	BvDsectors=Chemicals, Petroleum, Rubber & Plastic	,140	,198	,018	,708	,479	,457	2,190
	BvDsectors=Communications	,060	,335	,003	,178	,859	,786	1,273
	BvDsectors=Computer Hardware	,250	,551	,008	,454	,650	,920	1,087
	BvDsectors=Computer Software	-,543	,325	-,031	-1,671	,095	,835	1,198
	BvDsectors=Construction	-,163	,280	-,012	-,583	,560	,743	1,345
	BvDsectors=Food & Tobacco Manufacturing	-1,293	,269	-,100	-4,813	,000	,675	1,482
	BvDsectors=Industrial, Electric & Electronic Machinery	,633	,187	,090	3,390	,001	,416	2,403
	BvDsectors=Information Services	-,528	1,185	-,008	-,446	,656	,987	1,013
	BvDsectors=Leather, Stone, Clay & Glass products	,110	,326	,006	,338	,735	,805	1,242
	BvDsectors=Media & Broadcasting	-,203	,432	-,009	-,470	,639	,882	1,134
	BvDsectors=Metals & Metal Products	,060	,253	,005	,236	,814	,663	1,508
	BvDsectors=Mining & Extraction	-,782	,279	-,058	-2,807	,005	,683	1,463

	BvDsectors=Miscellaneous Manufacturing	,525	,455	,021	1,154	,249	,902	1,109
	BvDsectors=Printing & Publishing	-1,462	,547	-,047	-2,671	,008	,931	1,075
	BvDsectors=Property Services	-,438	,286	-,030	-1,532	,126	,772	1,295
	BvDsectors=Public Administration, Education, Health Social Services	-,783	,466	-,030	-1,678	,094	,917	1,090
	BvDsectors=Retail	-1,349	,307	-,085	-4,401	,000	,774	1,293
	BvDsectors=Textiles & Clothing Manufacturing	-,683	,387	-,033	-1,765	,078	,853	1,172
	BvDsectors=Transport Manufacturing	,705	,245	,064	2,875	,004	,590	1,695
	BvDsectors=Transport, Freight & Storage	-,804	,267	-,062	-3,013	,003	,683	1,464
	BvDsectors=Travel, Personal & Leisure	-,580	,453	-,023	-1,280	,201	,908	1,101
	BvDsectors=Utilities	-1,052	,262	-,085	-4,013	,000	,645	1,550
	BvDsectors=Waste Management & Treatment	-,208	,696	-,005	-,298	,765	,957	1,045
	BvDsectors=Wholesale	-,573	,193	-,071	-2,976	,003	,515	1,940
	BvDsectors=Wood, Furniture & Paper Manufacturing	-,114	,388	-,005	-,295	,768	,848	1,180
	Ownership Type	,003	,080	,001	,039	,969	,728	1,374
	IPR	,674	,113	,122	5,965	,000	,696	1,438

a. Dependent Variable: LN_Pub


Histogram
Dependent Variable: LN_Pub
Mean = 2,80E-14
Std. Dev. = 0,999
N = 1.690
Frequency
150
100
50
0
-4
-2
0
2
4
Regression Standardized Residual


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: LN_Pub
Expected Cum Prob
1,0
0,8
0,6
0,4
0,2
0,0
0,0
0,2
0,4
0,6
0,8
1,0
Observed Cum Prob


Scatterplot
Dependent Variable: LN_Pub
Regression Standardized Predicted Value
Regression Standardized Residual
3
2
1
0
-1
-2
-3
-4
-2
0
2
4

APPENDIX 3: Factor Analysis

Correlation Matrix

		LN_OR	LN_Emp
Correlation	LN_OR	1,000	,913
	LN_Emp	,913	1,000

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,500
Bartlett's Test of Sphericity	Approx. Chi-Square	3040,370
	df	1
	Sig.	,000

Communalities

	Initial	Extraction
LN_OR	1,000	,956
LN_Emp	1,000	,956

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1,913	95,636	95,636	1,913	95,636	95,636
2	,087	4,364	100,000			

Extraction Method: Principal Component Analysis.

