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Corruption and Entrepreneurial Innovations in Developed vs Developing Countries.

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Abstract

This study aims to highlight the effect of corruption on entrepreneurial activities with varying levels of innovation. By having two sub samples of developing and developed countries, this study also aims to further address the gap in the current literature by drawing a comparison of how this effect varies between developed and developing countries. Using a panel data set for the years 2013 to 2017, a country fixed effects regression is utilized using a sample of 26 developed and 39 developing countries. Data regarding corruption, entrepreneurship and the control variables used are gathered from the Global Entrepreneurship Monitor, Transparency International, World Bank data and the Freedom House dataset. The results show corruption has a strong significant negative effect on highly innovative entrepreneurship within developed countries. A significant but weaker negative effect of corruption is also observed for moderately innovative entrepreneurship in developing countries. As for developing countries and also non-innovative entrepreneurship, corruption seems to be insignificant.

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1. Introduction

The rise in entrepreneurship within recent years has resulted in the emergence of self-employed individuals as a key source of employment in many economies. As such, entrepreneurship being one of the main drivers for economic growth, competitiveness and job creation, makes it a key focal point for researchers. As a result, this has shifted the focus of policy makers into smaller companies and start-ups as they form an important basis for the economic development of a nation. Additionally, Sahut & Peris-Ortiz (2014) find that the know-how and human capital smaller companies possess fosters a more entrepreneurial and innovation driven environment. Such an environment is crucial in today's economy as innovation is a key aspect regarding the long-term growth and survival of small businesses. Hence, innovation and the introduction of new products are more likely to take place in entrepreneurial driven countries. As seen through the implications of the COVID-19 pandemic, innovation also plays an integral role in the recovery of the business sector and many innovation-driven economies. One of the main ways this takes place is through innovative entrepreneurship. Innovation through the formation of new business plays an integral role in disrupting industries and the advancement of technologies. This can be a contributing factor of the large gap between countries in terms economic growth and development. Such a large gap can potentially stem from factors such corruption. The institutional quality of a nation and the level of corruption experienced can largely affect entrepreneurship and innovation as a result (Sobel, 2008). Therefore, by studying the relationship between corruption, economic development and entrepreneurship with different levels of innovativeness we can derive a better understanding of how regulators should approach anti-corruption policies in terms of stimulating entrepreneurship and innovation.

Entrepreneurial activities can be categorized based on the underlying motivation of the entrepreneur. This study will make a distinction between the different types of entrepreneurship based on innovativeness. The important role innovative entrepreneurship plays in driving economic growth and job creation while also addressing social challenges, makes it a key area for researchers to investigate (Desai, 2011). The concept of innovation when applied to entrepreneurship allows us to distinguish between entrepreneurship that is innovative and other forms of entrepreneurship. Baumol et al (2007) explores this as they define innovative entrepreneurship as one that provides a new product or service rather than replicating what other entrepreneurs have previously done. This concept also applies to the development and use of novel methods that deliver existing goods and services at a lower cost. Whereas non-innovation entrepreneurs can be defined as ones that do not generate a new product or service, they replicate existing business models that best suit their talents, experience, and interest (Baumel et al, 2007). This study will also introduce the idea of moderately innovative entrepreneurs, this will be used to distinguish between entrepreneurship that involves higher levels

of innovativeness from lower levels of innovativeness. This will be key in order to pinpoint which type of entrepreneurship is affected the most by corruption.

In order to foster innovative, moderately innovative and non-innovative entrepreneurship on a country level, a number of institutional factors must be taken into account. One of the most important factors that takes on an influential role in the level of entrepreneurship is corruption. Corruption is a global phenomenon that makes an interesting case to study in terms of the industry wide effects it has on both individuals and businesses. Corruption is defined as the public sector's engagement in activities that encompasses bad policies, inefficient institutions, and bribery (Shleifer & Vishny, 1993). Corruption imposes a significant burden on the regulatory structures and business operations within a country. This is observed in Nigeria where corruption has suppressed economic growth, reduced economic efficiency and development, and increase costs for running a business (Elijah, 2007). Hence, the impact corruption has on the economic development and growth of a country can be detrimental. Studies focusing on highlighting some of the key differences between high and low income countries find that corruption levels make up a significant part the gap between such nations. Mo (2001) finds significant evidence that corruption decreases economic growth, level of human capital and share of private investment.

Considering the significant costs corruption imposes on nations, one would question why some nations do not pursue improving their institutions and reducing corruption. Mauro (2004) explains this through the lack of incentives individuals face in addressing corruption despite them being better off without it. Examining corruption from an entrepreneurial perspective can offer key insights regarding this matter. This is because entrepreneurs have to deal with a number of regulatory restrictions when starting a new business venture. Hence, entrepreneurs may potentially take advantage of corrupt regulatory systems as a result. However, research regarding the relationship between entrepreneurship and corruption presents varying results. Avinmelech et al (2014) finds that high levels of corruption negatively impacts productive entrepreneurship. Despite the consensus being that corruption has adverse consequences on entrepreneurship and economic development, this relationship can vary for countries at different stages of economic development. Dutta & Sobel (2016) finds that in a bad business climate corruption remains to negatively impact entrepreneurship, but to a smaller degree. Hence, the adverse effects of corruption on entrepreneurship are to a varying extent experienced by countries regardless of their level of economic development. In terms of the relationship between corruption and innovation, varying results are presented by the current literature. Under an inefficient public sector of Vietnam, corruption is seen to have a significant and positive relationship with corporate innovation (Nguyen et al, 2016). An example of this would be the common practice of paying informal fees to carry out quicker transactions. On the other hand, this is

not the case with the studies focusing on developed countries that have a more efficient public sector. Anokhin & Schulze (2009) in contrast finds that corruption hinders innovation and entrepreneurship.

