Does Corruption Grease or Sand the Wheels of Innovation?

The Moderating role of Managerial Embeddedness and R&D

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Date: 14 | 06 | 2021

Topic: International Business

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Executive Summary

Using survey data of enterprises in 37 East-African regions from 2013 to 2019 collected by the World Bank, I study the impact of corruption on firm innovation. Regional corruption is found to positively and significantly impact innovation confirming the so-called ‘greasing the wheels’ hypothesis of corruption on firm’s innovative output. In high corrupt environments, corruption greases the wheels of innovation. Managerial embeddedness and R&D do not significantly affect the relationship of corruption on innovation.

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Chapter 1 – Introduction

Innovation is considered to be the main driver of long-term firm growth and performance, as it stimulates productivity and enhances competitive advantages (Baumol, 2002). It is therefore one of the key areas corporate managers focus on, in order to acquire and retain advantages over the competition faced (Christensen et al., 2004). Moreover, businesses worldwide develop new innovative products and services, in order to deliver crucial benefits that cater to the world's population and customers' needs (Christensen and Raynor, 2003). By investing in R&D, innovative firms bring cutting-edge and novel products and services to the market, which in turn create new business growth and possible new industries (Baumol, 2004; Hamel and Getz, 2004; OECD, 2007).

Besides the firm's own R&D and other innovation inputs, the institutional environment in which a firm operates, is found to significantly impact firm-level innovation, as it shapes the nature of innovation activities and the economic environment of the firm (Ellis et al., 2020; Chadee and Roxas, 2013). One of the most salient features of an organization's institutional environment is the level of corruption. Corruption is a phenomenon that has afflicted human societies since the beginning of time and is especially present in weak institutional environments (IMF, 2016; Ugur, 2014). According to a recent study carried out by the International Monetary Fund (IMF), the global cost of corrupt bribery alone has been estimated to be 2 trillion USD per year (IMF, 2016). Moreover, according to the Corruption Perceptions Index (CPI), corruption is faced by firms all over the world, especially in developing countries (Corruption Perceptions Index, 2019).

Although the effect of institutions on country investments and growth has been studied widely in literature, only little attention has been given to the effect of corruption on firm-level innovation and it remains controversial among academics and economists as conflicting results were found. This is surprising because there are good reasons to expect corruption to influence firm-level innovation. For example, one could argue that corruption in the external environment of an organization, acts as an impediment for firm-level innovation (Mauro, 1995). Corruption, more specifically corrupt civil servants, might cause delays in an organization's innovation project, in order to get the opportunity to extract a bribe (Shleifer and Vishny, 1993). Furthermore, corrupt officials have an incentive to enact and sustain distortions in the economy and protect their illegal income (Veracierto, 2008). In academia, this perspective is known as the 'Sand the Wheels hypothesis' proposed by Myrdal (1968). On the other hand, corruption could be beneficial to firm-level innovation, especially in developing countries. As mentioned by Huntington (1968),' *the only thing worse than a society with a rigid, overcentralized, dishonest bureaucracy is one with a rigid, overcentralized, honest bureaucracy*'. Where an ill-functioning bureaucracy lacks, corruption could compensate. By means of bribery payments to officials, corruption could lessen the time spent waiting in queues for approval of an innovation project (Mahagaonkar, 2008; Shleifer and Vishny, 1993).

Moreover, corruption could surmount bureaucratic regulations that act as barriers for innovation (Habiyaremye and Raymond, 2018; Asiedu and Freedman, 2009). This perspective is known as the 'Grease the Wheels hypothesis' proposed by Leff (1964), Leys (1965) and Huntington (1968).

As both the 'Sand the Wheels' and 'Grease the Wheels' hypotheses are well reasoned and could be valid for different subsets of firms, it is crucial to study and identify possible moderation effects. In this study, the moderators Managerial embeddedness and R&D activity are included, as both constructs could be argued to influence the extent to which corruption affects firm-level innovation. Managerial embeddedness is considered to moderate the relationship between corruption and firm-level innovation, as it enhances managers' capability to understand present industry dynamics and the institutional environment and therefore helps cope with corruption (Balsmeier and Czarnitzki, 2014). When firms operate in countries characterized by low institutional quality and corruption is faced, the managers' embeddedness in the environment and skillset become even more important (Chetty et al., 2006). For example, in an environment where getting a license for a new product/service or for importing/exporting depends on bribing the right people, managerial embeddedness and knowledge is crucial for enabling maximum possible returns of innovation activities, as it offers reputation, knowledge, personal contacts and trustworthiness that are beneficial when dealing with corruption (Barasa et al., 2017; Balsmeier and Czarnitzki, 2014).

R&D is considered to moderate the relationship between corruption and firm-level innovation as well. Firms investing in R&D extend their scientific and technological knowledge base, which allows them to engage in innovative activities (Barasa et al., 2017). R&D is a crucial input especially for radical innovations where the product/service is significantly improved and the current market is transformed or a new market is created (Battaggion and Grieco, 2007). Even though one could argue that a firm with higher levels of R&D would be more inclined to engage in informal payments and bribes in fear of retribution from corrupt officials or in order to speed up procedures and the time to market, the extent to which firms are able to create value from the conducted R&D could depend on corruption faced (Martin-de Castro et al., 2013). Corrupt environments are resembled by poor protection of intellectual property rights and therefore unprotected knowledge. When knowledge is unprotected, it could be easily imitated by competitors and the firm that actually engaged and invested in costly R&D activities is not able to appropriately benefit (Barney, 1991). This is even more so the case for radical innovations as it is more dependent on protection of knowledge and technology and therefore has greater risks of knowledge leakage. Hence, when corruption is faced, it is likely that firms are unsuccessful in transforming R&D inputs into product/service innovation (Barasa et al., 2017; Martin-de Castro et al., 2013; Battaggion and Grieco, 2007; Barney, 1991).

Purpose of the Study

By acknowledging both the 'Sand the Wheels' and 'Grease the Wheels' hypotheses and recognizing that both strands could be valid depending on different subsets of firms, the intention of this study is to examine how Managerial embeddedness and R&D moderate and determine the effect corruption has on firm-level innovation. In order to achieve this understanding, the study focuses on the following overarching research question; How do Managerial embeddedness and R&D moderate the effect of corruption on firm-level innovation?

Drawing on the work by Ellis (et al., 2020), Mahagaonkar (2008) and Mauro (1995), in this study, the effect of corruption on innovation is determined by focusing on developing East African countries. According to the Corruption Perceptions Index (2019), corruption is highly ranked and experienced by businesses here. Therefore, the issue of corruption is of utmost importance in this context. Additionally, the focus lies on innovative output and includes both product and service innovation. This study deviates from previous research on two crucial bases. Firstly, by including the moderators R&D and Managerial embeddedness, this study extends previous research. As both the 'Grease the Wheels' and 'Sand the Wheels' hypotheses could be valid depending upon different subsets of firms, it would be interesting to determine the effect of Managerial embeddedness and R&D on this relationship and whether the effect of corruption on firm-level innovation is weakened or strengthened by managerial embeddedness and R&D. Secondly, in this study a regional-level corruption variable is applied, by aggregating scores from firms in the same region. Notwithstanding the importance of corruption on a country-level, it is argued that corruption could significantly differ across regions in a country, as regions within East-African countries can be characterized by specific set of formal and informal institutions (Barasa et al., 2017; North, 1990). Regions in developing countries are found to often be culturally, politically and economically heterogeneous (Boschma and Frenken, 2009). Moreover, as becomes evident from aforementioned arguments, corruption is a feature of a firm's environment, therefore it would be appropriate to take a regional-level corruption approach and take into account within-country corruption variation (Barasa et al., 2017; North, 1990).

Relevance

The findings of this study contribute to the aforementioned currently ambiguous effect of corruption on innovation, by extending this relation with R&D and Managerial embeddedness as moderators. For research and science, this study would contribute by examining the effect of corruption on innovation and how the moderators R&D and Managerial embeddedness impact the effect corruption has on firm-level innovation. Corruption has proven to be a timeless feature of human societies and understanding its impact on enterprises is crucial to gaining a greater understanding in the functioning of worldwide business. This study contributes to research by including these moderating effects

beyond the ‘Grease the Wheels’ and ‘Sand the Wheels’ hypotheses, therefore extending previous research, while depicting that both hypotheses might be accurate depending on subsets of firms.
For policy makers, it is important to identify the influence corruption has on firm-level innovation. Countries have started developing policies in order to decrease the amount of corruption and increase institutional quality, by means of anti-corruption policies (Rose-Ackerman and Truex, 2012). However, when taking into account the ‘Grease the Wheels’ hypothesis, fighting corruption by means of these policies might have negative consequences for firm innovation that need to be compensated for (Chetty et al., 2006; Barney, 1991). This study therefore benefits policy makers, by shedding light on the consequences of corruption on firm-level innovation and the role of their anti-corruption laws.
For managers, it is crucial to understand how the institutional environment, in this case corruption, could influence their firm’s innovation and how managerial embeddedness and R&D could play a role in determining the effect of corruption on firm-level innovation. Managers of firms engaged in a highly corrupt environment, might decide differently on R&D and human capital management after finding out how corruption, managerial embeddedness and R&D could affect their innovative output.
Similarly, the findings of this study contribute to the field of International Business. Nowadays, Multinational Enterprises (MNEs) increasingly expand internationally to developing countries to be part of rapid market growth, access resources and talent, and to enhance efficiency (Hansen and Gwozdz, 2015). Especially for developed country MNEs often faced with high institutional quality, it is crucial to understand how the institutional environment in developing countries could differ and how corruption could affect innovation by the MNE subsidiary. International strategists and Global managers might decide differently on R&D & internationalization plans and management, after finding out the effect of corruption, managerial embeddedness and R&D on firm-level innovation.

All in one, there is a need to empirically investigate the effect managerial embeddedness and R&D have on the relationship between corruption and firm-level innovation. Especially for developing African countries, where political instability and corruption is common, this issue is of utmost importance.

Outline

The remainder of this study is structured as follows. Chapter 2 reviews the theoretical and empirical literature by diving deeper into the ‘Grease the Wheels’ and ‘Sand the Wheels’ hypotheses, as well as the roles played by Managerial embeddedness and R&D. Moreover, in this chapter a conceptual model is presented. Chapter 3 describes the empirical strategy, dataset and variables. Chapter 4 presents the analysis and hypothesis testing. Finally in Chapter 5, the discussion, implications, recommendations and conclusion are outlined.

Chapter 2 – Theoretical Framework

Innovation

Innovation could be defined and categorized in multiple ways and is undoubtedly recognized to be among the key factors for raising and maintaining competitiveness of firms and long-term firm growth (Goedhuys et al., 2016; Fagerberg, 2004). In this study, the focus lies on innovative outputs of firms. By continuously improving or adding to their product/service offerings, firms are able to cater to their customers and attract new customers, while competing with others (Mahagaonkar, 2008). Following the guidelines of the OECD (2007), innovation is defined as the introduction of a product or service that is new or significantly improved with respect to its characteristics and intended use (OECD, 2007). Hence, the focus lies on both product and service innovation by firms.

Innovation is driven by both firm-internal and external mechanisms (Ibrahim and Fallah, 2005). R&D is considered to be the most crucial firm-internal mechanism that enables and drives innovation (Barasa et al., 2017). By investing in R&D, firms are able to extend their knowledge base and engage in innovative activities. Consequently, firms are able to introduce new products and services (Baumol, 2004; Hamel and Getz, 2004; OECD, 2007). Along with the R&D investments as innovation input, the institutional environment in which a firm operates significantly influences firm-level innovation and acts as an external mechanism (Ellis et al., 2020; Chadee and Roxas, 2013). Firms do not innovate in isolation as successful innovations result from a mixture of interactive relationships within the firms' institutional environment (Lundvall, Joseph and Chaminade et al., 2011; Freeman, 1987). The institutional environment comprises a set of political, social and regulatory rules that govern economic exchange as well as production and distribution (Barasa et al., 2017). As the institutional environment shapes the economic environment and activities of firms, it is able to influence firm-level innovation (Chadee and Roxas, 2013). Innovative activities can involve obtaining permits for the construction of additional features in plants, acquisition of equipment, importing and exporting permits, installation of communication infrastructure and registration of trademarks (Murphy et al., 1883; Barasa et al., 2017; Nguyen et al., 2016). These activities require contact with the institutional environment, more specifically with public officials that are able to influence the innovative output.