APPENDIX 4: RELIABILITY ANALYSIS

Case Processing Summary

		N	%
Cases	Valid	1682	84,0
	Excluded[a]	320	16,0
	Total	2002	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,098	,668	6

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	8,250	,000	25,705	25,705	1542109,821	98,650	6

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Between People		214488,303	1681	127,596		
Within People	Between Items	829643,086	5	165928,617	1442,170	,000
	Residual	967035,999	8405	115,055		
	Total	1796679,085	8410	213,636		
Total		2011167,389	10091	199,303		

Grand Mean = 8,2503835

APPENDIX 5: REGRESSION ANALYSIS

```
*************** PROCESS Procedure for SPSS Version 3.5.3 ***************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 2
    Y  : LN_Pub
    X  : Firm_R
    W  : Own_Num
    Z  : IPR_Scor

Covariates:
Columns   1 -  14
 Sec_2    Sec_3    Sec_5    Sec_6    Sec_7    Sec_8    Sec_9    Sec_10
Sec_11   Sec_12   Sec_13   Sec_14   Sec_15   Sec_16
Columns  15 -  28
 Sec_17   Sec_18   Sec_19   Sec_20   Sec_21   Sec_22   Sec_23   Sec_24
Sec_25   Sec_26   Sec_27   Sec_28   Sec_29   Sec_30
Columns  29 -  29
 Age

Sample
Size:  1682

Coding of categorical W variable for analysis:
 Own_Num      W1      W2
   1,000    ,000    ,000
   2,000   1,000    ,000
   3,000    ,000   1,000

**************************************************************************
OUTCOME VARIABLE:
 LN_Pub

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,7364      ,5422     2,6537    54,1289    36,0000  1645,0000
,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     2,8265      ,1597    17,6999      ,0000     2,5133     3,1397
Firm_R       1,4500      ,0669    21,6685      ,0000     1,3187     1,5812
W1           -,0228      ,1346     -,1694      ,8655     -,2869      ,2413
W2           -,0391      ,2614     -,1494      ,8812     -,5519      ,4737
Int_1         ,5368      ,1303     4,1187      ,0000      ,2812      ,7925
Int_2        -,2225      ,2314     -,9614      ,3365     -,6764      ,2314
IPR_Scor      ,5128      ,1214     4,2239      ,0000      ,2747      ,7509
Int_3         ,4173      ,1183     3,5279      ,0004      ,1853      ,6493
Sec_2        -,5696      ,3732    -1,5261      ,1272    -1,3016      ,1625
Sec_3       -1,8367      ,2579    -7,1205      ,0000    -2,3426    -1,3307
Sec_5        -,4204      ,1955    -2,1497      ,0317     -,8039     -,0368
Sec_6         ,3045      ,1967     1,5484      ,1217     -,0812      ,6903
Sec_7         ,2586      ,3297      ,7843      ,4330     -,3882      ,9054
Sec_8         ,2068      ,5401      ,3828      ,7019     -,8526     1,2661
Sec_9        -,4295      ,3200    -1,3424      ,1797    -1,0571      ,1981
Sec_10       -,1297      ,2751     -,4714      ,6374     -,6693      ,4099
```