The high uncertainty and chance of failure associated with the entrepreneurial domain poses an important barrier for the entry to innovative entrepreneurship. In terms of the individual level factors, Mayhew et al (2012) shows that factors such as education level fosters innovation, while personality traits also significantly effect social innovative entrepreneurship. Research regarding country level factors have well established that culture and macro level factors such as GDP and taxations also play a significant role in promoting innovative entrepreneurship. However, the relationship concerning corruption and the degree of innovation within entrepreneurship is yet to be comprehensively studied by the current literature. A lot of the prior research into entrepreneurship fail to make the distinction between innovative and non-innovative entrepreneurship. Hence, it remains unclear how corruption effects entrepreneurship with different innovation levels involved. In addition, a cross country analysis of corruption and entrepreneurship between developing and developed countries is yet to be established. Therefore, by highlighting the relationship between corruption and entrepreneurship, this research aims to address the current gap in the literature by identifying the extent to which corruption influences different levels of innovation within entrepreneurship across developing and developed countries. Furthermore, drawing on the comparison of this relationship between developed and developing countries will provide key insights regarding how country level differences can influence innovative entrepreneurship.

Following the main purpose of this research, this study will aim to address the following research question:

To what extent does corruption effect entrepreneurship under different innovation levels and how does this effect differ amongst developed and developing countries?

To address the research question, this paper will cover the literature that attempts to highlight both corruption and entrepreneurship. Moreover, based on the hypothesis that will be formed, a panel data set combining corruption and entrepreneurship data with different level of innovativeness amongst developed and developing countries is formed for the years 2013 to 2017. By using a country fixed effects model, this study will attempt to answer the main research question through the results obtain from the analysis, and draw conclusions, recommendations and limitations of this study.

The findings of this research can present key insights to policy makers in regards to fostering entrepreneurship and innovation in a nation. By exploring the relationship between corruption and

innovative entrepreneurship, it can be established whether and how institutions should improve to promote innovation. This can help economies achieve higher levels of economic growth and aid individuals that aspire to innovate and form new businesses. Furthermore, by observing how the nature of this relationship varies across developing and developed countries, the results obtained can help answer some of the key questions in regards the influence of country level characteristics and how entrepreneurial innovations can be supported. Hence, this can aid nations with relatively lower levels of economic development thrive through identifying optimal policies that foster entrepreneurship and innovation.

2. Theoretical framework and hypothesis

The impact of corruption is experienced by various sectors across a nation. A closer look into how different markets and industries operate as a result of corruption shows that inefficiencies become a widespread phenomenon across countries especially in public projects (Shliefer & Vishny, 1993). This is observed through the distortionary effect corruption creates in markets. Hence, reduction in domestic and foreign direct investment, and lower expenditures in education, health and infrastructure are common outcomes of a nation with a corrupt regulatory authority (Wei, 2016). As a result, countries with weak governments and higher levels of corruption experience lower levels of economic growth.

Through examining some of the key differences between countries with high and low levels of corruption, the structure of governmental institutions and political processes represents an important determinant of the level of corruption (Shliefer & Vishny, 1993). Bribery is a major source of corruption for governments and represents a significant difference in foreign direct investment amongst countries while also imposing an additional cost of capital for firms (Gray & Kaufman, 1998).

Given the well-established relationship between economic development and innovative entrepreneurship (Johnson, 2008), it is expected that highly corrupt countries will a have lower share of innovative entrepreneurs. While countries with more stable governments and a greater a control of corruption are likely to have better economic conditions that help foster innovative entrepreneurship (Anokhin & Schulze, 2009). Countries with better control of corruption are more likely to have implemented efficient innovation systems that can promote innovative entrepreneurship.

Prior research into the determinants of entry to self-employment show that governments have a significant influence on the level of entrepreneurial activity. Millan et al (2012) finds that expenditure

on startup subsidies decrease the risk of exit from self-employment through higher survival chances. Such incentives are an effective tool for policy makers to increase entry to self-employment and consequently promote innovative entrepreneurship. Hence, when governments prioritize private gain and engage in activities that increase corruption levels, it can be expected that incentives and policies that promote entrepreneurial entry are neglected. This is reinforced by Aidis et al (2012) as they find that freedom from corruption and government size are inversely related to entrepreneurial entry. Therefore, corruption is expected to have a detrimental effect on individual entry of innovative entrepreneurship.

The level of trust for a state to enforce laws and rules of trade in markets is highly dependent on the extent to which corruption is controlled for. Countries with higher level of trust in the state are expected to have a more developed arms trade systems and control of more complex economic activities (Anokhin & Schulze, 2009). Such countries experience higher growth levels of innovation and entrepreneurship. Moreover, Boudreaux et al (2018) finds that corruption not only negatively effects economic growth but also creates an institutional environment that promotes destructive rather productive entrepreneurship.

The negative effect of corruption on economic growth has been thoroughly established in prior literature. Hence, part of the effect of corruption on innovative entrepreneurship is expected to be indirect through economic variables. However, prior research into this relationship have also established that corruption also has a direct effect on innovative entrepreneurship. Controlling for country level economic variables, Anokhin & Schulze (2009) finds that lower levels of corruption directly increase entrepreneurship and innovation.