Innovation in developing countries

In developing economies, the nature of innovation differs as the institutional environment in these countries is often characterized by poor institutional quality and institutional voids (Khanna and Palepu, 2010). Firms in emerging markets are likely to engage in lower risk and technologically less intense incremental innovation that is new to the customers in these countries but not new to the world (Bradley et al., 2012). Examples are extensions on products/services in terms of type, functions and flavors or offering of products/services already existing in the developed world. In terms of resources, emerging market firms innovate by collaborating and co-creating with external relationships and

exploring their networks by integrating different partners' knowledge and capabilities (Nahi, 2016; Robson et al., 2009). Besides R&D, the external network of firms and knowledge is crucial. In terms of capturing knowledge and skills, foreign experts, graduates, engineers and scientists are often employed (Mahemba and de Bruijn, 2003). While progress has been made in developing countries to improve the general business climate, firms in these countries continue to face specific challenges, among which high transaction costs, that influence their innovation activity (IMF, 2016; Ugur, 2014; Huang and Wei, 2006; Corruption Perceptions Index, 2019).

Corruption

One of the main yet confounding features of many economies that firms deal with is corruption (Mahagaonkar, 2008). In this study, corruption is defined as the abuse of public power or authority for private benefits (Rodriguez et al., 2006). Corruption can take many forms, among which bribery, extortion, informal payments, embezzlement and fraud (Lambsdorff, 2007). In general, there are two types of corruption, classified by scale. Firstly, there is grand corruption, which focuses on acts committed at a high level of government that distort policies and the central functioning of the state (Kabadurmus, 2017). Secondly, there is petty corruption, which refers to the everyday abuse of entrusted power by low- and mid-level public officials (Kabadurmus, 2017; Nguyen et al., 2016). As public officials play a central role in affecting firm-level innovation, by firms being dependent on the goodwill of corrupt officials to acquire permits, and innovative activities require contact with these officials, in this study the focus lies on petty corruption. In exchange of a favor that benefits the firm's innovative activities and performance, such as securing contracts/permits, firms pay bribes or informal payments to public officials (Mahagaonkar, 2008; Habiyaremye and Raymond, 2018). In academia, two main strands are found with opposing hypotheses about the effect of corruption on firm-level innovation, where on one hand corruption is found to grease the wheels of innovation and on the other hand corruption is found to sand the wheels of innovation.

'Grease the Wheels Hypothesis'

Following this hypothesis, petty corruption is beneficial for firm-level innovation as it may help bypassing other existing obstacles faced by firms, especially firms operating in institutional environments characterized by poor institutional quality and bureaucracy (Leys, 1965: Leff, 1964; Goedhuys et al., 2016; Mahagaonkar, 2008). As Huntington indicated in his study about political order in societies (1968), in weak institutional environment it could be beneficial to have a dishonest bureaucracy where corruption is able to compensate for the ill-functioning environment. Moreover, according to Mahagaonkar (2008), one can argue that corruption greases the wheels of innovation based on two distinct dimensions.

Relationship with corrupt officials

Firstly, in general, organizations require permits, licenses and permission provided by public officials for many innovative activities, such as acquiring new technology and getting their innovative output on the market. Attaining these permits and licenses could take some costly time, especially when competition is faced and these must come through a heavily bureaucratized institutional structure (Mahagaonkar, 2008). Petty corruption could help firms to acquire these permits, licenses and permissions at a faster pace, by building beneficial relationships with corrupt officials. This could result into the firm winning the innovation race from competitors (Nguyen et al., 2016). Secondly, petty corruption could benefit a firm by reducing uncertainty faced, especially in countries with sluggish administration (Fishman and Svensson, 2007; Mahagaonkar, 2008). By building strong long-term relationships with corrupt officials, these firms can be more certain that requirements of permits etc. will be granted. As a result, this relationship acts as a facilitator of long-term planning and as a reducing mechanism of uncertainty (Mahagaonkar, 2008; Barasa et al., 2017). As bureaucracy and red tape are major barriers to innovation, corruption could grease the wheels of innovation by providing informational advantages and lobbying power to compensate (Damanpor, 1996; Barasa et al., 2017).

Policy hurdles and increased buffering

Thirdly, corruption could grease the wheels of innovation by making it possible to jump policy hurdles (Bailey, 1966; Leff, 1964). Firms conform to policy regulations based on their discretion of whether it is perceived as harmful or beneficial, as policy makers do not always come up with solutions that benefit firms. (Bailey, 1966). Through petty corruption, firms may adopt an overlooked better solution than the one provided by policy makers. Hence, by jumping policy hurdles, corruption is a reaction of organizations to bad policies (Leff, 1964; Bailey, 1966; Mahagaonkar, 2008). Fourthly, Leff (1964) and Mahagaonkar (2008) propose that corruption greases the wheels of innovation by acting as a facilitator to boost the scope and scale of investment, by creating a hedge against political risks and an increased buffering effect. Corruption could prevent blockage to firms' flow and planning of innovative activities by shielding against organized crime and vandalism, often faced in developing countries. Hence, according to the 'Grease the Wheels Hypothesis' corruption positively affects innovation.

'Sand the Wheels Hypothesis'

Following this hypothesis, corruption is thought to be detrimental for firm-level innovation as it undermines the foundations of institutional trust needed for the development of innovative activities (Myrdal, 1968; Habiyaremye and Raymond, 2018; Mahagaonkar, 2008). By negatively influencing the rewards from innovative input, it reduces the incentives for firms to invest in innovative ideas. Aside from long administrative procedures and regulations, petty corruption sands the wheels of innovation by rejecting promising projects and delaying innovation (Qian and Xu, 1998). Especially

in situations with high competitive pressures and so called 'innovation races', time is costly and the presence of corruption in the firm's environment could significantly impact the firm's decision to engage in innovative practices, and therefore firm performance (Mahagaonkar, 2008).

Poor protection and increased costs

It is argued that petty corruption in the institutional environment leads to poor protection of a firm against the external environment and an increase in innovation costs. In their paper, Qian and Xu (1998) explain how deliberate delays by corrupt government officials in granting permits and licenses, could sand the wheels of innovation. These deliberate delays are held in order to extract a higher amount of informal payments from the firm. Acquiring these permits comes with high costs, making it unattractive for a firm to engage in innovation in the first place. (Habiyaremye and Raymond, 2018; Qian and Xu, 1998). Additionality, on the investment angle, corruption sands the wheels of innovation and hinders R&D investments in the presence of imperfect financial markets (Driffill et al., 2000). If financial markets were thought of as perfect, which is more the case in highly developed economies, any losses to investment caused by corruption costs could have been compensated. However as this is not the case and imperfect financial markets are especially dominant in developing countries, corruption could negatively influence innovative input and activities by increasing related costs. (Driffill et al., 2000; Aidis et al., 2012). Finally, by taking a transaction costs perspective (TCE), it is found that corruption increases external uncertainty, therefore increasing transaction costs and consequently, making a potentially promising innovative opportunity much less attractive (Luo, 2005; Aidis et al., 2012). These increased costs negatively affect the innovative output of firms.
All in one, according to this theoretical point of view, corruption sands the wheels of firm-level innovation.

As academic support is found for both the 'Grease the Wheels' and 'Sand the Wheels' hypotheses and both strands of reasoning could be valid for different subsets of firms, in this study, Managerial embeddedness and R&D are identified and examined as important moderators.

Managerial Embeddedness

By adding to the managers' capability to understand the firm and institutional environment, managerial embeddedness is expected to positively moderate the effect corruption has on firm-level innovation (Balsmeier and Czarnitzki, 2014). Managers embedded in the industry and institutional environment of the firm are thought to have better insights into future business opportunities, threats, niche markets, products, technologies as well as market development (Helfat and Liebermann, 2002; Shane, 2000). In this study, managerial embeddedness is defined as an element of social capital comprising the extent of a manager's network of interpersonal relationships built during their career

(Granovetter, 1985; Moran, 2005; Weterings and Koster, 2007; Balsmeier and Czarnitzki, 2014) and positively moderates the effect of corruption on innovation in various ways.

Relationship with corrupt officials

Managerial embeddedness offers reputation, knowledge, personal contacts, trustworthiness and institutional know-how, which are beneficial when dealing with petty corruption as these are crucial elements for building strong relationships with corrupt officials (Chetty et al., 2006). Managers embedded in the industry and environment are able to maximize possible returns of innovation activities in an institutional environment characterized by bureaucracy and corrupt officials, by bribing the right people and building relationships. (Chetty et al., 2006; Barasa et al., 2017).
For example, in a situation where conducting innovative activity requires acquiring permits, licenses and permission, highly embedded managers with strong relationships with corrupt officials are more certain that requirements of permits, licenses and permission will be granted. This strong relationship built, acts as a facilitator of long-term planning and as a reducing mechanism of uncertainty.
Moreover, when looking at innovation races between organizations, firms with embedded managers are better able to acquire permits at a faster pace or reduce possible deliberate delays. As innovation is influenced by corrupt officials and firms become dependent upon these officials, managerial embeddedness is expected to positively moderate as embedded managers are able to build relationships with the 'right' corrupt officials in order to get things done (Chetty et al., 2006).
Additionality, these strong relationships with corrupt officials could lower the external uncertainty faced (Penrose and Penrose, 2009). Consequently, as less uncertainty is faced, transaction costs are lowered and engaging in innovative activity is incentivized (Penrose and Penrose, 2009).

Increased buffering

Managerial embeddedness is expected to positively influence the attractiveness of engaging in innovative activity, by protecting against consequences of corruption on firm-level innovation and creating an increased buffering against external uncertainties. In corrupt environments, firms rely more on trust, informal contacts and established relationships, offered by managerial embeddedness, in order to successfully engage in innovative activities (Peng and Luo, 2000; Li and Zhang, 2007). By promoting a well-established network of contacts, reputation and institutional know-how, embedded managers are able to better protect their firms against political risks, organized crime and vandalism regularly faced in developing countries. This established network could prevent blockage to a firm's flow and innovative activities, thereby incentivizing firms to engage in innovation.
Hence, in this study, managerial embeddedness is expected to positively moderate the effect of corruption on firm-level innovation.

H1: Managerial Embeddedness positively moderates the relationship between Corruption and Innovation; While for low levels of managerial embeddedness a negative effect of corruption on firm-level innovation is expected, for high levels of managerial embeddedness a positive effect of corruption on firm-level innovation is expected.

Research & Development

Firms invest in R&D in order to further develop their scientific and technological knowledge base, which allows them to engage in innovation activities (Barasa et al., 2017; Goedhuys and Sleuwaegen, 2010). In accordance with the Oslo Manual, in this study, R&D is defined as research and experimental development that comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge and the use of this knowledge to devise new applications (Data, 2005; Zhou et al., 2019).

Poor protection and increased costs

The extent to which firms are able to extract value from their R&D efforts to develop innovative output is related to the level of petty corruption firms face (Martin-de Castro et al., 2013). Highly corrupt environments are resembled by poor protection of intellectual property rights, such as patents (Zhao, 2006; Barasa et al., 2017). As a result, the knowledge and ideas of firms gained by R&D are poorly protected and could be easily imitated by competitors (Barney, 1991). Therefore, firms in corrupt environments are less able to benefit from their costly R&D efforts and become unsuccessful in transforming their efforts into innovative output (Barasa et al., 2017). This is even more so the case for firms engaging in radical innovations that depend more on knowledge and technology protection (Battaggion and Grieco, 2007). Firms engaging in R&D are unprotected, while competitors that did not spend on R&D are able to imitate these firms that engaged in R&D, putting these firms at a disadvantage (Zhao, 2006). If there is weak protection of intellectual property rights, R&D leads to sunken costs and time spent. The incentives to engage in innovative activity, which is negatively affected by corruption as it could increase external uncertainty and transaction costs, now become even more unattractive by the sunken costs of R&D (Luo, 2005; Aidis et al., 2012). Moreover, the position and power of corrupt officials to demand informal payments and deliberately delay granting permits, is strengthened for firms engaging in R&D, as these firms already face time and costs spent in R&D efforts (Qian and Xu, 1998; Martin-de Castro et al., 2013). This strengthened position allows corrupt officials to bribe even higher amounts of informal payments.

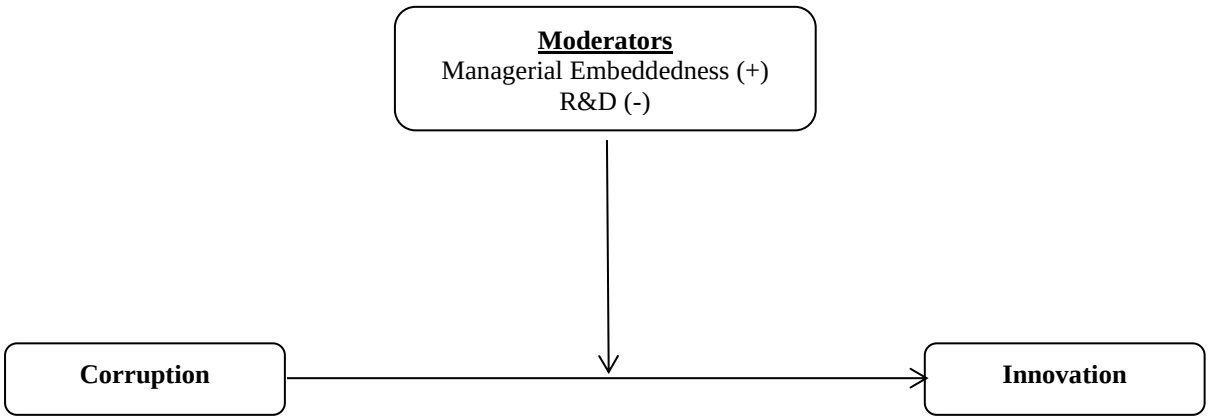
Hence, in this study, R&D is expected to negatively moderate the effect of corruption on firm-level innovation, in such a way that for firms engaging in R&D, a negative effect of corruption on firm-level innovation is expected, confirming the ‘Sand the Wheels’ hypothesis, whereas for firms that do

not engage in R&D, a positive effect of corruption on firm-level innovation is assumed, confirming the ‘Grease the Wheels’ hypothesis.