Sec_11	-1,0743	,2655	-4,0466	,0001	-1,5951	-,5536
Sec_12	,7920	,1851	4,2785	,0000	,4289	1,1550
Sec_13	-,6427	1,1602	-,5539	,5797	-2,9183	1,6329
Sec_14	,1364	,3206	,4257	,6704	-,4923	,7652
Sec_15	,0320	,4259	,0751	,9401	-,8034	,8674
Sec_16	,2228	,2502	,8905	,3733	-,2679	,7134
Sec_17	-,7508	,2733	-2,7476	,0061	-1,2868	-,2149
Sec_18	,7765	,4472	1,7363	,0827	-,1007	1,6536
Sec_19	-1,2829	,5374	-2,3872	,0171	-2,3370	-,2288
Sec_20	-,2920	,2813	-1,0381	,2994	-,8438	,2597
Sec_21	-,7530	,4572	-1,6471	,0997	-1,6496	,1437
Sec_22	-1,3105	,3009	-4,3553	,0000	-1,9007	-,7203
Sec_23	-,4349	,3804	-1,1434	,2531	-1,1810	,3112
Sec_24	1,0049	,2439	4,1202	,0000	,5265	1,4833
Sec_25	-,8076	,2614	-3,0892	,0020	-1,3204	-,2948
Sec_26	-,6242	,4435	-1,4073	,1595	-1,4941	,2457
Sec_27	-,8542	,2588	-3,3008	,0010	-1,3618	-,3466
Sec_28	-,1031	,6818	-,1512	,8799	-1,4404	1,2342
Sec_29	-,4945	,1896	-2,6075	,0092	-,8664	-,1225
Sec_30	,0784	,3810	,2059	,8369	-,6688	,8256
Age	-,0082	,0018	-4,4663	,0000	-,0119	-,0046

Product terms key:

Int_1	:	Firm_R	x	W1
Int_2	:	Firm_R	x	W2
Int_3	:	Firm_R	x	IPR_Scor

Test(s) of highest order unconditional interaction(s):

	R2-chng	F	df1	df2	p
X*W	,0054	9,6652	2,0000	1645,0000	,0001
X*Z	,0035	12,4460	1,0000	1645,0000	,0004
BOTH	,0105	12,5921	3,0000	1645,0000	,0000

Focal predict: Firm_R (X)
Mod var: Own_Num (W)
Mod var: IPR_Scor (Z)

Conditional effects of the focal predictor at values of the moderator(s):

Own_Num	IPR_Scor	Effect	se	t	p	LLCI	ULCI
1,0000	-,4306	1,2702	,0736	17,2601	,0000	1,1259	1,4146
1,0000	,0000	1,4500	,0669	21,6685	,0000	1,3187	1,5812
1,0000	,4306	1,6297	,0934	17,4426	,0000	1,4464	1,8129
2,0000	-,4306	1,8071	,1342	13,4663	,0000	1,5439	2,0703
2,0000	,0000	1,9868	,1194	16,6441	,0000	1,7526	2,2209
2,0000	,4306	2,1665	,1252	17,3014	,0000	1,9209	2,4121
3,0000	-,4306	1,0478	,2416	4,3365	,0000	,5739	1,5217
3,0000	,0000	1,2275	,2292	5,3555	,0000	,7779	1,6770
3,0000	,4306	1,4072	,2278	6,1782	,0000	,9605	1,8539

