Erasmus School of Economics
Master Thesis Strategy Economics

Which factors explain the innovation heterogeneity among entrepreneurs? A cross-country analysis

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Academic Year: 2021-22
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Date Final Version: 4th August 2022

Abstract

This research investigates which factors influence an entrepreneur's likelihood to innovate. More specifically, this study focuses on four factors: motivation for entrepreneurship and risk behavior at the individual level and governmental support and market barriers at the country level. This research performed a multilevel ordered logistic regression to model the relationship between these factors and innovation. Therefore, a repeated cross-sectional dataset from 2014 to 2018 is used. The study finds that entrepreneurs driven by opportunity are more likely to develop process and product innovations than necessity-driven entrepreneurs. Moreover, risk-averse entrepreneurs are less likely to develop product innovation than risk-loving entrepreneurs. However, the opposite relationship happens for process innovations, meaning risk-averse entrepreneurs are more likely to engage in process innovation. Regarding the macro aspects, this study establishes that entrepreneurs are more likely to develop product and process innovations in a country with high governmental support for entrepreneurship. Furthermore, entrepreneurs are more likely to create product innovation in a country with a higher free entry into the market. On the other hand, countries with strong intellectual property rights protection discourage opportunity-driven entrepreneurs from developing process innovation. Lastly, industry characteristics may play a crucial role when deciding to innovate, yet this topic is left for further research.

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Content

1. Introduction

It is well known that entrepreneurship and innovation are important factors of economic growth (Solow, 1956, Romer, 1986, Wong et al., 2005). However, do entrepreneurs always innovate? For Schumpeter, entrepreneurs are key players in innovation (Wong et al., 2005). Nevertheless, diverse literature has shown that entrepreneurs are not necessarily innovative (Hurst & Lusardi, 2004, Anokhin & Wincent, 2011). Some ventures arise from the imitation of other products or services.

This topic is worth studying for several reasons. First, since entrepreneurship and innovation are important factors for economic growth, policymakers must understand what factors can foster or hinder these activities. For example, in Latin American countries, the rate of entrepreneurship is high compared to other comparable countries, yet the levels of innovation are lower compared to other regions (Lederman et al., 2014). Policymakers in developing countries tend to encourage entrepreneurship more broadly, generating little impact on economic growth, innovation, and productivity (Olafsen & Cook, 2016). Public policies should recognize the different characteristics of entrepreneurs to be effective. Several reviews have noted that these countries fail to differentiate between these characteristics, such as motivation for entrepreneurship, necessity, and opportunity, making public policies ineffective in shaping innovation and economic growth. (Olafsen & Cook, 2016). For this reason, different entrepreneur- and country-level characteristics should be analyzed when studying entrepreneurship and innovation.

This research aims to study why some entrepreneurs innovate and others do not and which factors could explain innovation behavior. More precisely, *what is the role of motivation for entrepreneurship and risk attitudes in product and process innovation? And how do governmental support and free entry into the markets affect the decision of entrepreneurs to develop product and process innovations*? Therefore, this research studies two individual characteristics and two macroeconomic factors that may influence entrepreneurs' innovative decisions. It is also examined whether a country with high protection of intellectual property rights can affect opportunity-driven entrepreneurs' decision to innovate.

Several previous papers have shown that opportunity entrepreneurs positively impact innovation while necessity entrepreneurs have a negative or insignificant effect on innovation performance (Mrożewski & Kratzer, 2016; Anokhin & Wincent, 2011). On the other hand, there is no consensus on how risk attitudes affect entrepreneurs' innovations. For example, Kollinger (2018) found no significant effects of risk-loving entrepreneurs on innovations compared to risk-averse entrepreneurs. However, other papers suggested a positive impact of risk-loving entrepreneurs on innovation (Zwan et al. (2016); Block et al., 2009). Past findings concerning the effect of governmental support for SMEs have also been ambiguous; depending on how the policy is formulated, it could promote or hinder innovation (Patanakul and Pinto, 2014). Finally, free entry to the market, a proxy for competition, can affect innovation in several ways. For example, Schumpeter (2008) suggests that high competition hinders innovations since imitation is more likely to occur. In contrast, the "escape competition effect" says that high competition may push firms to innovate for survival in the market (Aghion et al., 2018).