H2: R&D negatively moderates the relationship between Corruption and Innovation; While for firms engaging in R&D, a negative effect of corruption on firm-level innovation is expected, for firms that do not engage in R&D, a positive effect of corruption on firm-level innovation is expected.

Conceptual Model

Figure 1



Chapter 3 – Methodology

Data

In order to answer the central questions in this study, data is gathered from the Enterprise Survey dataset, which provides firm-level data on the business environment of over 160.000 establishments in more than 140 countries. The Enterprise Survey is conducted by the World Bank as a way to provide quality information on country investment climates worldwide. It is a firm-level survey of a representative sample of an economy's private sector and covers a wide range of topics including access to finance, corruption, innovation, performance, managerial experience and growth obstacles. The data provides views of respondents (business owners & managers) and information on the firm, which is the unit of observation. The survey follows guidelines according to the Enterprise Surveys Global Methodology. Due to sensitive survey questions addressing government and bribery-related topics, private contractors were hired by the World Bank to collect the data, where confidentiality of survey respondents and sensitive information provided is ensured. The sampling methodology for Enterprise Survey is stratified random sampling, where population units are grouped within homogenous groups and simple random samples are selected. There are two types of questionnaires, one for manufacturing firms and one for service firms. Both questionnaires are comprised of sixteen sections organized by different topics and starting with general information. Over 90% of the questions asked objectively ascertain characteristics of a country's business environment. The survey is implemented in two stages. First a screener questionnaire is applied to determine the eligibility of each firm. Second, one of the two questionnaires is administrated according to the screener questionnaire.
All in one, integrity and confidence in the quality of the Enterprise Survey dataset is obtained and the Enterprise Analysis Unit of the Development Economics Global Indicators Department of the World Bank Group is appreciated for making the data available.

Research Ethics

As the data for this research is gathered from the World Bank Group, details about the conduct of the researcher, the treatment of participating firms and ways to guarantee confidentiality and anonymity are addressed on the World Bank Group website. The Enterprise Survey data is publicly available. In order to establish reliability, the objective for this research is to ensure reproducibility and traceability of the Enterprise Survey data, by presenting a logbook in the appendix that entails specific steps taken in the analyses. Additionality, all data and SPSS output of the analysis are provided in the appendix.

Country Sample

In this research, the focus lies on East African countries. The country sample consists of 1001 firms from Kenya, 848 firms from Ethiopia, 813 firms from Tanzania, 762 firms from Uganda, 738 firms from South Sudan, 360 firms from Rwanda and 157 firms from Burundi. The data is collected from 2013-2019 and therefore relatively new.

The focus on East African countries in this research is justified by multiple grounds. Firstly, it is appropriate to focus on developing countries as they are characterized by low institutional quality and corruption, which fits the context of this research. According to the Corruption Perceptions Index 2019, all countries score relatively high on corruption ranging from 12-53, 0 meaning highly corrupt and 100 meaning very clean (Corruption Perceptions Index, 2019). The practical contribution of this research would be most beneficial here, as firms in this region regularly encounter corruption. The focus in this study therefore is on high corrupt environments according to the CPI.

Figure 2

Secondly, it is decided to focus on a specific region of developing countries, in order to preserve minimal institutional and cultural differences. By emphasizing on East-African countries, instead of a set of developing countries around the world, the institutional and cultural differences are kept to a minimum and corruption, as part of the institutional environment, can appropriately be examined. It is important to ensure that institutional and cultural differences are kept to a minimum as these differences could represent outside influences that affect the relation between corruption and innovation, therefore making it biased.

Variables

In this study, corruption is the independent variable affecting firm-level innovation, which is the dependent variable. Managerial embeddedness and R&D act as moderators affecting and determining the effect of corruption on firm-level innovation.

Innovation

Innovation can be measured in different manners depending on what is being studied. As mentioned before, in this study the focus lies on innovative output in terms of products and services. Following the OECD Manuel, innovation is measured as a binary variable, based on whether new products/ services have been introduced over the last 3 years. The focus lies on innovative output and this measure of innovation as it aligns with aforementioned grease and sand the wheels hypotheses and argumentations focusing on innovative output of firms. While being aware of the limitations of this measurement and it being relatively shallow, it does allow the representation of innovative output, including both product and service innovation. Innovation, however, is not factually and objectively measured but rather self-reported and thus subjective. The perception of innovation is not the same worldwide. Managers in East-Africa could report something as being innovative, whereas this might have not been reported as being innovative in the Western world. Therefore, in this study the focus

lies on a specific region in the world, in this case East Africa, in order to address the subjectivity of innovation to a certain extent.

Regional Corruption 1

Corruption can be measured in multiple ways and the Enterprise Survey has dedicated a whole section on corruption. As the objective here is to get a general view of corruption, the focus in this study lies on two corruption measurements guided by two analyses, as both measurements have pros and cons, and one is not clearly superior to the other. Regional Corruption 1 captures whether firms paid informal payments 'to get things done' aggregated for the 37 regions. More specifically, respondents are asked the following: *It is said that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percentage of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?* A dummy variable is created consisting of 0 meaning that the firm has not paid informal payments and 1, meaning that the firm has paid informal payments. Purposefully, the question refers to 'establishments like this' instead of 'this establishment', in order to encourage truthful answering and obtain quality answers. As corruption is a feature of the environment, a regional-level perspective is taken in this study, by aggregating the scores from firms in the same region.

Regional Corruption 2

Regional Corruption 2 measures the extent to which firms identify corruption as an obstacle ranging from 0 'no obstacle' to 4 'very severe obstacle' aggregated for the 37 regions. In the table below, the values for both regional corruption measurements are presented per region. In total there are 37 regions among the 7 countries, with Kenya split up in 10 regions, Ethiopia split up in 6 regions, Tanzania in 5 regions, Uganda in 6 regions, South Sudan in 4 regions, Rwanda and Burundi both in 3 regions. Corruption is represented as the average of all firms in a region. In total, there are 37 corruption measurements. Regional corruption 1 ranges from 0.00 to 0.73, with most values under 0.25. According to this measure, the regions Lira and Mbarara in Uganda are highly corrupt, whereas the regions Kigali, Western Province and Southern Province in Rwanda score very low. In Uganda, Kampala scores 0.05 and Lira scores 0.73, indicating a large range in this country and therefore supporting the decision for a regional level corruption measurement. Regional corruption 2 ranges from 0.11 to 2.84, with most values below 2. Similarly, Uganda indicates high corruption and Rwanda indicates low corruption. Tanzania represents the largest range in terms of regions from 0.61 to 2.84. In figure 3, a scatterplot is depicted of regional corruption 1 and regional corruption 2. By interpreting this scatterplot, it becomes evident that the two regional corruption measurements to a certain extent correlate as a pattern can be recognized. It also becomes evident that 2 regions could be defined as outliers, as they do not fit well in the pattern. Therefore, in this study the analysis is conducted twice.

Table 1

Country	*Region*	*Regional Corruption 1*	*Regional Corruption 2*	*Size*
Kenya	Mombasa	0.11	1.59	94
	Kilifi	0.11	2.11	70
	Machakos	0.14	1.76	69
	Kirinyaga	0.19	0.85	74
	Kiambu	0.10	1.53	106
	Trans Nzoia	0.19	2.10	40
	Uasin Gishu	0.12	1.55	70
	Nakuru	0.10	1.63	100
	Kisumu	0.23	1.79	73
	Nairobi	0.33	2.12	305
Ethiopia	AddisAbaba	0.04	1.19	457
	Amhara	0.03	1.46	69
	Dredawa	0.11	0.74	27
	Oromia	0.01	0.90	133
	Snnpr	0.04	0.96	53
	Tigray	0.01	0.47	109
Tanzania	Arusha	0.01	0.61	127
	Dar es Salaam	0.12	2.32	386
	Mbeya	0.10	1.06	87
	Mwanza	0.17	2.38	85
	Zanzibar	0.07	2.84	128
Uganda	Kampala	0.05	1.49	380
	Jinja	0.18	2.18	93
	Lira	0.73	2.14	38
	Mbale	0.24	1.44	82
	Mbarara	0.69	1.62	95
	Wakiso	0.08	1.78	74
South Sudan	Juba	0.28	1.92	400
	Nimule	0.13	1.93	103
	Torit	0.30	1.88	43
	Yei	0.37	2.42	192
Rwanda	Kigali	0.01	0.16	162
	Western Province	0.00	0.11	99
	Southern Province	0.01	0.28	99
Burundi	Bujumbura	0.17	2.51	111
	Gitega	0.06	1.82	22
	Ngozi	0.21	1.21	24

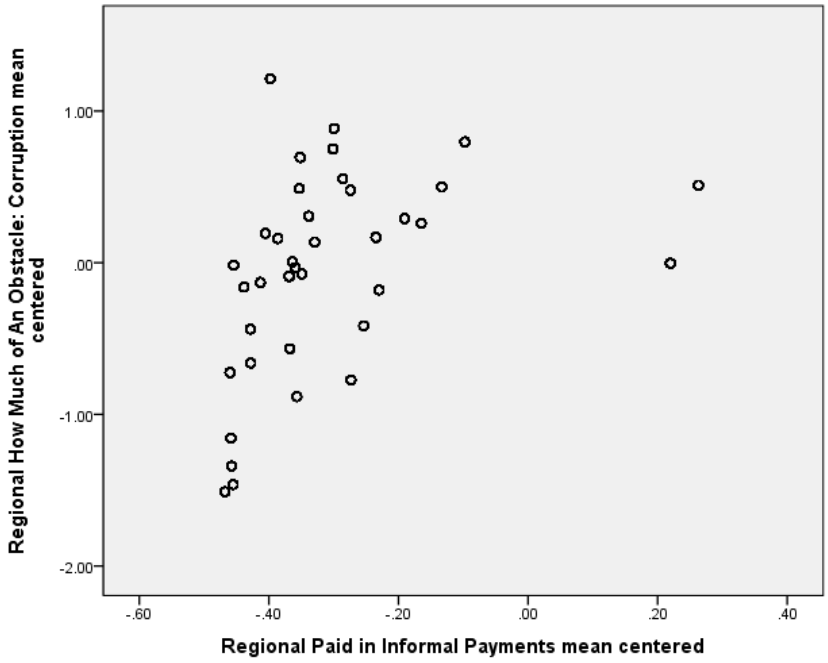


Figure 3

Managerial Embeddedness

The moderator managerial embeddedness is a complex, unobservable concept. In order to gain an adequate representation of the extent to which a manager is embedded in the firm's industry and institutional environment, the proxy managerial experience is applied. Managerial experience is expressed in years of experience by top managers. More specifically, respondents are asked how many years of experience working in this sector, the top manager has.

Table 2 **Variables**	**Measurement**	**Scale**
Regional Corruption 1	Paid Informal payments aggregated by region	Ratio
Regional Corruption 2	Corruption identified as obstacle ranging from 0 'no obstacle' to 4 'very severe obstacle', aggregated by region	Ratio
Innovation	Have there been New Products/Services introduced over the Last 3 Years?	Categorical (Binary)
Managerial Experience as a proxy for Managerial Embeddedness	How many Years of Experience Working in this Sector does the Top Manager have?	Ratio
R&D	During last Fiscal Year, Did the Establishment Spend on R&D?	Categorical (Binary)
Industry Sector	Food, Textiles and Garments, Chemical Pharmaceutical and Plastic, Other Manufacturing, Retail, Tourism, Other Services	Categorical
Firm age	Measured in number of years	Ratio
Firm size	Micro, Small, Medium, Large	Categorical
Legal status	Shareholder Company and Sole Proprietorship/Partnership/Limited Partnership/other	Categorical
External financing	% Of Working Capital financed from External Sources	Ratio

R&D

The moderator R&D represents a binary measurement that answers to the question whether during last fiscal year, the establishment spent on R&D or not. In this way, it recognizes firms that engage in R&D and therefore appropriately fits aforementioned R&D hypothesis. The table above summarizes all main variables included in this research, their measurement and their scale.