A study by Munemo (2012) utilizes a sample of developing countries in Africa and finds political stability as an important factor to promote entrepreneurship and the creation new small businesses. Hence, as consistent with the case of developed countries, it can be expected that innovative entrepreneurship declines with higher corruption in developing countries as well. Thus, by observing the effect at a country level, the following hypothesis are formed:

H1a: In developed economies, higher corruption is negatively associated with highly innovative entrepreneurship.

H1b: In developing economies, higher corruption is negatively associated with highly innovative entrepreneurship.

The relationship between corruption and innovative entrepreneurship can differ depending on various macro level factors. Therefore, country level differences can represent a significant source of the

disparity between the entrepreneurial innovations amongst nations. Given that economic development measures such as education are known to be well established indicators of entrepreneurial intentions and ability to innovate (Zhang et al, 2014), a distinction between countries through their level of economic development is made in this study. Hence, by examining how this relationship varies amongst developing and developed countries, a more comprehensive understanding of the nature of innovation and entrepreneurship can be achieved. When drawing this comparison, it is clear that more developed countries are associated with higher education and income levels, better infrastructure and more stable political systems relative to most developing countries. This can have a profound effect on the institutional characteristics of a nation. Blackburn et al (2006) finds empirical evidence for a negative relationship between corruption and economic development. Countries with better institutional quality and more stable governments are likely to be associated with lower corruption and thus a more supportive environment of entrepreneurial innovations. However, the extent to which corruption effects entrepreneurial innovations presents an interesting case that can vary depending on multiple factors. González-Pernía et al (2015) examines how that nature of innovative entrepreneurship can vary between developing and developed countries. They find that the connection between knowledge spill overs, innovation and entrepreneurship is weaker in developing countries in comparison to the traditional findings of the knowledge spill over theory. This notion is further reinforced by Avinmelech et al (2014) as they find empirical evidence suggesting that the negative effect of corruption on entrepreneurship is significantly stronger in developed countries. Hence, the second hypothesis is:

H2: The negative effect of corruption on highly innovative entrepreneurship is stronger in developed countries than developing countries.

In order to gain a better understanding of how corruption relates to innovation, it is key to take into account entrepreneurship with varying levels of innovation involved. When comparing entrepreneurial activities across different levels of innovation, a lot of the previous literature advocates for the idea that increases in the level of corruption decreases the level of innovation within entrepreneurial activity. In a study conducted by Xu & Yango (2017), it is found that firms located in areas where anti-corruption efforts are higher invested significantly more in R&D and generated more patents. Hence, lower corruption levels in a nation can be an effective means to facilitate innovation through entrepreneurial activities. Moreover, this effect can also be observed through the adverse effects corruption has on productivity and investment in innovation and entrepreneurship (Anokhin & Schulze, 2009).

Hence, as consisted with the previous hypothesis, the following hypothesis are formed:

H3a: In developed economies, higher corruption is negatively associated with moderately innovative entrepreneurship.

H3b: In developing economies, higher corruption is negatively associated with moderately innovative entrepreneurship.

H4: The negative effect of corruption on moderately innovative entrepreneurship is stronger in developed countries than developing countries.

Using a sample of 64 countries worldwide, Avinmelech et al (2014) finds that countries with higher corruption levels tend to have lower levels of productive entrepreneurship. Productive entrepreneurship encompasses both innovative and non-innovative entrepreneurship. Moreover, as mentioned previously, given that most studies focus on non-innovative entrepreneurship, the negative relationship between corruption and innovative entrepreneurship is expected to be consistent with non-innovative entrepreneurship as well. Thus, the following hypothesis are:

H5a: In developed economies, higher corruption is negatively associated with non-innovative entrepreneurship.

H5b: In developing economies, higher corruption is negatively associated with non-innovative entrepreneurship.

In regards to non-innovative entrepreneurship, most studies point out the fact that the relationship between entrepreneurship and economic development is U-shaped. Low developed countries experience high levels of necessity-based entrepreneurship, while highly developed countries on the other hand experience high levels of opportunity-based entrepreneurship (Wennekers et al, 2005). Hence, when exploring the relationship between corruption and non-innovative entrepreneurship, this relationship is expected to differ between developing and developed countries given the different nature of entrepreneurship of both types of countries. Chowdhury et al (2019) finds empirical evidence that improving institutional quality has a larger effect on the quantity and quality of entrepreneurship in developing economies compared to developed economies. Improvements in entrepreneurial capital, fiscal, labor and bankruptcy regulations are found to have a stronger impact in developing countries. A key difference between developing and developed countries that would result in this difference is the proportion of necessity and opportunity-based entrepreneurship. Product innovation is less likely to take place within necessity entrepreneurs (Darnihamedani & Hessels, 2016). Hence, with developing countries being known to have a larger share of necessity entrepreneurship, it is also the case that non-innovative entrepreneurship will be more common in developing countries. Moreover, Puffer et al (2010) finds that entrepreneurs in developing countries

are more able to rely on informal institutions when experiencing corruption from formal institutions. Therefore, it appears that entrepreneurs in developing countries are better suited to deal with the corruption and any adverse effects it may bring about in comparison to their counterparts in developed countries. Hence, when examining the impact this has on non-innovative entrepreneurship, the following hypothesis is formed:

H6: The negative effect of corruption on non-innovative entrepreneurship is stronger in developed countries than developing countries.