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

```
DATA LIST FREE/
   Firm_R     Own_Num    IPR_Scor   LN_Pub     .
BEGIN DATA.
    -1,0008     1,0000     -,4306      ,9665
      ,0000     1,0000     -,4306     2,2377
     1,0008     1,0000     -,4306     3,5090
    -1,0008     1,0000      ,0000     1,0074
      ,0000     1,0000      ,0000     2,4586
     1,0008     1,0000      ,0000     3,9097
```

```
    -1,0008     1,0000      ,4306     1,0484
      ,0000     1,0000      ,4306     2,6794
     1,0008     1,0000      ,4306     4,3104
    -1,0008     2,0000     -,4306      ,4064
      ,0000     2,0000     -,4306     2,2149
     1,0008     2,0000     -,4306     4,0234
    -1,0008     2,0000      ,0000      ,4474
      ,0000     2,0000      ,0000     2,4358
     1,0008     2,0000      ,0000     4,4241
    -1,0008     2,0000      ,4306      ,4884
      ,0000     2,0000      ,4306     2,6566
     1,0008     2,0000      ,4306     4,8248
    -1,0008     3,0000     -,4306     1,1500
      ,0000     3,0000     -,4306     2,1987
     1,0008     3,0000     -,4306     3,2473
    -1,0008     3,0000      ,0000     1,1910
      ,0000     3,0000      ,0000     2,4195
     1,0008     3,0000      ,0000     3,6479
    -1,0008     3,0000      ,4306     1,2320
    ,0000     3,0000      ,4306     2,6403
     1,0008     3,0000      ,4306     4,0486
END DATA.
GRAPH/SCATTERPLOT=
 Firm_R   WITH     LN_Pub   BY       Own_Num  /PANEL   ROWVAR=  IPR_Scor .

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95,0000

Z values in conditional tables are the mean and +/- SD from the mean.

NOTE: The following variables were mean centered prior to analysis:
          IPR_Scor Firm_R

WARNING: Variables names longer than eight characters can produce incorrect
output
when some variables in the data file have the same first eight characters.
Shorter
variable names are recommended. By using this output, you are accepting all
risk
and consequences of interpreting or reporting results that may be
incorrect.

------ END MATRIX -----
```