Control Variables

In this research, control variables are taken into account in order to minimize errors and ensure that statistical inferences are controlled by certain variables that could absorb the explicability of the conceptual model. Firstly, industry sectors are controlled for, as corruption and innovation could differ across industry sectors. Especially since innovation is dependent upon which sector the firm engages in. Secondly, support has been found that firm age and firm size are both related to corruption and innovative output and therefore taken into account as control variables (Ayyagari et al., 2012; Barasa et al., 2017). While firm age has been proposed to be inversely related to innovative output meaning that the older the firm the less innovative it is, it is expected that younger firms face more corruption. Furthermore, a direct relationship for firm size on innovation has been proposed and bigger firms are expected to face less corruption (Athanasouli et al., 2012). Thirdly, legal status, which demonstrates the ownership of firms, is a control variable as it has been proposed that corporations report greater innovative output than cooperatives, sole proprietorships and partnerships (Ayyagari et al., 2012). Next to that, private-owned enterprises are expected to face more corruption than state-owner enterprises (Nguyen and Van Dijk, 2012). Lastly, external financing is taken into account as control variable. It has been proposed to relate to innovative output, as capital becomes (more) available for the use of innovative activities. Moreover, external financing is expected to positively relate to corruption, as it increases the firm's dependency upon the external environment and therefore could enhance the power of officials to extract bribes. To sum up, in this study, industry sectors, firm age, firm size, legal status and external financing are taken into account as control variables, as they are expected to associate with both corruption and firm-level innovation.

Empirical Strategy

A quantitative logistic regression strategy is used for analyzing the data. Because the dependent variable innovation is of binary nature, a logistic regression would be appropriate to measure the effect of corruption on innovation and how this is moderated by managerial embeddedness and R&D. SPSS, the Statistical Package for Social Sciences, version 24 is used for data analyses. As mentioned before, a regional-level corruption perspective is taken in this study. Consequently, the logistic regression assumption of independence of observations is violated, as firms in the same region are clustered. In order to account for the evident violation of this assumption, in this study the standard errors are clustered at the regional level.

Chapter 4 – Analysis

Objective

The objective of the analysis is to test the hypotheses shown in Figure 1 (Chapter 2), hence to examine the relation between regional corruption and innovation as well as the moderating roles played by managerial embeddedness (proxy; managerial experience) and R&D. Suitably a logistic regression analysis is conducted, following the traditional approach advocated by Hosmer (et al., 2013), in order to successfully answer the central research question: How do Managerial embeddedness and R&D moderate the effect of corruption on firm-level innovation?

The chapter is divided into two parts, namely descriptive statistics and logistic regression. In the first part, the data is described in terms of country, industry and sampling size. Moreover, characteristics of the key variables are predicted. Additionality, histograms, and initial correlations are presented.

The second part entails the logistic regression, in which the analysis is conducted twice; once with regional corruption as in paid informal payments (Regional Corruption 1) and once with regional corruption as an obstacle (Regional Corruption 2). For each analysis, three models are made. Model 1 includes innovation and the control variables industry sectors, firm age, firm size, legal status and external financing. Model 2 further carries regional corruption, managerial experience and R&D. In Model 3, the interaction effects of regional corruption and managerial experience as well as regional corruption and R&D are added.

Descriptive Statistics

Table 3	**Kenya**	**Ethiopia**	**Tanzania**	**Uganda**	**South Sudan**	**Burundi**	**Rwanda**
Size	1001	848	813	762	738	157	360

Table 4 **Industry Sectors**	**Size**
Food	771
Textiles and Garments	292
Chemical, Pharmaceutical, and Plastic	204
Other Manufacturing	1311
Retail	998
Tourism	623
Other Services	480
Total	4679

Table 5 **Sampling Size**	
Small	2616
Medium	1327
Large	591
Micro	106
Not identified	39
Total	4679

In total the dataset consists of 4679 firms in East Africa, of which 1001 from Kenya, 848 from Ethiopia, 813 from Tanzania, 762 from Uganda, 738 from South Sudan, 157 from Burundi and 360 from Rwanda (Table 3). Within these 7 countries, the focus lies on 37 regions depicted in Table 1. In Table 4, the firms are categorized into 7 industry sectors, of which manufacturing, retail and food are the main sectors. Of the total 4679 firms, 2616 are identified as small firms, 1327 as medium firms and 591 as larger organizations (Table 5).

Table 6	**Mean**	**Range (Min-Max)**
Regional Corruption 1	0.1489	0--0.73
Regional Corruption 1_mc	-0.3190	-0.47—0.26
Regional Corruption 2	1.6243	0.11—2.84
Regional Corruption 2_mc	0	-1.51—0.88
Managerial Experience (ME)	13.39	1--65
Managerial Experience_mc	-0.0015	-12.39—51.61
R&D	0 *(Mode)*	0--1
Innovation	0 *(Mode)*	0--1

*mc: mean-centered

Table 6 contains the mean and range of the key variables. Regional corruption 1 has a mean of 0.1489. This originates from a binary variable answering whether the firm paid informal payments (0/1) that has been aggregated to a regional perspective. 0.1489 indicates that in average, most of the regions have not paid informal payments. Regional corruption 2 has a mean of 1.6243. Here regional corruption is noted as an obstacle ranging from 0-4. This indicates that corruption is seen as a small obstacle on average. Managerial experience has a mean of 13.39 years of experience by top management and ranges from 1 year to 65 years of experience. R&D and innovation are binary variables with 0 as the mode, meaning that most firm have not spent on R&D / introduced a new product or service. Both regional corruption measurements and managerial experience have been mean-centered as a way to deal with multicollinearity and to easily interpret coefficients (Jaccard and Jaccard, 2001).

Table 7	**No**	**%**	**Yes**	**%**
*Innovation	2490	53.2	2177	46.5
R&D	3899	83.3	780	16.7

*0.03% do not know

In Table 7, the dependent variable innovation and the moderator R&D are discussed. 46.5% of all firms has introduced a new product or service over the past three years. Moreover, 16.7% of firms have engaged in R%D over the past three years.

Histograms

In figure 4, histograms are depicted of regional corruption 1 mean centered and regional corruption 2 mean centered (Jaccard and Jaccard, 2001).

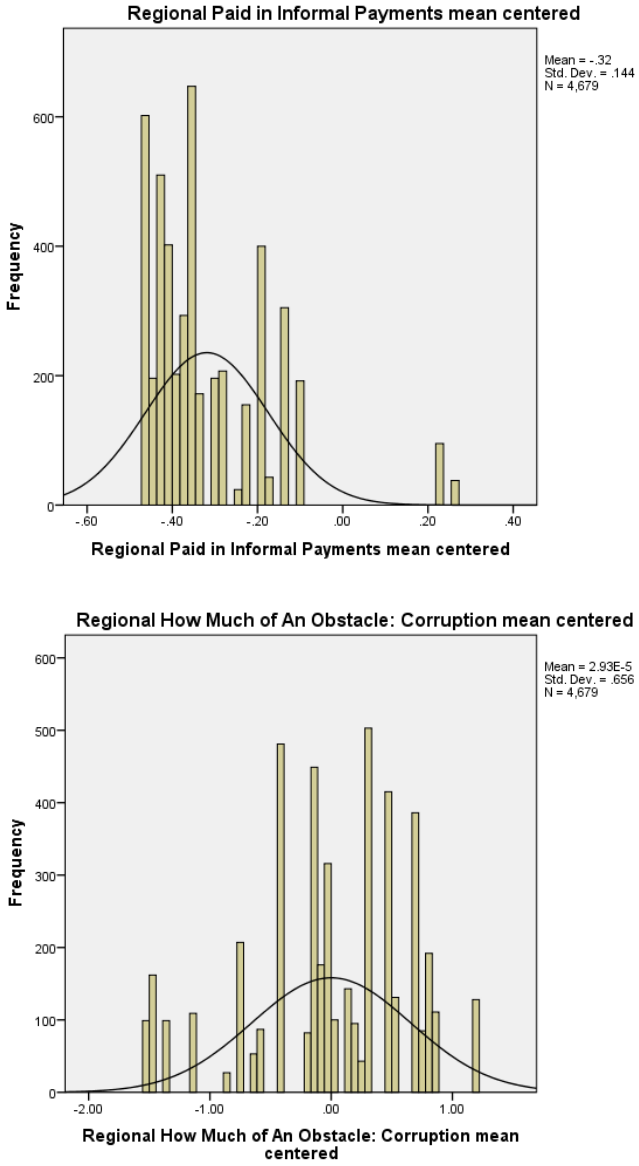


Figure 4

Correlations

In Table 8, the correlations are found of the variables in the analysis including the control variables. Regional corruption 1 significantly correlates with regional corruption 2 (medium correlation), R&D, managerial experience, innovation, sampling size, legal status, firm age and external financing (weak

Table 8 Correlations	Regional Corruption 1	Regional Corruption 2	R&D	Managerial Experience	Innovation	Industry Sector	Sampling Size	Legal Status	Firm Age	External Financing
Regional Corruption 1	-									
Regional Corruption 2	0.47**	-								
R&D	0.09**	0.10**	-							
Managerial Experience	-0.09**	-0.00	0.02	-						
Innovation	0.12**	0.20**	0.23**	0.05**	-					
Industry Sector	0.01	-0.04*	-0.05**	-0.09**	-0.04**	-				
Sampling Size	-0.16**	-0.12**	0.10**	0.17**	0.02	-0.13**	-			
Legal Status	0.04**	-0.01	0.10**	0.03	0.01	-0.03	0.17**	-		
Firm Age	-0.05**	0.00	0.10**	0.47**	0.05**	-0.12**	0.27**	0.16**	-	
External Financing	0.03*	-0.06**	0.03	0.00	0.05**	-0.02	-0.00	0.01	-0.01	-

**significant at 0.01 *significant at 0.05

correlation). Regional corruption 2 significantly correlates with regional corruption 1 (medium), R&D , innovation, industry sector, sampling size and external financing (weak). Innovation correlates the strongest with R&D (0.23), regional corruption 2 (0.20) and regional corruption 1 (0.11). Both corruption measures correlate positively and significantly with innovation. Moreover, the strongest correlations are found between regional corruption 1 and 2 (0.47) and between managerial experience and firm age (0.47). Managerial experience is found to negatively correlate with corruption (-0.09).

Table 9 **Correlations**	**Regional Corruption 1 (*Eta)***	**Regional Corruption 2 (*Eta)***	**Managerial Experience *(Eta)***	**R&D *(Chi-Square)***
Innovation	0.331	0.331	0.127	**244.258

** significant at <0.001

Table 9 shows the correlations between the regional corruption measurements, managerial experience and R&D on innovation as the dependent variable. As innovation is of binary nature and regional corruption and managerial experience are continuous, an Eta coefficient test is conducted, which measures the strength of association found between regional corruption 1 (0.331), regional corruption 2 (0.331) and managerial experience (0.127) separately on innovation. According to Field (2013), these can be interpreted as weak to medium strength correlations. Moreover, as R&D is a binary variable, a Chi-Square test of independence is conducted and found to be significant (244.258).

Logistic Regression

As mentioned before, in this study two measures have been applied for regional corruption, as both measures have clear pros and cons, and one is not superior to the other. First, the analysis is conducted with regional corruption defined as whether a firm paid informal payments (Regional Corruption 1). Second, the analysis is conducted with regional corruption defined by a firm as an obstacle ranging from 'no obstacle' to 'very severe obstacle' (Regional Corruption 2). In the Appendix, the complete analyses outputs are shown including model 1 with only the control variables, model 2 including regional corruption, managerial experience and R&D, and model 3 including the interaction effects. A summary of the models is depicted and interpreted below.

Regional Corruption 1 | Paid informal payments

Table 10	**-2 Log Likelihood**	**Cox & Snell R Square**	**Nagelkerke R Square**
	5380.232	0.069	0.093

Table 10 depicts the model summary with the -2 Log Likelihood value and two R-square measures. The model has a Log Likelihood value of 5380.232, which indicates the model fitness and is best interpreted when comparing models. Moreover, the Cox & Snell R-square has a value of 0.069. This is a pseudo-R-square measure that bases on the log likelihood for the model compared to the log likelihood for a baseline model (Cox and Snell, 2018). The Nagelkerke R-square value of 0.093 is an adjusted version of the Cox & Snell that covers the full range from 0-1 (Nagelkerke, 1991). The R square values evaluate the fitness of the model, in other words to what extent the data fits the model. One way of interpreting the R-square is by comparing the values of model 1 (0.004 & 0.005) with model 3 (0.069 & 0.093). In this case, an increase in model fitness is found.