3. Data

One of the main datasets used for this is study is the Global Entrepreneurship Monitor (GEM). The GEM collects data regarding entrepreneurial behaviors and attitudes of individuals in over 70 countries worldwide. The database spans from 1999 to 2017 and is collected through directly surveying entrepreneurs aged between 16 - 64 annually. The Adult Population Survey (APS) database includes around 2000 individuals and is used to measure the dependent variables, which are the share of innovative, moderately innovative and non-innovative entrepreneurship.

The second dataset used in this study is from Transparency International (TI) and is utilized to obtain a corruption measure for 180 countries. The corruption perception index (CPI) variable used as the independent variable to proxy the corruption level within a country as shown in table 2. The CPI is calculated using 13 different data sources and is standardized to a scale from 0 to 100 where 0 is highest and 100 is the lowest level of perceived corruption.

Finally, the world bank and freedom house datasets are used to obtain the control variables for the model. The freedom house database is primarily used to obtain control variables that relates to political factors.

The dataset used for this study will include a sample of 65 countries that consist of both developing and developed countries. Variables from the years 2013 to 2017 will be used to ensure a sufficient sample size and time period. The sample will be further split into two sub samples of developed and developing nations. The following table shows all the descriptive statistics of all the variables used in this study.

Table 1: Descriptive statistics for developed countries

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Innovative	112	14.879	5.916	2.883	33.455
Moderately innovative	112	31.021	8.925	8.074	60.259
Noninnovative	112	54.1	11.703	23.77	85.546
Independent variable					
CPI	112	67.679	14.86	40	90
Control variables					
GDP growth	112	.745	7.357	-17.06	12.778
GDP per capita growth	112	.383	7.336	-16.512	11.718
Enforcing contracts	112	65.867	9.403	40.597	85.7
Political freedom	112	15.402	.65	14	16
High and medium tech entrepreneurs	112	7.668	3.071	.56	17.568

Table 2: Descriptive statistics for developing countries

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Innovative	123	16.514	11.205	.204	48.719
Moderately innovative	124	28.67	11.513	1.209	62.406
Non-innovative	124	54.95	18.373	10.972	98.791
Independent variable					
CPI	124	40.734	12.33	25	73
Control variables					
GDP growth	124	1.51	9.18	-29.09	21.509
GDP per capita growth	124	.178	9.118	-30.557	19.867
Enforcing contracts	124	56.083	12.12	29.039	84.149
Political freedom	117	9.846	4.824	1	16
High and medium tech entrepreneurs	121	2.897	2.503	0	13.647

3.1 Dependent variables

Three dependent variables are used based on different degrees of innovativeness within entrepreneurship, namely highly innovative, moderately innovative and non-innovative entrepreneurship. Using these as the dependent variables will allow for a distinction to be made between different types of entrepreneurship while being able to draw comparison between different countries.

Share of highly innovative entrepreneurs

The first dependent variable that will be used for this study is the share of innovative entrepreneurs within a country. This variable is the percentage of total entrepreneurship activity (TEA) in a country that provides a product that is new to all customers. A higher share of highly innovative entrepreneurs will indicate that a country is more conductive of innovative entrepreneurship and is likely to have implemented systems that help stimulate entrepreneurial innovations.

Share of moderately innovative entrepreneurs.

The second dependent variable for this study is the share of moderately innovative entrepreneurs within a country. This is mainly used as a proxy for entrepreneurship that involves relatively lower levels of innovation. This is measured through the percentage of total entrepreneurship activity (TEA) in a country that provides a product that is new only to some customers.

Share of non-innovative entrepreneurs

The last dependent variable is the share of non-innovative entrepreneurship. This variable is measured through the percentage of total entrepreneurship activity (TEA) in each country that does not provide a product that is new to all or some customers. A higher share of non-innovative entrepreneurs indicates the lack of entrepreneurial innovations and systems that assist entrepreneurs in pursuing innovative business ventures. Such countries mainly consist of individuals seeking entrepreneurial entry through existing markets.

3.2 Independent variable

Corruption perception index

For the independent variable, the corruption perception index from the Transparency International database will be used as a proxy for corruption. I chose this variable since corruption encompasses multiple different factors as it can be driven by both the public and private sector (Lindskog et al, 2010). The corruption perception index provides a broad measure in order to accurately capture the effect of corruption across different countries. This is done by aggregating data from 13 different databases regarding the perceptions of businesspeople and experts of corruption. This variable is measured through a scale from 0 to 100 where 0 represents the highest level of corruption and 100 represents the lowest level of corruption. Therefore, countries with a value closer to 100 are less corrupt and are likely to have a higher institutional quality. Hence, a significant and positive coefficient will indicate that lower levels of corruption will increase the level of entrepreneurial activity.

3.3 Control variables

Several control variables are included in the model in order to account for the key time varying factors that can influence corruption and entrepreneurship with different levels of innovativeness. All control variables are measured at the country level and are included for the period 2013 – 2017.

GDP and GDP per capita growth

Economic growth and development are key factors that influence entrepreneurship and innovation in a country. Based on the U-shaped relationship between economic growth and economic development, the level of entrepreneurship in a country is expected to vary based on GDP and GDP per capita. Moreover, the relationship between corruption, economic development and economic growth is also established in various studies. Mo (2001) finds a negative relationship between economic growth and corruption. This is mainly through the effects of political instability. Hence, both GDP growth and GDP per capita growth from the World Bank database are used to capture the effect of economic development and growth on corruption and innovative entrepreneurship.