As it is observed, several studies analyze how individual and country-level characteristics may affect innovation. However, this paper makes the following contributions: First, few papers study how these factors affect different types of innovation (product and process innovation). Product and process innovation differ in their characteristics. While process innovations are firm-specific, product innovations are essential at an industry level (Damanpour, 1996; Bergfors & Larsson, 2009). Moreover, product innovations aim to satisfy consumer needs, while process innovations seek to improve internal efficiency (Fagerberg, 2013; Maier, 2018). Due to these differences, this paper wants to analyze whether the effect of the two individual level and country level characteristics also differs between product and process. In that case, this information may help policymakers adopt adequate measures to foster a specific innovation type. Second, since there is no consensus on how risk attitudes affect innovation performances, this paper contributes to the debate and complements the literature on how this factor affects innovation. Thirdly, this study differs from others since it does not study how tax affects SMEs' innovations but how these policies affect nascent entrepreneurs' innovative decisions. Lastly, policymakers tend to formulate broad policies to foster entrepreneurship and innovation. Still, some of these policies tend to be ineffective in increasing innovation, employment, and productivity because they do not consider several

individual characteristics (Olafsen & Cook, 2016). Therefore, this paper emphasizes the importance of considering various individual and country-level factors when formulating policies to encourage entrepreneurship and innovation. Enriching politicians' knowledge on this topic is essential for improving public innovation policies.

The research performs a multilevel analysis using repeated cross-sectional data, with the most recent GEM baseline (2014-2018). Therefore, with a hierarchical dataset, this research investigates how entrepreneurial motivation, risk attitudes, government support for new SMEs, and free entry into the market can impact the probability of an entrepreneur to innovate, specifically in product and process innovation.

2. Theoretical Background

This section explains several definitions to understand the research's aim deeply. Firstly, innovation and entrepreneurship are defined. Secondly, this section discusses how individual characteristics can explain innovation heterogeneity among entrepreneurs. Then, it is assessed how country characteristics can affect the degree of innovation among entrepreneurs. Finally, this section discusses the role of protecting intellectual property rights and opportunity-driven entrepreneurs on innovation.

2.1 Innovation and entrepreneurship

Due to the effect of innovation and entrepreneurship on economic growth and development (Wong et al., 2005), it is crucial to understand what factors promote these activities.

What is innovation?

Invention and innovation are terms that are used interchangeably. However, an invention describes the first generation of a new idea, while an innovation is defined as the commercialization of this new idea (Fagerberg, 2013). The concept of innovation arose in the 1950s when Solow discovered that technological change was one of the prime drivers of economic growth (Wong et al., 2005). Nowadays, system models are used to explain innovation. It analyzes the role of various actors and activities in generating innovation. It is a model that analyzes the whole context and helps detect bottlenecks in innovation. This thesis intends to investigate how various factors addressed in the system model help generate or prevent the development of product and process innovations.

Moreover, innovation can also be categorized into several types. Schumpeter identified five categories: new products, new methods of production, new sources of supply, the exploitation of new markets, and new ways to organize a business. (Fagerberg, 2013). Today, product and process innovation are the best-known types of innovation. Product innovation refers to introducing a new product or service to the market or improving an existing product. On the other hand, process innovation refers to improving how a service or good is produced (Fagerberg, 2013).

But then, what role does entrepreneurship plays in innovation? There is a traditional stream in entrepreneurship studies where entrepreneurship and innovation are seen as two linked terms (Anokhin & Wincent, 2011). This concept started with Schumpeter in 1911; he established the entrepreneur as an innovator and, therefore, the key to economic growth (Wong et al., 2005).

From that moment on, it was assumed that high rates of innovation in a country were associated with high rates of new ventures (Anokhin & Wincent, 2011). In fact, Wennekers and Thurik (1999) developed a model showing how new ventures through innovation generate economic growth. Likewise, other studies have shown a positive impact between startups and annual economic growth (Acs et al., 2013).

However, recent literature has disagreed with the uniformly positive relationship between entrepreneurship and innovation (Anokhin & Wincent, 2011). Some literature has indirectly shown a negative relationship between startup and innovation (Anokhin & Wincent, 2011). On the one hand, early-stage startups are generally recognized as scarce resources and therefore have greater difficulty innovating (Hurst & Lusardi, 2004, Anokhin & Wincent, 2011). In fact, in the following work by Schumpeter in 1942, he stated that innovation comes from large companies rather than new Enterprises.

Anokhin and Wincent (2011) found evidence for a non-uniform relationship between entrepreneurship and innovation in a cross-country analysis. The authors found that in developed countries, there is a positive association between Total early-stage Entrepreneurial Activity rates (TEA) and innovation, whereas developing countries encounter the opposite situation. The main explanation for the previous results is the entrepreneur's motivation when funding a new startup. Specifically, entrepreneurs in developing countries enhance less-developed opportunities associated with lower innovation rates.