	Model 1			**Model 2**			**Model 3**		
Table 11	*B*	*Wald*	*Sig.*	*B*	*Wald*	*Sig.*	*B*	*Wald*	*Sig.*
Sampling Size	-0.032	0.709	0.400	-0.020	0.247	0.619	-0.021	0.270	0.603
Industry Sector	-0.032	3.485	0.062	-0.027	2.403	0.121	-0.027	2.374	0.123
Firm Age	0.007	7.761	0.005	0.002	0.734	0.391	0.002	0.654	0.419
Legal Status	0.041	0.228	0.633	-0.095	1.100	0.294	-0.099	1.186	0.276
External Financing	0.005	2.468	0.116	0.004	1.720	0.190	0.004	1.708	0.191
Regional Corruption_mc**				1.538	43.652	0.000	1.658	42.064	0.000
Managerial Experience_mc**				0.006	2.874	0.090	0.012	2.044	0.153
R&D				1.296	187.796	0.000	1.120	30.154	0.000
Interaction effect Regional Corruption & *ME							0.019	0.584	0.445
Interaction Effect Regional Corruption & R&D							-0.582	0.925	0.336

*ME: Managerial Experience **mc: mean-centered

Table 11 provides the crucial estimates for the coefficients of the predictors in model 1, 2 and 3 (Field, 2013). The *b*-value represents the change in the logit of innovation associated with one-unit change in the predictor variables. The Wald statistic tells us whether the *b* coefficient for that predictor is significantly different from zero (Peng et al., 2002). If this is the case, it can be assumed that the predictor makes a significant contribution on innovation. Moreover, the significance level is presented (Hosmer et al., 2013); Field, 2013).

Model 1 consists of the control variables. Here, firm age is found to significantly (0.005) associate with innovation with a Wald value of 7.761 and a *b* value of 0.007. The low *b* value tells us that the association is weak. The other control variables remain insignificant with low *b* values.
In model 2, regional corruption, managerial experience and R&D are added. Here, firm age becomes insignificant. Regional corruption significantly, strongly and positively associates with innovation (0.000) with a Wald value of 43.652 and a *b* value of 1.538, which represents the change in the logit of innovation caused by regional corruption. Moreover, R&D significantly, strongly and positively associates with innovation (0.000) with a *b* value of 1.296 and a Wald value of 187.796. When comparing the *b* values, regional corruption represents the largest change in innovation in this model. Managerial experience does not significantly affect innovation (0.090) with low *b* and Wald values. In this model, regional corruption and R&D positively affect innovation.
In model 3, the analysis is extended with the moderators managerial embeddedness and R&D. The control variables sampling size, industry sector, firm age, legal status and external financing are found to be insignificant with $p > 0.05$. Hence, the control variables do not significantly impact the extent to which corruption influences innovation. With a *b*-value of 1.658 and a Wald value of 42.064, regional corruption_mc significantly, strongly and positively impacts innovation. For every 1-unit increase in regional corruption, innovation increases with 1.658. With a *b*-value of 0.012 and a Wald value of 2.044, the direct effect of managerial experience on innovation is found insignificant. R&D significantly, strongly and positively impacts innovation with a *b*-value of 1.120 and a Wald value of 30.154. The interaction effects are insignificant with $p > 0.05$ and Wald values around zero. Hence, in this final model regional corruption and R&D positively affect innovation, with regional corruption having the strongest impact in terms of change in the logit of innovation. The moderators managerial experience and R&D do not significantly influence the extent to which corruption affects firm-level innovation and no support is found for hypothesis 1 and hypothesis 2.

Regional Corruption 2 | Corruption as obstacle

Table 12	**-2 Log Likelihood**	**Cox & Snell R Square**	**Nagelkerke R Square**
	5273.616	0.093	0.124

Table 12 depicts the model summary this time with regional corruption as an obstacle. A Log Likelihood value of 5273.616 is found. Moreover, the Cox & Snell R-square has a value of 0.093 and the Nagelkerke R-square has a 0.124 value, both indicating the model fitness (Nagelkerke, 1991; Cox and Snell, 2018: Field, 2013). Comparing with model 1 (0.004 & 0.005), an increase is found of model fitness. Moreover, comparing with previous analysis, higher R square values are found, indicating that the analysis with regional corruption 2 has a higher model fitness.

	Model 1			**Model 2**			**Model 3**		
Table 13	B	Wald	Sig.	B	Wald	Sig.	B	Wald	Sig.
Sampling Size	-0.032	0.709	0.400	0.006	0.018	0.892	0.005	0.016	0.898
Industry Sector	-0.032	3.485	0.062	-0.015	0.670	0.413	-0.015	0.677	0.411
Firm Age	0.007	7.761	0.005	0.002	0.523	0.469	0.002	0.564	0.453
Legal Status	0.041	0.228	0.633	-0.056	0.367	0.545	-0.058	0.387	0.534
External Financing	0.005	2.469	0.116	0.006	3.088	0.079	0.006	3.113	0.078
Regional Corruption_mc**				0.631	143.208	0.000	0.619	125.209	0.000
Managerial Experience_mc**				0.005	1.887	0.170	0.005	1.850	0.174
R&D				1.245	171.699	0.000	1.238	166.800	0.000
Interaction effect Regional Corruption & *ME							-0.001	0.011	0.915
Interaction Effect Regional Corruption & R&D							0.123	0.466	0.495

*ME: Managerial Experience **mean-centered

Table 13 provides the estimates for the coefficients of model 1, 2 and 3. In model 1 the control variables are presented. Model 1 is similar to the first analysis output. Firm age is significant (0.005) with a weak *b* value of 0.007. Model 2 extends the previous model with regional corruption, managerial experience and R&D. In this case, firm age becomes insignificant. Regional corruption positively, strongly and significantly (0.000) associates with innovation with a *b* value of 0.631 and a Wald value of 143.208. R&D positively, strongly and significantly associates with innovation (0.000) with a *b* value of 1.245 and a Wald value of 171.699. In this model, innovation is positively and strongly associated with regional corruption and R&D. In model 3, the analysis is extended with the moderation effects of managerial embeddedness and R&D. In this model, the control variables sampling size, industry sector, firm age, legal status and external financing were found to be insignificant ($p>0.05$) with *b*-values ranging from -0.058 to 0.006 and low Wald values ranging from 0.016- 3.113. Hence, no control variables were found to significantly influence the effect on corruption and firm-level innovation. Regional corruption was found to significantly ($p<0.05$) impact innovation with a *b*-value of 0.619 and a Wald value of 125.209. For every 1-unit increase in regional corruption, innovation increases with a value of 0.619. Regional corruption positively and strongly

affects firm-level innovation, meaning that in high corruption environments, corruption positively influences firm-level innovation. On the contrary, managerial experience does not significantly impact innovation with a p value of 0.174, a *b*-value of 0.005 and a Wald value of 1.850. R&D is found to positively and significantly (0.000) influence firm-level innovation with a *b*-value of 1.238 and a Wald value of 166.800. In terms of the moderation effects of managerial experience and R&D, both were found to insignificantly impact the extent to which corruption affects innovation. With p values below 0.05, Wald values of 0.011 and 0.466, and *b*-values of -0.001 and 0.123, the moderation effects remain insignificant. No support is found for hypotheses 1 and 2.

Additional Analyses

In addition to aforementioned analysis, I assess whether different conclusions can be drawn in terms of how regional corruption affects firm-level innovation when distinguishing between manufacturing firms and services firms, in order to provide further evidence for the greasing the wheels or sanding the wheels hypotheses. In total there are 1925 manufacturing firms and 2754 services firms. For the manufacturing firms, regional corruption (1) is found to positively and significantly (0.001) associate with innovation with a *b* value of 1.396 and a Wald test of 11.686, confirming the grease the wheels hypotheses. When assessing regional corruption (2), regional corruption (2) positively, strongly and significantly (0.000) associates with innovation with a *b* value of 0.626 and a Wald test of 51.531. For the services firms, regional corruption (1) is found to affect firm-level innovation (0.000) positively and significantly with a strong *b* value of 2.155 and a Wald test of 38.014, confirming the greasing effect of corruption on innovation. When assessing regional corruption (2), a positive and significant (0.000) impact is found on innovation with a *b* value of 0.660 and a Wald test of 79.363. The *b*-value represents the change in the logit of innovation associated with 1-unit change in regional corruption. This indicates that regional corruption (1) for services firms has the strongest greasing effect on innovation. It further indicates that regional corruption (1) represents more positive change in the logit of innovation. All four measurements provide further evidence for the greasing effect of regional corruption on innovation, which is in line with the findings of this study.

Table 14	**B**	**Wald**	**Sig.**
Manufacturing Firms | Regional Corruption 1			
Regional corruption	1.396	11.686	0.001
Manufacturing firms | Regional Corruption 2			
Regional corruption	0.626	51.531	0.000
Services Firms | Regional Corruption 1			
Regional corruption	2.155	38.014	0.000
Services Firms | Regional Corruption 2			
Regional corruption	0.660	79.363	0.000

Chapter 5 - Discussion

In this study, the focus lied on regional corruption in East-Africa and its impact on innovation of firms. By reflecting upon both the 'grease the wheels' and 'sand the wheels' hypotheses (Leff, 1964; Myrdal, 1968), the study extended previous research by including managerial embeddedness and R&D as moderators. With the objective to reveal the impact of corruption on firm-level innovation and the roles played by managerial embeddedness and R&D, the central question was: *How do Managerial embeddedness and R&D moderate the effect of corruption on firm-level innovation?*

Does Corruption Grease or Sand the Wheels of Innovation?

In the analyses, two regional corruption measurements were applied, namely regional corruption as in whether firms paid informal payments and regional corruption ranked as an obstacle. From both cases, similar conclusions can be drawn with regards to the impact of corruption on firm-level innovation and the 'grease the wheels' hypotheses as proposed by Leys (1965) and Leff (1964) can be confirmed. In high corrupt environments, regional corruption positively affects firm-level innovation. Corruption could be a way for firms in developing countries characterized by weak institutions to compensate for the lack of institutional development. By building beneficial relationships with corrupt civil servants, corruption could facilitate firms acquiring licenses, permits and permissions at a faster pace, which in turn greases the wheels of innovative activities. These strong long-term relationships with corrupt officials act as a reducing mechanism of uncertainty and a facilitator of long-term planning. Firms can be more secure that requirements of innovative activities such as permits etc. will be granted by the corrupt civil servants, which reduces uncertainty and promotes the creation of innovative output. Moreover, via the relationships built with corrupt civil servants and by means of bribes, corruption could grease the wheels of innovation by providing informational advantages and a way for firms to jump policy hurdles. Corruption could create a hedge against political risks and an increased buffering effect, by shielding against organized crime and vandalism ofttimes faced in developing countries. In this way, the informal payments and relationships built could prevent blockage to a firm's flow and planning of innovative activities, hence grease the wheels of innovation.

The findings of this study are in line with research conducted by Nguyen (et al., 2016), Goedhuys (et al., 2016) and Mahagaonkar (2008). In their study, Nguyen (et al., 2016) examined the impact of petty corruption on firm innovation in Vietnam. Informal payments by Vietnamese firms were found to encourage overall innovation and product improvement innovation (Nguyen et al., 2016). Likewise, Goedhuys (et al., 2016) explored the effect of institutional obstacles and corruption on firm-level innovation and growth in Egypt and Tunisia. Evidence was found to support the claim that corruption serves as a mechanism to bypass bureaucratic obstacles related to obtaining permits and licenses for

innovation (Goedhuys et al., 2016). Moreover, in the study based on the African continent by Mahagaonkar (2008), corruption was found to facilitate marketing innovation.

The Moderating role of Managerial Embeddedness and R&D

For both regional corruption measurements, the moderating role of managerial embeddedness and R&D were analyzed. In both cases, managerial experience, as a proxy for managerial embeddedness, was found to not be a significant role in determining the impact of regional corruption on innovation. Therefore, it can be concluded that regional corruption positively impacts innovation, regardless of the extent to which the manager is embedded in the business environment. In addition, managerial embeddedness is not a crucial factor for innovation. In contrast to this finding, in their study Balsmeier and Czarnitzki (2014) identified managerial experience to positively impact innovative output, especially in institutionally less developed countries. The study suggests that managerial experience reduces innovation uncertainty and provides knowledge about how to cope with institutional shortfalls. One possible explanation could be the narrow focus on top management. Likewise, R&D was found to not play a significant role in the relationship of regional corruption and firm-level innovation. Hence, regional corruption positively impacts innovation, regardless of whether the firm engages in R&D or not. Additionality, for both regional corruption measurements, R&D is identified as a crucial input for innovation. This is in line with previous research conducted by Barasa (et al., 2017) in which R&D is identified as a firm-level resource that positively impacts innovation.