Enforcing contracts

Based on the World Bank database, enforcing contracts refers to the level of which a country has adopted practices that encourage efficiency and quality in the court system. Hence, this also affects how easy it is for an entrepreneur is to start a new business venture. To measure this, the world bank takes the average score of the following factors, procedures, time and cost. This consists of a scale from 0 -100 with 0 being the lowest level of quality and efficiency in terms of enforcing contrast and 100 being the highest. Ease of enforcing contracts effects the legislative procedure that entrepreneurs go through and is also a determinant of corruption levels of a country. Hence, a high value suggests that the country has enforced multiple legislative procedures and practices within their legal system.

Political pluralism and participation

Political pluralism and participation represents the political freedom of individuals in a nation. The Freedom House database measures this through aggregating the scores relating to a number of questions regarding the perception of people's political freedom and how free they are to express their own political stance. A score of 16 indicates the highest degree of freedom and a score of 0 indicates the lowest. Autio & Fu (2015) find that the quality of political institutions positively affects entry into entrepreneurship. While Charron (2008) shows that political and social openness has a significant impact in addressing corruption. Thus, political freedom can influence corruption levels and potentially the willingness to participate as a solo self-employed worker.

Share of medium and high-tech TEA

The level of innovation and the implications of corruption can vary significantly depending on the industry. In order to take this into account, a distinction will be made between low tech sectors and medium to high tech sectors. To capture this effect in the country level model, the share of medium and high technology used with TEA from the GEM global national survey is added as a control variable.

4. Methodology

In order to examine the relationship between corruption and innovative entrepreneurship a longitudinal country level analysis will be carried out. Using the 2013 − 2017 panel data set of the variables mentioned previously, a country level fixed effects model will be used to conduct the analysis. By doing so, the model used takes into account the time invariant control variables that affect corruption and innovative entrepreneurship. In terms of time varying variables, control variables related to key factors that influence corruption and innovative entrepreneurship are then added to the model.

The sample will be split into two, a sub-samples of 26 developed countries and 39 developing countries. The classification of developed and developing countries are based on the 2016 UN World Economic Situation report. The fixed effects regression will be carried out with both samples in order to establish how the relationship between corruption and innovative entrepreneurship varies amongst countries with different levels of economic development. In order to obtain a more comprehensive understanding of how corruption affects innovation within the context of entrepreneurship, three econometric models with varying levels of entrepreneurial innovativeness are utilized in this study. A comparison of the three models should provide a better understanding of which type of entrepreneurship is more significantly affected by corruption. Hence, the following models are formed:

The first model will examine the effect of corruption on entrepreneurship with a high degree of innovation. The dependent variable here represents the share of total early entrepreneurship that provides a new product to all customers.

$$\text{Innovative} = \beta o + \beta 1 * (\text{CPI}) + \beta 2 * (\text{GDP growth}) + \beta 3 * (\text{GDP per capita growth}) + \beta 4 * (Tech\ level) + \beta 5 * (Enforcing\ contracts) + \beta 6 * (Political\ freedom)$$

The second model will examine the effect of corruption on the entrepreneurship with moderate levels of innovation. The dependent variable here represents the share of total early entrepreneurship that provides a new product to some customers.

Moderatly innovative

$$= \beta o + \beta 1 * (\text{CPI}) + \beta 2 * (\text{GDP growth}) + \beta 3 * (\text{GDP per capita growth}) + \beta 4$$
$$* (Tech\ level) + \beta 5 * (Enforcing\ contracts) + \beta 6 * (Political\ freedom)$$

The third model will examine the effect of corruption on the non-innovative entrepreneurship. The dependent variable here represents the share of total early entrepreneurship that does not provide a new product to some or all customers.

Non − innovative

$$= \beta o + \beta 1 * (\text{CPI}) + \beta 2 * (\text{GDP growth}) + \beta 3 * (\text{GDP per capita growth}) + \beta 4$$
$$* (Tech\ level) + \beta 5 * (Enforcing\ contracts) + \beta 6 * (Political\ freedom)$$

4.1 Sampled countries

The list of countries used is based on the countries surveyed by the GEM in 2016. From then, country-level data for the years 2013 -2017 are added to the model. The following table illustrates the list of countries included in this study.

Table 3: List of developing countries and their share of entrepreneurs by the level of innovativeness.

Country	Share of innovative entrepreneurs	Share of moderately-innovative entrepreneurs	Share of non innovative entrepreneurs
Argentina	17,05201429	27,81444291	55,1335428
Brazil	8,131069769	12,21619696	79,65273327
Burkina Faso	4,557390046	31,82918504	63,61342492
Cameroon	4,060150376	27,66917293	68,27067669
Chile	43,2674729	44,1477356	12,58479149
China	14,50636113	62,40573967	23,0878992
Colombia	12,0659527	35,41591201	52,51813529
Ecuador	18,77133106	11,26279863	69,96587031
Egypt	22,61716929	18,6080952	58,77473551
Guatemala	39,56174134	36,39044023	24,04781844
India	43,35199847	19,22777924	37,42022229
Indonesia	21,61888586	22,89291255	55,48820158
Iran	8,06199032	22,50319156	69,43481812

Israel	14,06874082	38,30523313	47,62602605
Jamaica	10,05025126	19,09547739	70,85427136
Kazakhstan	4,117984223	23,33477686	72,54723892
Korea	17,13630473	45,57142034	37,29227493
Lebanon	17,15451176	57,60997446	25,23551378
Macedonia	12,36474795	12,24739424	75,38785781
Malaysia	3,870604521	5,894894269	90,23450121
Mexico	10,69902552	27,01367014	62,28730434
Morocco	27,28483403	28,40670684	44,30845913
Panama	24,06015038	20,67669173	55,26315789
Peru	15,92317757	23,9129663	60,16385613
Qatar	20,17444359	28,95074233	50,87481408
Russia	9,270744361	8,243350612	82,48590503
South Africa	23,8052757	24,05195104	52,14277326
Thailand	9,798016904	26,23906157	63,96292152
Uruguay	17,7344439	28,04825445	54,21730165

Table 4: List of developed countries and their share of entrepreneurs by their level of innovativeness.