2nd Regression analysis

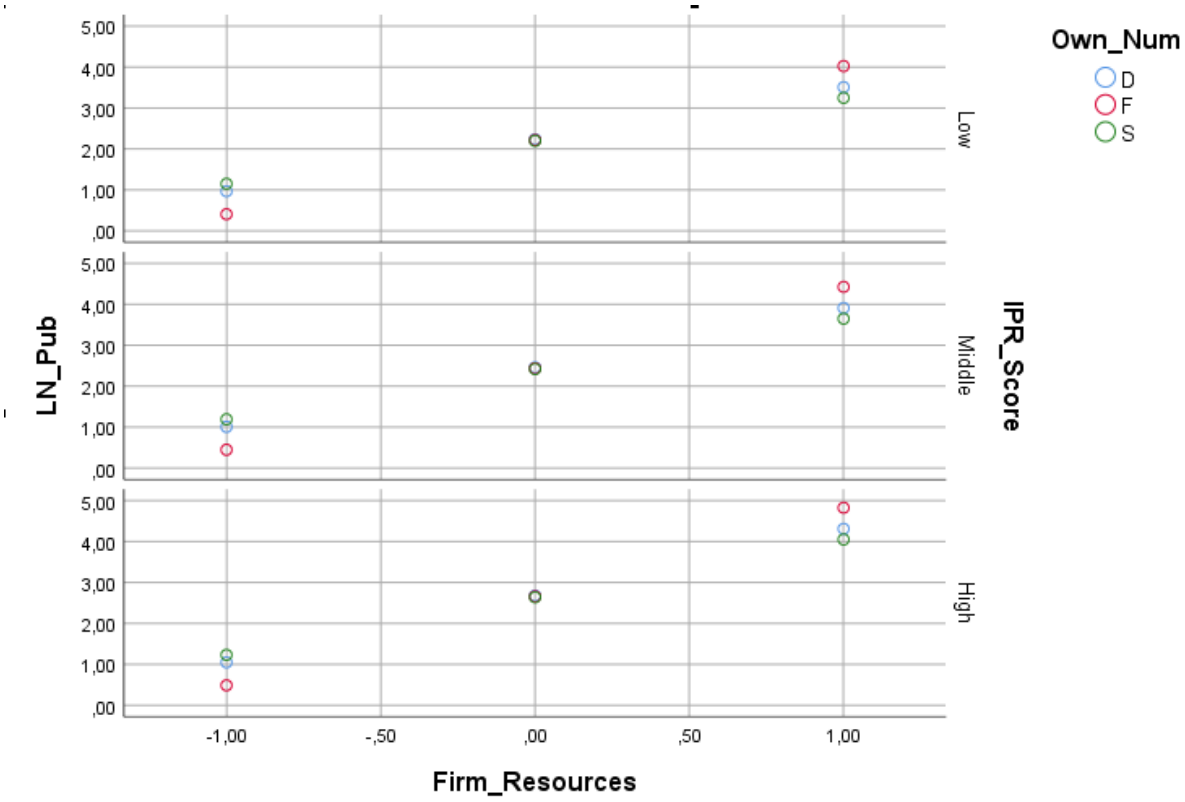
OUTCOME VARIABLE:
LN_Pub

Model Summary

R	R-sq	MSE	F	df1	df2	p
,7271	,5286	2,7245	54,4852	34,0000	1652,0000	,0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	-,2921	,6983	-,4183	,6757	-1,6618	1,0775
FAC1_1	-,0859	,6973	-,1232	,9019	-1,4536	1,2818
Dom_Own	,0656	,1245	,5271	,5982	-,1786	,3099
Int_1	-,4138	,1210	-3,4203	,0006	-,6511	-,1765
IPR_Scor	,5147	,1213	4,2441	,0000	,2768	,7525
Int_2	,3309	,1181	2,8024	,0051	,0993	,5625
Age	-,0015	,0004	-3,9727	,0001	-,0022	-,0007
Sec_3	-1,9786	,2581	-7,6675	,0000	-2,4848	-1,4725
Sec_5	-,4682	,1973	-2,3731	,0178	-,8552	-,0812
Sec_6	,2827	,1983	1,4260	,1541	-,1062	,6716
Sec_7	,1600	,3334	,4799	,6314	-,4939	,8139
Sec_8	,3417	,5461	,6258	,5316	-,7294	1,4129
Sec_9	-,4400	,3230	-1,3624	,1733	-1,0735	,1935
Sec_10	-,1167	,2784	-,4190	,6752	-,6628	,4294
Sec_11	-1,1788	,2675	-4,4069	,0000	-1,7035	-,6542
Sec_12	,7581	,1866	4,0625	,0001	,3921	1,1242
Sec_13	-,6488	1,1755	-,5520	,5810	-2,9544	1,6568
Sec_14	,1613	,3236	,4985	,6182	-,4734	,7961
Sec_15	,0460	,4311	,1067	,9150	-,7995	,8915
Sec_16	,1766	,2517	,7016	,4830	-,3170	,6702
Sec_17	-,7632	,2764	-2,7611	,0058	-1,3053	-,2210
Sec_18	,7341	,4526	1,6222	,1050	-,1535	1,6217
Sec_19	-1,3558	,5429	-2,4975	,0126	-2,4205	-,2910
Sec_20	-,3286	,2847	-1,1542	,2486	-,8869	,2298
Sec_21	-,7158	,4630	-1,5460	,1223	-1,6240	,1924
Sec_22	-1,3683	,3041	-4,4992	,0000	-1,9648	-,7718
Sec_23	-,4920	,3846	-1,2791	,2010	-1,2464	,2624
Sec_24	,8810	,2452	3,5938	,0003	,4002	1,3619
Sec_25	-,7939	,2647	-2,9988	,0028	-1,3131	-,2746
Sec_26	-,5874	,4490	-1,3080	,1910	-1,4681	,2934
Sec_27	-,9407	,2615	-3,5976	,0003	-1,4536	-,4278
Sec_28	-,0606	,6905	-,0878	,9301	-1,4150	1,2938
Sec_29	-,5127	,1914	-2,6792	,0075	-,8880	-,1374
Sec_30	,0181	,3854	,0470	,9625	-,7378	,7741
Sec_2	-,7329	,3773	-1,9425	,0522	-1,4730	,0071


Own_Num
D
F
S
LN_Pub
5,00
4,00
3,00
2,00
1,00
,00
Low
Middle
High
IPR_Score
-1,00
-,50
,00
,50
1,00
Firm_Resources