How do Managerial embeddedness and R&D moderate the effect of corruption on firm-level innovation? In high corrupt environments, corruption is found to positively impact the innovative output of firms. As the focus in this study lies on East Africa, a part of the world characterized by the CPI as a highly corrupt environment, the 'grease the wheels' hypothesis is supported for high corrupt environments (Corruption Perceptions Index, 2019). Managerial embeddedness and R&D do not play a significant role in moderating the impact of corruption on firm innovation. One possible explanation for this could be the sole focus on highly corrupt environments. As according to the CPI, the country focus of this study is ranked as highly corrupt, the study does not assess the end of the spectrum with low corrupt environments. This narrow view might affect managerial embeddedness and R&D. Another possible explanation of R&D not playing a significant role on the impact of corruption on innovation, is the different innovation landscape in developing countries. As proposed by Mahemba and Bruijn (2003), innovation in developing countries characterized as less institutionally developed, is different and requires other resources such as external relationships and specific skills to deal with institutional voids, besides the conventional R&D input. This might explain the lacking role of R&D as a moderator. In addition, industry sectors, firm age, firm size, legal status and external financing were found to not impact the effect of regional corruption on innovation.

Theoretical implications

In the context of East-Africa, corruption greases the wheels of innovation. Support is found for the 'Grease the wheels' hypothesis as proposed by Leff (1964), Leys (1965) and Huntington (1968). Corruption has proven to be a timeless feature of human societies so understanding its effects on business is crucial to gaining a greater understanding in the functioning of worldwide business.
For research, this study contributes to the ambiguous effect of corruption on innovation by providing evidence for the 'grease the wheels' hypothesis and shedding light on the moderating roles of managerial embeddedness and R&D, which were found to not impact corruption and innovation. These lacking roles of managerial embeddedness and R&D indicate that the impact of regional corruption on innovation does not depend on firm-level characteristics but might depend on the extent to which corruption is present. Corruption could have a non-linear impact. As proven in this study, in highly corrupt environment, a positive impact is found on innovation. In low corrupt environments, this impact could be negative. For the broader study of innovation and corruption, it implies that in high corrupt environments, a positive impact is found, and that regional corruption could have a non-linear relation with innovation.

Practical implications

For policy, it is crucial to clarify how corruption affects the innovative output of firms. As a way to prevent corruption, countries worldwide have started developing anti-corruption policies (Rose-Ackerman and Truex, 2012). When taking into account the 'grease the wheels' hypotheses, fighting corruption could potentially negatively affect innovative output of firms in these countries. Corruption greases the wheels of innovation as a way to compensate for the lack of institutional development and possible institutional voids faced. A proper way to continue would therefore be to simultaneously increase the development of the institutional environment and decrease corruption, by means of fitting policies (Chetty et al., 2006; Barney, 1991). In this way, firm-level innovation is stimulated.
For managers, understanding the institutional environment of the firm is of utmost importance. This study contributes by shedding light on how the institutional environment and lack of development thereof could impact innovation by the firm and provides a deeper understanding in the occurrence of corruption. For International Business, this study contributes in a similar way. Nowadays, MNEs increasingly expand to developing countries to benefit from the rapid market growth (Hansen and Gwozdz, 2015). Especially for developed country MNEs, the institutional environment in developing countries could significantly differ and understanding how innovation could be affected is crucial for Global managers and international strategists.

Limitations

The following limitations of this study are identified. First, as the country focus of this study is East-Africa, a region ranked as highly corrupt according to the CPI (Corruption Perceptions Index, 2019), the study does not cover low corruption environments and thus this end of the spectrum cannot be assessed. Therefore, the findings of this study specifically relate to high corruption environments as identified by the CPI. A second limitation is the assessment of innovation. In this study, the focus lies on innovative output in terms of products and services. Given that the innovative input and activities of the firm do not necessarily reflect the innovative output of firms, this assessment could be argued as shallow. A firm could for example spend a considerate amount of time and resources on innovative input and activities without it leading to new products or services for the firm.

A third limitation is the assessment of managerial embeddedness. In this study, managerial embeddedness is defined as an aspect of social capital that comprises the extent of a manager's network of interpersonal relationships built during the career (Granovetter, 1985; Moran, 2005). Managers embedded in their industry and institutional environment are thought to have better insights in the business and future opportunities, threats, niche markets, products, technologies and market development (Helfat and Liebermann, 2002). Managerial embeddedness is a complex construct to capture and assess. In this study, the proxy managerial experience is applied measured in number of years of experience in the industry sector. It could be argued that this proxy does not fully capture the essence of managerial embeddedness. A manager could potentially have multiple years of experience in the industry sector, but still be dislodged from the business environment with a limited network.

The fourth and final limitation represents the extent of socially desirable responses. Better known as the social desirability bias, it represents the tendency of respondents to answer questions in such a way that is considered to be appreciated and right in the eyes of others, or society at large (Fisher, 1993). Corruption is an illegal and arguably immoral activity that exemplifies mistrust, fraud and manipulation. Especially with the rise of anti-corruption laws, public institutions are actively fighting against corruption (Rose-Ackerman and Truex, 2012). Social desirability bias may lead survey respondents to underreport socially undesirable behavior, in this case corruptive activities (Incerti, 2020). The Enterprise Survey Methodology encourages truthful answering by purposefully referring to 'establishments like this' instead of 'this establishment' in corruption related questions and guaranteeing anonymity and confidentiality. Still to a certain extent, respondents could feel pressured to deliver socially desirable responses (Fisher, 1993; Incerti, 2020).

Recommendation

For future research, it would be interesting to focus on a diverse set of countries that are identified as low, medium and high corruption environments by the CPI, in order to assess the entire spectrum (Corruption Perceptions Index, 2019). In this case, evidence is gathered that corruption greases the wheels of innovation. This holds for high corruption environments as the focus lies on East-Africa. It

could be the case that the positive impact of corruption on innovation could differ when focusing on countries with lower corruption environments. Therefore, it would be interesting to assess that end of the spectrum as well. Moreover, it would be interesting to differently assess innovation in future research. In this study, the focus lies on innovative output in terms of products and services. It would be interesting to assess innovation in terms of innovative input and/or process innovation as the amount of time and resources spent on innovation do not necessarily reflect new products/services. Lastly, it is crucial for future research to identify possible firm characteristics, constructs and moderators that affect the extent to which corruption impacts firm-level innovation. In this study, managerial embeddedness and R&D were examined. As previous research suggests that corruption could possibly grease and sand the wheels of innovation (Qian and Xu, 1998; Mahagaonkar, 2008; Habiyaremye and Raymond, 2018), it would be interesting to further identify possible moderation effects that influence the extent to which corruption affects firm-level innovation. It could be the case that specific constructs and firm characteristics determine whether the innovation of a firm is either positively or negatively affected by corruption and identifying these is crucial for worldwide business.

Conclusion

The objective of this study was to determine the impact of regional corruption on firm-level innovation and the moderating role of managerial embeddedness and R&D, as previous research remains controversial about whether corruption sands the wheels of innovation or greases the wheels of innovation. Using survey data from the Enterprise Survey provided by the World Bank, a regional corruption perspective was taken of 37 East-African regions in Kenya, Ethiopia, Tanzania, Uganda, South Sudan, Rwanda and Burundi. The focus lied on East Africa as this region is identified as being highly corrupt by the Corruption Perceptions Index (2019). Regional corruption is assessed twice; once as whether firms paid informal payments and once ranked on a scale as an obstacle. For both cases, similar conclusions can be made. In high corrupt environments, corruption greases the wheels of innovation. The analyses confirm the 'greasing the wheels' hypothesis of corruption on a firm's innovative output including products and services innovation. Both managerial embeddedness and R&D do not significantly affect the impact corruption has on firm-level innovation. It is critically important for future research to examine whether the positive effect of corruption on innovation is short-term and to highlight the true cost of corruption in the long run. Moreover, while fighting against corruption via anti-corruption laws, it remains vital to identify ways to encourage innovative output of these firms in institutionally less developed regions of the world.

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Appendix

Descriptive Statistics

Country Code					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Kenya	1001	21.4	21.4	21.4
	"Ethiopia"	848	18.1	18.1	39.5
	"Tanzania"	813	17.4	17.4	56.9
	"Uganda"	762	16.3	16.3	73.2
	"South Sudan"	738	15.8	15.8	89.0
	"Burundi"	157	3.4	3.4	92.3
	"Rwanda"	360	7.7	7.7	100.0
	Total	4679	100.0	100.0	

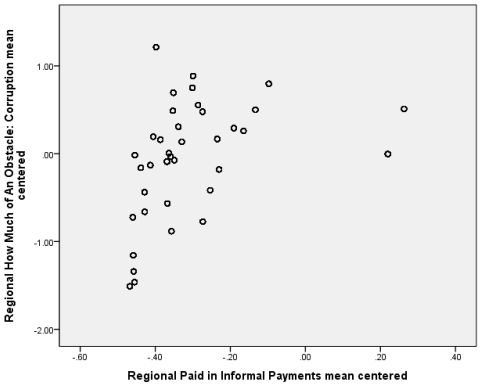
Industry Sampling Sector					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Food	771	16.5	16.5	16.5
	Textiles and Garments	292	6.2	6.2	22.7
	Chemical, Pharmaceutical, and Plastic	204	4.4	4.4	27.1
	Other Manufacturing	1311	28.0	28.0	55.1
	Retail	998	21.3	21.3	76.4
	Tourism	623	13.3	13.3	89.7
	Other Services	480	10.3	10.3	100.0
	Total	4679	100.0	100.0	

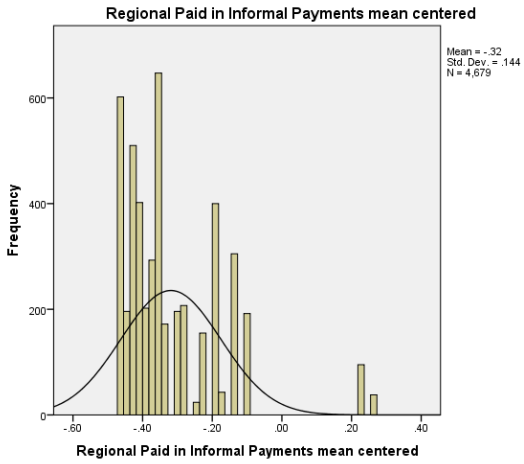
Sampling Size					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Small	2616	55.9	55.9	55.9
	Medium	1327	28.4	28.4	84.3
	Large	591	12.6	12.6	96.9
	"Micro"	106	2.3	2.3	99.2
	"all sizes combined"	39	.8	.8	100.0
	Total	4679	100.0	100.0	

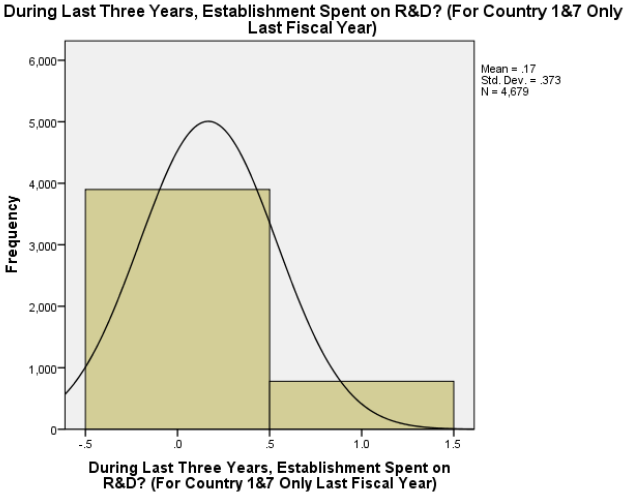
Descriptive Statistics	Minimum	Maximum	Mean	Std. Deviation
Regional Paid in Informal Payments mean centered	-.47	.26	-.3190	.14407
Regional How Much of An Obstacle: Corruption mean centered	-1.51	1.21	.0000	.65569
Regional Paid Informal Payments	.00	.73	.1489	.14407
Regional How Much of An Obstacle: Corruption	.11	2.84	1.6243	.65569
How Many Years of Experience Working In This Sector Does The Top Manager Have?	1	65	13.39	9.783
Managerial_Experience_mc	-12.39	51.61	-.0015	9.78276
During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	0	1	.17	.373
New Products/Services Introduced Over Last 3 Yrs	0	1	.47	.499
Interaction effect of Binary Corruption mean centered and managerial experience mean centered	-19.98	5.70	-.1241	3.32651
Interaction effect of Binary Corruption mean centered and R&D	-.47	.26	-.0481	.12679
Interaction effect of Corruption as obstacle and managerial experience	-52.29	28.86	-.0235	6.13203
Interaction effect of Corruption as obstacle and RD	-1.51	1.21	.0257	.21086