Country	Share of innovative entrepreneurs	Share of moderately- innovative entrepreneurs	Share of non innovative entrepreneurs
Australia	17,62404361	25,15563318	57,22032321
Bulgaria	4,087294269	25,83377938	70,07892635
Canada	14,56734514	41,55084229	43,88181257
Croatia	10,89233344	17,16887049	71,93879607
Estonia	11,29278373	35,75563111	52,95158516
Finland	17,91949843	33,68124378	48,39925779
France	18,04281747	32,71022281	49,24695972
Germany	11,56648936	26,82285399	61,61065665
Greece	15,55589645	22,70867271	61,73543084
Hungary	8,00253684	24,3066247	67,69083846

Ireland	16,44556254	37,58802015	45,96641731
Italy	30,60252315	37,56401027	31,83346658
Latvia	14,44490282	28,66323127	56,89186591
Luxembourg	14,09534419	53,57608975	32,32856607
Netherlands	12,2727632	29,8216139	57,9056229
Poland	15,60693642	42,19653179	42,19653179
Portugal	5,677540224	26,50830219	67,81415758
Slovakia	10,05291005	33,86243386	56,08465608
Slovenia	17,99758015	26,01748226	55,98493759
Spain	12,53821451	23,77298475	63,68880074
Sweden	5,860122268	38,72276678	55,41711095
Switzerland	13,93376517	30,33490091	55,73133392
United Kingdom	17,12164538	33,90521415	48,97314047
United States	15,393118	32,21609813	52,39078387

5. Results

5.1 Highly Innovative entrepreneurship

Table 5 illustrates the first model built which examines the effect of corruption on entrepreneurship that involves a high degree of innovation amongst developed and developing countries. The main independent variable of this study, *corruption perception index* (CPI) is positive and statistically significant at 1% for developed countries. Developed countries with lower corruption experience higher levels of highly innovative entrepreneurship. Therefore, this model supports hypothesis H1a, as it provides evidence for developed countries experiencing a lower share of highly innovative entrepreneurs with higher levels of corruption. The remaining variables are insignificant in this model.

For the sample of developing countries, CPI is positive but is no longer statistically significant. Moreover, all other variables are also insignificant in this model. Therefore, hypothesis H1b is rejected given lack of evidence for the effect of corruption on highly innovative entrepreneurship regarding developing countries. When comparing the coefficient of 1.372 of developed countries to the coefficient of 0.417 for developing countries, it is clear that the effect of corruption on highly innovative entrepreneurs primarily takes place within developed countries. Hence, countries with higher levels of economic development are likely to be more susceptible to the adverse effects of corruption. Therefore, entrepreneurs that operate in such countries face more difficulties in forming

highly innovative entrepreneurial ventures relative to those in less developed countries. Thus, this supports hypothesis 2 that states that the negative effect of corruption on highly innovative entrepreneurship is stronger in developed countries in comparison to developing countries.

Table 5: Linear regression of Corruption Perception Index on highly innovative entrepreneurship.

Innovative Entrepreneurship	Developed Countries		Developing Countries	
	Coefficient	t-value	Coefficient	t-value
Corruption Perception Index	1.372*** (0.583)	2.35	.417 (0.374)	.269
GDP growth	-5.606 (4.026)	-1.39	-3.316 (2.163)	.129
GDP per capita growth	5.755 (4.089)	1.42	3.338 (2.186)	.13
Enforcing contracts	-.277 (0.225)	-1.23	.093 (1.137)	.496
Political freedom	.393 (0.44)	0.89	-.232 (0.320)	.471
Share of medium and high tech TEA	.305 (3.07)	0.99	.094 (0.271)	.729
Constant	-58.537 (43.003)	-1.36	.477 (17.095)	.978
R-squared	0.178		0.039	
N	116		134	

* p-value < 0.10 , ** p-value < 0.05 , *** p-value < 0.01

5.2 Moderately innovative entrepreneurship

Table 6 shows the results of examining the effect of corruption on entrepreneurship that involves a moderate levels of innovation amongst developed and developing countries. For developed countries, CPI is positive and statistically significant at 10% indicating that that countries with lower corruption are associated with higher levels of moderately innovative entrepreneurs. Hence, this supports hypothesis H3a, as it provides evidence for developed countries experiencing a lower share of moderately innovative entrepreneurs with higher levels of corruption. All other variables seem to have to an insignificant effect on the share of moderately innovative entrepreneurs.

When examining the effect of corruption on moderately innovative entrepreneurship for developing countries, a negative coefficient of CPI is observed indicating a that corruption increases the share of

moderately innovative entrepreneurship. However, the p-value of the CPI coefficient is insignificant. Therefore, hypothesis H3b is rejected since an opposite effect is observed rather than the negative effect of corruption that was initially expected. All other variables seem to have an insignificant effect on the share of moderately innovative entrepreneurs. Furthermore, by comparing the results of the fixed effects regression between developed and developing countries, it is evident that the negative effect of corruption on moderately innovative entrepreneurship is only observed within the sample of developed countries. The coefficient of CPI for developed countries is 1.352 and is statistically significant at 10% while the coefficient for developing countries is -0.561. Hence, hypothesis 3 that states that the negative effect of corruption on moderately innovative entrepreneurship is stronger in developed countries than developing countries is supported through results of both models.