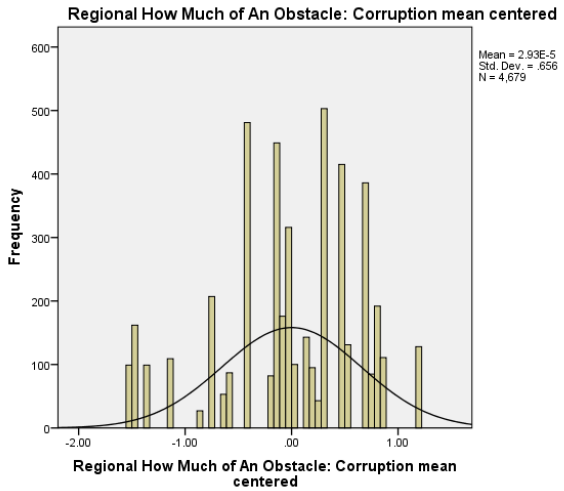
New Products/Services Introduced Over Last 3 Years					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Don't know (spontaneous)	12	.3	.3	.3
	"No"	2490	53.2	53.2	53.5
	Yes	2177	46.5	46.5	100.0
	Total	4679	100.0	100.0	

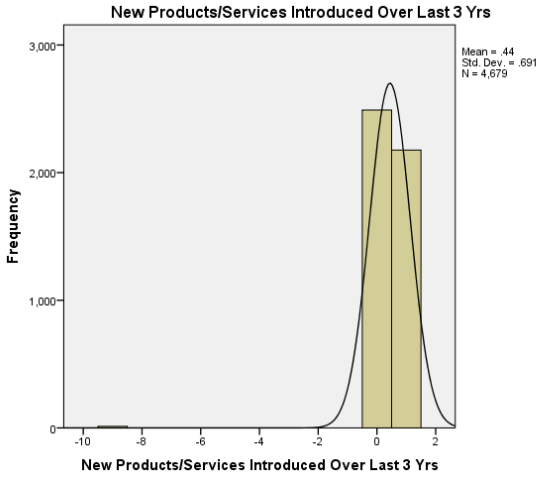
During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	"No"	3899	83.3	83.3	83.3
	Yes	780	16.7	16.7	100.0
	Total	4679	100.0	100.0	











Directional Measures			Value
Nominal by Interval	Eta	Regional Paid in Informal Payments mean centered Dependent	.116
		New Products/Services Introduced Over Last 3 Yrs Dependent	.331

Directional Measures			Value
Nominal by Interval	Eta	Regional How Much of An Obstacle: Corruption mean centered Dependent	.198
		New Products/Services Introduced Over Last 3 Yrs Dependent	.331

Directional Measures			Value
Nominal by Interval	Eta	How Many Years of Experience Working In This Sector Does The Top Manager Have? Dependent	.053
		New Products/Services Introduced Over Last 3 Yrs Dependent	.127

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	244.258[a]	1	.000		
Continuity Correction[b]	243.030	1	.000		
Likelihood Ratio	249.115	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	244.206	1	.000		
N of Valid Cases	4667				

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 363,38.

b. Computed only for a 2x2 table

Correlations

		Regional How Much of An Obstacle: Corruption mean centered	Regional Paid in Informal Payments mean centered	During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	New Products/Services Introduced Over Last 3 Yrs	Managerial_Experience_mc	Industry Sampling Sector	Sampling Size	Legal Status of The Firm	Firm Age	% of Working Capital from External Sources
Regional How Much of An Obstacle: Corruption mean centered	Pearson Correlation	1	.471**	.105**	.198**	-.004	-.038*	-.119**	-.013	.008	-.062**
	Sig. (2-tailed)		.000	.000	.000	.806	.010	.000	.360	.596	.000
	N	4679	4679	4679	4667	4533	4679	4679	4647	4481	4337
Regional Paid in Informal Payments mean centered	Pearson Correlation	.471**	1	.094**	.116**	-.088**	.013	-.159**	.042**	-.047**	.034*
	Sig. (2-tailed)	.000		.000	.000	.000	.377	.000	.004	.002	.026
	N	4679	4679	4679	4667	4533	4679	4679	4647	4481	4337
During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	Pearson Correlation	.105**	.094**	1	.229**	.025	-.050**	.100**	.109**	.105**	.027
	Sig. (2-tailed)	.000	.000		.000	.092	.001	.000	.000	.000	.076
	N	4679	4679	4679	4667	4533	4679	4679	4647	4481	4337
New Products/Services Introduced Over Last 3 Yrs	Pearson Correlation	.198**	.116**	.229**	1	.053**	-.042**	.018	.014	.054**	.052**
	Sig. (2-tailed)	.000	.000	.000		.000	.004	.214	.329	.000	.001
	N	4667	4667	4667	4667	4524	4667	4667	4635	4470	4330
Managerial_Experience_mc	Pearson Correlation	-.004	-.088**	.025	.053**	1	-.087**	.170**	.028	.473**	.005
	Sig. (2-tailed)	.806	.000	.092	.000		.000	.000	.064	.000	.735
	N	4533	4533	4533	4524	4533	4533	4533	4518	4386	4236
Industry Sampling Sector	Pearson Correlation	-.038*	.013	-.050**	-.042**	-.087**	1	-.135**	-.028	-.125**	-.019
	Sig. (2-tailed)	.010	.377	.001	.004	.000		.000	.059	.000	.221
	N	4679	4679	4679	4667	4533	4679	4679	4647	4481	4337
Sampling Size	Pearson Correlation	-.119**	-.159**	.100**	.018	.170**	-.135**	1	.167**	.267**	-.002
	Sig. (2-tailed)	.000	.000	.000	.214	.000	.000		.000	.000	.904
	N	4679	4679	4679	4667	4533	4679	4679	4647	4481	4337
Legal Status of The Firm	Pearson Correlation	-.013	.042**	.109**	.014	.028	-.028	.167**	1	.162**	.014
	Sig. (2-tailed)	.360	.004	.000	.329	.064	.059	.000		.000	.371
	N	4647	4647	4647	4635	4518	4647	4647	4647	4463	4314
Firm Age	Pearson Correlation	.008	-.047**	.105**	.054**	.473**	-.125**	.267**	.162**	1	-.012
	Sig. (2-tailed)	.596	.002	.000	.000	.000	.000	.000	.000		.441
	N	4481	4481	4481	4470	4386	4481	4481	4463	4481	4193
% of Working Capital from External Sources	Pearson Correlation	-.062**	.034*	.027	.052**	.005	-.019	-.002	.014	-.012	1
	Sig. (2-tailed)	.000	.026	.076	.001	.735	.221	.904	.371	.441	
	N	4337	4337	4337	4330	4236	4337	4337	4314	4193	4337

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

*. Correlation is significant at the 0.05 level (2-tailed).

Logistic Regression | Regional Corruption 1

Model 1

Block 0: Beginning Block

Classification Table[a,b]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			''No''	Yes	
Step 0	New Products/Services Introduced Over Last 3 Yrs	''No''	2217	0	100.0
		Yes	1956	0	.0
	Overall Percentage				53.1
a. Constant is included in the model.					
b. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.125	.031	16.303	1	.000	.882

Variables not in the Equation					
			Score	df	Sig.
Step 0	Variables	Sampling Size	.057	1	.811
		Legal Status of The Firm	.837	1	.360
		Firm Age	8.871	1	.003
		% of Working Capital from External Sources	2.344	1	.126
		Industry Sampling Sector	4.674	1	.031
	Overall Statistics		15.487	5	.008

Block 1: Method = Enter

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	15.536	5	.008
	Block	15.536	5	.008
	Model	15.536	5	.008

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5753.135[a]	.004	.005
a. Estimation terminated at iteration number 3 because parameter estimates changed by less than ,001.			

Classification Table[a]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			‘’No’’	Yes	
Step 1	New Products/Services Introduced Over Last 3 Yrs	‘’No’’	1964	253	88.6
		Yes	1697	259	13.2
	Overall Percentage				53.3
a. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Sampling Size	-.032	.038	.709	1	.400	.969
	Legal Status of The Firm	.041	.086	.228	1	.633	1.042
	Firm Age	.007	.002	7.761	1	.005	1.007
	% of Working Capital from External Sources	.005	.003	2.468	1	.116	1.005
	Industry Sampling Sector	-.032	.017	3.485	1	.062	.969
	Constant	-.531	.329	2.602	1	.107	.588
a. Variable(s) entered on step 1: Sampling Size, Legal Status of The Firm, Firm Age, % of Working Capital from External Sources, Industry Sampling Sector.							

Model 2

Block 0: Beginning Block

Classification Table[a,b]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			‘’No’’	Yes	
Step 0	New Products/Services Introduced Over Last 3 Yrs	‘’No’’	2184	0	100.0
		Yes	1922	0	.0
	Overall Percentage				53.2
a. Constant is included in the model.					
b. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.128	.031	16.695	1	.000	.880

Variables not in the Equation					
			Score	df	Sig.
Step 0	Variables	Sampling Size	.101	1	.750
		Legal Status of The Firm	1.106	1	.293
		Firm Age	8.073	1	.004
		% of Working Capital from External Sources	2.877	1	.090
		Industry Sampling Sector	5.488	1	.019
		Regional Paid in Informal Payments mean centered	65.150	1	.000

		During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	231.790	1	.000
		Managerial_Experience_mc	4.552	1	.033
	Overall Statistics		284.185	8	.000

Block 1: Method = Enter

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	293.649	8	.000
	Block	293.649	8	.000
	Model	293.649	8	.000

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5381.746[a]	.069	.092
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.			

Classification Table[a]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			‘’No’’	Yes	
Step 1	New Products/Services Introduced Over Last 3 Yrs	‘’No’’	1878	306	86.0
		Yes	1299	623	32.4
	Overall Percentage				60.9
a. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Sampling Size	-.020	.040	.247	1	.619	.980
	Legal Status of The Firm	-.095	.091	1.100	1	.294	.909
	Firm Age	.002	.003	.734	1	.391	1.002
	% of Working Capital from External Sources	.004	.003	1.720	1	.190	1.004
	Industry Sampling Sector	-.027	.018	2.403	1	.121	.973

	Regional Paid in Informal Payments mean centered	1.538	.233	43.652	1	.000	4.657
	During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	1.296	.095	187.796	1	.000	3.655
	Managerial_Experience_mc	.006	.004	2.874	1	.090	1.006
	Constant	-.150	.354	.180	1	.671	.860

a. Variable(s) entered on step 1: Sampling Size, Legal Status of The Firm, Firm Age, % of Working Capital from External Sources, Industry Sampling Sector, Regional Paid in Informal Payments mean centered, During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year), Managerial_Experience_mc.

Model 3

Block 0: Beginning Block

Classification Table[a,b]

	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 0	New Products/Services Introduced Over Last 3 Yrs	"No"	2184	0	100.0
		Yes	1922	0	.0
	Overall Percentage				53.2

a. Constant is included in the model.

b. The cut value is ,500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.128	.031	16.695	1	.000	.880

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Sampling Size	.101	1	.750
		Legal Status of The Firm	1.106	1	.293
		Firm Age	8.073	1	.004
		% of Working Capital from External Sources	2.877	1	.090
		Industry Sampling Sector	5.488	1	.019
		Regional Paid in Informal Payments mean centered	65.150	1	.000

		During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	231.790	1	.000
		Managerial_Experience_mc	4.552	1	.033
		Interaction effect of Binary Corruption mean centered and managerial experience mean centered	4.240	1	.039
		Interaction effect of Binary Corruption mean centered and R&D	140.122	1	.000
	Overall Statistics		287.264	10	.000

Block 1: Method = Enter

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	295.163	10	.000
	Block	295.163	10	.000
	Model	295.163	10	.000

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5380.232[a]	.069	.093
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.			

Classification Table[a]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 1	New Products/Services Introduced Over Last 3 Yrs	"No"	1868	316	85.5
		Yes	1284	638	33.2
	Overall Percentage				61.0
a. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Sampling Size	-.021	.040	.270	1	.603	.979
	Legal Status of The Firm	-.099	.091	1.186	1	.276	.906

	Firm Age	.002	.003	.654	1	.419	1.002
	% of Working Capital from External Sources	.004	.003	1.708	1	.191	1.004
	Industry Sampling Sector	-.027	.018	2.374	1	.123	.973
	Regional Paid in Informal Payments mean centered	1.658	.256	42.064	1	.000	5.249
	During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	1.120	.204	30.154	1	.000	3.066
	Managerial_Experience_mc	.012	.009	2.044	1	.153	1.012
	Interaction effect of Binary Corruption mean centered and managerial experience mean centered	.019	.024	.584	1	.445	1.019
	Interaction effect of Binary Corruption mean centered and R&D	-.582	.605	.925	1	.336	.559
	Constant	-.105	.357	.087	1	.768	.900

a. Variable(s) entered on step 1: Sampling Size, Legal Status of The Firm, Firm Age, % of Working Capital from External Sources, Industry Sampling Sector, Regional Paid in Informal Payments mean centered, During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year), Managerial_Experience_mc, Interaction effect of Binary Corruption mean centered and managerial experience mean centered, Interaction effect of Binary Corruption mean centered and R&D.