Table 6: Linear regression of Corruption Perception Index on moderately innovative entrepreneurship.

Moderately Innovative Entrepreneurship	Developed Countries		Developing Countries	
	Coefficient	t-value	Coefficient	Coefficient
Corruption Perception Index	1.353* (0.767)	1.76	-.561 (0.358)	-1.57
GDP growth	.067 (4.81)	0.01	-1.333 (2.069)	-0.64
GDP per capita growth	-.036 (4.818)	-0.01	1.465 (2.091)	0.70
Enforcing contracts	-.87 (0.665)	-1.31	-.07 (0.131)	-0.54
Political freedom	-.192 (0.529)	-0.36	.093 (0.306)	0.30
Share of medium and high tech TEA	.441 (0.366)	1.20	-.076 (0.259)	-0.29
Constant	21.584 (62.383)	0.35	56.553*** (16.352)	3.46
R-squared	0.053		0.051	
N	116		134	

* p-value < 0.10 , ** p-value < 0.05 , *** p-value < 0.01

5.3 Non-innovative entrepreneurship

Finally, models regarding non-innovative entrepreneurship are constructed and shown in table 7. In terms of developed countries, a negative and insignificant coefficient of CPI is observed. Therefore, corruption does not seem to be a key determinant of non-innovative entrepreneurship in this case.

Based on this result, hypothesis H4a is rejected. All other variables have an insignificant effect on the share of non-innovative entrepreneurs.

On the other hand, in terms of the sample of developing countries, the coefficient of CPI is positive but insignificant. This is consistent with the case of developed nations as corruption in this model is not a key determinant of non-innovative entrepreneurship. Ultimately, based on these results, hypothesis H4b is rejected as well since the effect of corruption is insignificant. Moreover, when comparing both models, all the variables are insignificant and no evidence is found to suggest that the effect of corruption is stronger for developed countries compared to developing countries. Therefore, hypothesis 6 is also rejected as a result which indicates that the negative effect of corruption on non-innovative entrepreneurship is stronger in developed countries than developing countries.

Table 7: Linear regression of Corruption Perception Index on non-innovative entrepreneurship

Non-innovative Entrepreneurship	Developed Countries		Developing Countries	
	Coefficient	t-value	Coefficient	t-value
Corruption Perception Index	-.918 (0.767)	-1.20	.144 (0.536)	0.27
GDP growth	-5.463 (5.292)	-1.03	4.649 (3.093)	1.50
GDP per capita growth	5.344 (5.309)	1.01	-4.803 (3.127)	-1.54
Enforcing contracts	-.047 (0.295)	-0.16	-.024 (0.195)	-0.12
Political freedom	.341 (0.578)	0.59	.138 (0.458)	0.30
Share of medium and high tech TEA	-.621 (0.403)	-1.54	-.018 (0.388)	-0.05
Constant	120.898 (56.521)	2.14	42.97 (24.451)	1.76
R-squared	0.050		0.034	
N	116		134	

* p-value < 0.10 , ** p-value < 0.05 , *** p-value < 0.01

6. Discussion

Through examining the results from the models built, there does not seem to be concrete evidence for corruption having a significantly strong effect on entrepreneurship as initially expected. When investigating the role of the public sector, Goetze & Freshwater (2001) find financial entrepreneurial capital to be a significant determinant of entrepreneurial activity. Moreover, governmental policies

that focus on education and access to capital also seem to have a more significant effect on entrepreneurial activity (Kayne, 1999). Hence, when it comes to inefficient institutions and bad policies, corruption has a significant effect on a multitude of macro-economic variables which in turn also contributes towards influencing the level of entrepreneurship. Using a model of tax evasion opportunities, Torrini (2005) finds that tax evasion can either play a role in spurring or reducing self-employment rate. Hence, an ambiguous effect of some of the key aspects of corruption such as tax evasion, may not have clear direct effect on entrepreneurship as one would have initially expected.

By breaking down entrepreneurship based on different levels of innovativeness, it is clear that the results support the hypothesis that corruption has a significant negative impact on highly innovative entrepreneurs. This seems to be specifically the case with developed countries. As expected, corruption has an adverse effect on innovation. Hence, as seen from the results, countries lower corruption levels and more efficient systems have a higher share of highly innovative entrepreneurs. Veracierto (2008) explores this phenomenon as he finds that small increases in penalties to corruption-related activities may result in a large increase in product innovation. As presented through the positive coefficients of CPI from results of table 5 and 6, this is likely to take place in developed countries given the higher level of opportunity-based entrepreneurship in these countries compared to developing countries. Furthermore, this also seems to be the case with entrepreneurship with moderate levels of innovation involved as the coefficient of CPI is positive as well. This means as CPI increases, the lower corruption levels positively affects the level of moderately innovative entrepreneurship. Therefore, despite the effect being more significant for highly innovative entrepreneurs, corruption does seem to play a damaging role for entrepreneurship with moderate levels of innovation as well. This is consistent with the previous results as the impact seems to take place more significantly within developed countries. Without the trust associated with the government's ability to control corruption, productivity and investment in innovation and entrepreneurship suffers as a result (Anokhin & Schulze, 2009). On the other hand, the negative coefficient of CPI in the table 5 may suggest that in some cases corruption may aid entrepreneurial activity for developed countries. Using a sample 43 countries over the period from 2003 to 2005, Dreher & Gassebner (2013) find that corruption increases firm entry within highly regulated economies. Hence, this provides evidence for the fact that the relationship between regulations and entrepreneurship has a dependency on the level of corruption associated within the economy to some extent. Moreover, when looking at non-innovative entrepreneurship the effect of corruption seems to be insignificant in both developed and developing countries. A possible reason for this is that non-innovative entrepreneurs normally do not require external financing when launching their business venture (Darnihamedani et al, 2018). Additionally, they operate in existing markets where the risk of

failure is lower compared to more innovative entrepreneurship. Hence, the impact of institutional inefficiencies and bad governmental policies is more limited when it comes to non-innovative entrepreneurs.

When comparing the results across developing and developed countries, it seems to be the case that developed countries experience the detrimental effects of corruption to a greater extent than developing countries in terms entrepreneurship and innovation. Entrepreneurship and innovation are key driving factors in many developed countries. Such countries have established economies where innovation and entrepreneurship play an integral role in the economic growth and development of the nation through opportunity-based entrepreneurship (Valliere & Peterson, 2009). Hence the role of governments in controlling corruption may play a greater role in developed countries given the reliance on innovation. This is consistent with the study conducted by Avnimelch et al (2014) as they find that the negative effect of corruption is more significant amongst developed countries in comparison to developing countries. One of reason they present for this alongside the research conducted by Puffer et al. (2010), is that unlike entrepreneurs in developing countries, in developed countries entrepreneurs are unable to rely on informal institution when facing corruption from formal institutions. This mainly is due to the fact that informal institutions are significantly weaker in developed countries in comparison to developing countries (Puffer et al, 2010). Hence, entrepreneurs in developed countries with varying levels of innovations are all likely to experience to the negative effects of corruption to a greater extent.

7. Conclusion

In conclusion, corruption overall can have a damaging impact on the quality and quantity of entrepreneurship in a country. This study attempts to provide evidence for this through analyzing the impact of corruption on different levels of innovation. The results from the country fixed effects analysis proves that corruption negatively effects entrepreneurship with moderate and high levels of innovation involved for developed countries. However, as initially hypothesized, the effect is lower and less significant for developing countries. Despite this, there seems to be no significant effect of corruption across all levels of innovation for developing countries. This was not initially expected from the results. Given that informal institutions are stronger in developing countries, they may act as a potential aid to entrepreneurs (Puffer et al, 2010). Thus, corruption may not necessarily hinder entrepreneurial activity and innovation, but in some cases may even improve it. In terms of non-innovative entrepreneurs, they seem to be unaffected by the levels of corruption in a nation. Hence, corruption poses a less of a threat to the entry of entrepreneurs to existing market.

7.1 Implications

The findings from this research makes an important contribution to our understanding of corruption, innovation and entrepreneurship. By exploring entrepreneurship through different levels of innovativeness, this study outlines which types of entrepreneurs suffer the most from the adverse effects of corruption. As a result, this can enable policy makers to implement a more tailorized approach when it comes fostering entrepreneurship and innovation. Countries with a higher share of highly innovative entrepreneurs may benefit more from anti-corruption efforts than countries with lower levels of innovation within their entrepreneurial scene. Hence, this should be taken into account when evaluating whether pursuing anti-corruption policies is a favorable approach or not for policy makers. Moreover, this can also benefit society at large through enabling individuals aspiring to venture into entrepreneurship to identify which environments present a higher likelihood of succeeding as an entrepreneur. This is especially important nowadays due to significant rise in the solo self-employed (Falco & Haywood, 2016). Thus, this research can enable such individuals in making better decisions when opening new business ventures. Furthermore, by drawing the comparison between developed and developing countries, this study finds that corruption may not necessarily always have a negative effect on entrepreneurship. Hence, entrepreneurs in developing countries may benefit from relying on informal institutions and engaging in corruption related activities. Vietnamese firms being able to engage in informal payment within an inefficient public sector is found to promote product improvements and innovations (Nguyen et al, 2016). As a result, the unique nature of the legal system and how business is conducted in less developed countries must be taken into account in order to benefit society at large.

7.2 Limitations and further research

Despite the insights brought forward by this research, it is important to note some the limitations of this study. Firstly, due to the relatively small sample size of the countries, the sample used may not be fully representative of the global nature of corruption, entrepreneurship and innovation. Thus, the conclusions derived should be interpreted with caution given that this may not apply to every country in the world. Therefore, for future studies, given that access to data is available, incorporating a larger sample of developed and developing countries would a yield a more externally valid analysis.

Secondly, the statistical analysis and the variables utilized are rather a more simplistic model of what a comprehensive research into this topic would entail. For future studies, including an individual level analysis through a probit model would yield a more detailed understanding of the relationship between entrepreneurial entry and corruption. By calculating the predicted probabilities of entry for

different levels of entrepreneurial innovativeness while incorporating individual level control variables as well, a more robust set of results can be derived regarding the implications of corruption.

Lastly, despite distinguishing between different levels of entrepreneurial innovativeness, this study does not look into whether the innovations explored are primarily process or product innovation. Darnihamedani & Hessels (2016) finds that necessity entrepreneurs are less likely to engage in product innovation. Hence, by taking into account the type of innovation into the research it is possible to further examine what drives entrepreneurial innovations to vary between different countries.

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