Logistic Regression | Regional Corruption 2

Model 1

Block 0: Beginning Block

Classification Table[a,b]

	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 0	New Products/Services Introduced Over Last 3 Yrs	"No"	2217	0	100.0
		Yes	1956	0	.0
	Overall Percentage				53.1

a. Constant is included in the model.

b. The cut value is ,500

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.125	.031	16.303	1	.000	.882

Variables not in the Equation					
			Score	df	Sig.
Step 0	Variables	Industry Sampling Sector	4.674	1	.031
		Sampling Size	.057	1	.811
		Legal Status of The Firm	.837	1	.360
		Firm Age	8.871	1	.003
		% of Working Capital from External Sources	2.344	1	.126
	Overall Statistics		15.487	5	.008

Block 1: Method = Enter

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	15.536	5	.008
	Block	15.536	5	.008
	Model	15.536	5	.008

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5753.135[a]	.004	.005
a. Estimation terminated at iteration number 3 because parameter estimates changed by less than ,001.			

Classification Table[a]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 1	New Products/Services Introduced Over Last 3 Yrs	"No"	1964	253	88.6
		Yes	1697	259	13.2
	Overall Percentage				53.3
a. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Industry Sampling Sector	-.032	.017	3.485	1	.062	.969
	Sampling Size	-.032	.038	.709	1	.400	.969
	Legal Status of The Firm	.041	.086	.228	1	.633	1.042
	Firm Age	.007	.002	7.761	1	.005	1.007
	% of Working Capital from External Sources	.005	.003	2.468	1	.116	1.005
	Constant	-.531	.329	2.602	1	.107	.588
a. Variable(s) entered on step 1: Industry Sampling Sector, Sampling Size, Legal Status of The Firm, Firm Age, % of Working Capital from External Sources.							

Model 2

Block 0: Beginning Block

Classification Table[a,b]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 0	New Products/Services Introduced Over Last 3 Yrs	"No"	2184	0	100.0
		Yes	1922	0	.0
	Overall Percentage				53.2
a. Constant is included in the model.					
b. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.128	.031	16.695	1	.000	.880

Variables not in the Equation					
			Score	df	Sig.
Step 0	Variables	Industry Sampling Sector	5.488	1	.019
		Sampling Size	.101	1	.750
		Legal Status of The Firm	1.106	1	.293
		Firm Age	8.073	1	.004
		% of Working Capital from External Sources	2.877	1	.090
		Regional How Much of An Obstacle: Corruption mean centered	189.207	1	.000

		During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	231.790	1	.000
		Managerial_Experience_mc	4.552	1	.033
	Overall Statistics		384.264	8	.000

Block 1: Method = Enter

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	401.305	8	.000
	Block	401.305	8	.000
	Model	401.305	8	.000

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5274.091[a]	.093	.124
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.			

Classification Table[a]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 1	New Products/Services Introduced Over Last 3 Yrs	"No"	1598	586	73.2
		Yes	1043	879	45.7
	Overall Percentage				60.3
a. The cut value is ,500					

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Industry Sampling Sector	-.015	.018	.670	1	.413	.985
	Sampling Size	.006	.041	.018	1	.892	1.006
	Legal Status of The Firm	-.056	.093	.367	1	.545	.945
	Firm Age	.002	.003	.523	1	.469	1.002

	% of Working Capital from External Sources	.006	.003	3.088	1	.079	1.006
	Regional How Much of An Obstacle: Corruption mean centered	.631	.053	143.208	1	.000	1.879
	During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	1.245	.095	171.699	1	.000	3.473
	Managerial_Experience_ mc	.005	.004	1.887	1	.170	1.005
	Constant	-.868	.353	6.051	1	.014	.420

a. Variable(s) entered on step 1: Industry Sampling Sector, Sampling Size, Legal Status of The Firm, Firm Age, % of Working Capital from External Sources, Regional How Much of An Obstacle: Corruption mean centered, During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year), Managerial_Experience_mc.

Model 3

Block 0: Beginning Block

Classification Table[a,b]

	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 0	New Products/Services Introduced Over Last 3 Yrs	"No"	2184	0	100.0
		Yes	1922	0	.0
	Overall Percentage				53.2

a. Constant is included in the model.

b. The cut value is ,500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.128	.031	16.695	1	.000	.880

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Industry Sampling Sector	5.488	1	.019

		Sampling Size	.101	1	.750
		Legal Status of The Firm	1.106	1	.293
		Firm Age	8.073	1	.004
		% of Working Capital from External Sources	2.877	1	.090
		Regional How Much of An Obstacle: Corruption mean centered	189.207	1	.000
		During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	231.790	1	.000
		Managerial_Experience_mc	4.552	1	.033
		Interaction effect of Corruption as obstacle and managerial experience	.687	1	.407
		Interaction effect of Corruption as obstacle and RD	54.818	1	.000
	Overall Statistics		384.299	10	.000

Block 1: Method = Enter

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	401.779	10	.000
	Block	401.779	10	.000
	Model	401.779	10	.000

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5273.616[a]	.093	.124
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.			

Classification Table[a]					
	Observed		Predicted		
			New Products/Services Introduced Over Last 3 Yrs		Percentage Correct
			"No"	Yes	
Step 1	New Products/Services Introduced Over Last 3 Yrs	"No"	1610	574	73.7
		Yes	1053	869	45.2
	Overall Percentage				60.4

a. The cut value is ,500

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Industry Sampling Sector	-.015	.018	.677	1	.411	.985
	Sampling Size	.005	.041	.016	1	.898	1.005
	Legal Status of The Firm	-.058	.093	.387	1	.534	.944
	Firm Age	.002	.003	.564	1	.453	1.002
	% of Working Capital from External Sources	.006	.003	3.113	1	.078	1.006
	Regional How Much of An Obstacle: Corruption mean centered	.619	.055	125.209	1	.000	1.857
	During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year)	1.238	.096	166.800	1	.000	3.447
	Managerial_Experience_mc	.005	.004	1.850	1	.174	1.005
	Interaction effect of Corruption as obstacle and managerial experience	-.001	.006	.011	1	.915	.999
	Interaction effect of Corruption as obstacle and RD	.123	.180	.466	1	.495	1.131
	Constant	-.872	.353	6.089	1	.014	.418

a. Variable(s) entered on step 1: Industry Sampling Sector, Sampling Size, Legal Status of The Firm, Firm Age, % of Working Capital from External Sources, Regional How Much of An Obstacle: Corruption mean centered, During Last Three Years, Establishment Spent on R&D? (For Country 1&7 Only Last Fiscal Year), Managerial_Experience_mc, Interaction effect of Corruption as obstacle and managerial experience, Interaction effect of Corruption as obstacle and RD.

Logbook

13/4 Combined R&D Variable h7 & h8 (into h7). For Kenya and Rwanda, the R&D variable is based on last fiscal year, while for all other countries, the R&D variable is based on last three years. Keep in mind when making conclusions about R&D regarding Kenya and Rwanda specifically.

13/4 h8 deleted

13/4 Created Firm Age variable -> By Transforming -> Computing new variable-> Target variable (= Year of Survey - b6b (Year Establishment was registered))

13/4 b6b deleted (not needed anymore as firm age is now calculated)

13/4 b1 Legal Status transformed into 2 categories. 0 means sole proprietorship, partnership, limited partnership and other. 1 means shareholding company with publicly traded/ non-traded/ privately traded shares.

13/4 Made one variable called % of Working Capital from External Sources. It is a combination of the variables k3a/k3bc/k3e/k3f/k3hd

13/4 k3a/k3bc/k3e/k3f/k3hd deleted

16/4 e6 missing values: The reason why there are so many missing values for e6 (technology licensed from foreign firm) is because this question is only asked when the 'Manufacturing questionnaire' is handed out. For the 'Service questionnaire' this is not asked, explaining the missing value. Because of this e6 will not be taken as control variable.

20/4 ID 1301670 has a value of K3 of 110%, which is unrealistic as it should represent the amount of working capital financed by external sources. -> manually changed to 100%

Pre-Analysis

27/4 h7 -> Transformed values -9 and -8 into 0. This is done in order to properly create the interaction effect of R&D and regional corruption later on.

27/4 b7 -> Cleared -9 values in order to properly create the interaction effect of Managerial experience and regional corruption. In case needed, a separate datafile is made with the original b7 values including -9

27/4 Before calculating the interaction effects I mean-center the variables Managerial Experience and Regional Corruption. This is done in order to easily interpret the coefficients later on.

Mean centered Managerial experience: 'Managerial Experience' – Mean (Managerial Experience)'

Mean centered Regional corruption: 'Regional corruption' – Mean (Regional corruption)'

27/4 Made two interaction effects ->

Regional corruption mean-centered * Managerial experience mean-centered = Interaction effect RC_ME

Regional corruption mean-centered * R&D = Interaction effect RC_RD

27/4 Descriptive statistics Datafile created & appendix. Only key variables described in Chapter 4.

28/4 Checked for correlations between Regional Corruption (Eta), Managerial Experience (Eta) and R&D (Chi-square)

28/4 deleted -9 values of h1 (Innovation) in order to remain with two values 0 and 1. This is a prerequisite for binary regression, as it can only have two values to function.

04/05 Created j30f from original datafiles -> How much of an obstacle is corruption, ranging from 0 to 4.

04/05 Aggregated j30f based on regions

04/05 mean centered j30f aggregated

04/05 Created Bi_Corruption answering whether firm paid informal payments (0 =NO 1 =YES).

04/05 aggregated Bi_Corruption based on regions

04/05 mean centred Bi_Corruption aggregated

04/05 created new interaction effects

Regional Bi_Corruption_mc * Managerial experience mean_mc = Interaction effect

Regional Bi_Corruption_mc * RD = Interaction effect

07/05 Created new interaction effects for 'Corruption as obstacle'

Regional How Much of An Obstacle: Corruption mean centered * Managerial experience mean_mc = Interaction effect

Regional How Much of An Obstacle: Corruption mean centered * RD = Interaction effect

Analysis

17/05 Conducted the analysis with three models

Model 1 -> Innovation + Control Variables

Model 2 -> …. + Regional corruption 1, managerial experience, R&D

Model 3 -> …. + Moderators

Model 1 -> Innovation + Control Variables

Model 2 -> …. + Regional corruption 2, managerial experience, R&D

Model 3 -> …. + Moderators

Research Integrity Form

Name: Zakaria El Amriti	Student number: S1005488
RU e-mail address: Z.Elamriti@student.ru.nl	Master specialisation: International Business

Thesis title: **Does Corruption Grease or Sand the Wheels of Innovation?** The Moderating role of Managerial Embeddedness and R&D
Brief description of the study: Using survey data of enterprises in 37 East-African regions from 2013 to 2019 conducted by the World Bank, in this study the impact of corruption on firm innovation is examined. Regional corruption is found to positively and significantly impact innovation. The analysis confirms the 'greasing the wheels' hypothesis of corruption on firm's innovative output including products and services. In high corrupt environments, corruption greases the wheels of innovation. Managerial embeddedness and R&D do not significantly affect the relationship of corruption on innovation.

It is my responsibility to follow the university's code of academic integrity and any relevant academic or professional guidelines in the conduct of my study. This includes:

- providing original work or proper use of references;
- providing appropriate information to all involved in my study;
- requesting informed consent from participants;
- transparency in the way data is processed and represented;
- ensuring confidentiality in the storage and use of data;

If there is any significant change in the question, design or conduct over the course of the research, I will complete another Research Integrity Form.

Breaches of the code of conduct with respect to academic integrity (as described / referred to in the thesis handbook) should and will be forwarded to the examination board. Acting contrary to the code of conduct can result in declaring the thesis invalid

X

Zakaria El Amriti

Date: 14 | 06 | 2021

To be signed by supervisor

I have instructed the student about ethical issues related to their specific study. I hereby declare that I will challenge him / her on ethical aspects through their investigation and to act on any violations that I may encounter.

Supervisor's Signature:  **Date: 7-6-2021**

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2. Wherever possible and allowed, make theses available to potential users inside and outside Radboud University.

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Student number : S1005488

Student name : Zakaria El Amriti

Thesis title : **Does Corruption Grease or Sand the Wheels of Innovation?**
The Moderating role of Managerial Embeddedness and R&D

■ Yes, I grant permission to make available my thesis with the above title in the Radboud thesis Repository.

□ No, I do not grant permission to make available my thesis with the above title in the Radboud thesis Repository, but the thesis is allowed to make available with effect from …… (temporary embargo).

□ No, I do not grant permission to make available my thesis with the above title in the Radboud thesis Repository (permanent embargo).

Signature: Date: 14 | 06 | 2021

X

Zakaria El Amriti