Therefore, entrepreneurship is not defined as an innovative activity but as the creation of a business. This paper defines entrepreneurship as "the introduction of new economic activity that leads to change in the Marketplace" (Davidsson, 2016). The study analyzes why the degree of innovation varies among entrepreneurs. In similar studies, authors evaluated the impact of individual, environmental, and country-level characteristics on innovation. This research examines individual factors (entrepreneur characteristics) and country-level characteristics with repeated cross-sectional data.

2.2 Entrepreneur Characteristics

Motivation for entrepreneurship

People become entrepreneurs for positive (pull motives) or negative reasons (push motives). Some people are driven by necessity, while others are driven by opportunity. A person who is driven by necessity is motivated by push factors. In contrast, a person driven by opportunity is motivated by pull factors (Hessels et al., 2008). Push motives refer to negative aspects like unemployment or pressure from friends or family. In contrast, pull motives refer to positive factors such as the generation of new income and new market opportunities (van der Zwan et al., 2016). These concepts become transparent in the global entrepreneurship monitor.

Motivation for entrepreneurship can affect an entrepreneur's innovation performance, as a necessity-driven entrepreneur has lower aspirations than an opportunity entrepreneur, thus affecting innovation levels (Reynolds et al. 2002). In addition, as necessity-driven entrepreneurs are more present in developing countries, they may face different financial, human capital, or technological constraints that make it challenging to generate the desired level of innovation or job creation (Hessels et al., 2008).

Diverse literature shows that entrepreneurial motivation can positively or negatively affect innovation. For example, Mrożewski and Kratzer (2016) suggest that opportunity entrepreneurship and innovation have a positive relationship while necessity entrepreneurship negatively affects innovation. As mentioned before, Anokhin and Wincent (2011) also identified how different motivations affect entrepreneurs' innovation. Necessity entrepreneurs, more common in developing countries, are usually known as self-employed. Therefore, entrepreneurship becomes their only option for employment. While in developed

countries, entrepreneurs are looking for high-quality opportunities. This translates into technological breakthroughs and, thus, innovation. (Anokhin & Wincent, 2011, Shane,2009).

Fewer papers make a distinction between the type of innovation. Darnihamedani and Hessels (2016), show that necessity entrepreneurs are less likely to develop process innovations than opportunity-driven entrepreneurs; this could be explained by the low levels of education necessity entrepreneurs may have (Hessels et al., 2008). However, this study also demonstrates that necessity entrepreneurs with high levels of education are more likely to develop product and process innovation (Darnihamedani and Hessels 2016). Although other studies do not specifically analyze the effect of entrepreneurial motivation between process and product innovation, they do include this variable as a control in their models. On the one hand, Schott and Jensen (2016) found that opportunity-driven entrepreneurs are more likely to develop product innovations than process innovations. Also, Hoogendoorn et al. (2020), in cross-sectional data from 2009, found that opportunity-driven entrepreneurs are more likely to develop product and process innovation. Considering the previous evidence, this research places motivation for entrepreneurship as the main factor explaining entrepreneurs' innovation heterogeneity. Also, this study differs from the others since it uses repeated cross-sectional data instead of the standard cross-sectional data of the previous papers mentioned. Also, it analyzes more recent periods than previous literature so that the results may be more relevant to the current context. Finally, there is minor literature regarding process innovation. Therefore, this research intended to complement the literature regarding entrepreneurship motivation and the effect on types of innovation.

H1: Opportunity-driven entrepreneurs are more likely to innovate than necessity-driven entrepreneurs.

H1a: Opportunity-driven entrepreneurs are more likely to develop process innovation than necessity-driven entrepreneurs.

H1b: Opportunity-driven entrepreneurs are more likely to create product innovations than necessity-driven entrepreneurs.

Risk behavior

Besides entrepreneurs' motivation, risk tolerance may play an important role when deciding to innovate. Usually, innovative activities imply an amount of risk and uncertainty

that some entrepreneurs are willing to tolerate (Koellinger, 2008). Several factors are involved when deciding to innovate, which can make innovation a risky activity. These factors are financial resources, preferences, and opportunity cost (Hamilton & Harper 1994; Gifford, 1992; Evans & Leighton 1989). Therefore, it is considered that risk loving entrepreneurs are more likely to innovate compared to risk-averse entrepreneurs. A study by Block et al. (2009) in Germany found that opportunity-driven entrepreneurs were likelier to be risk loving than necessity-driven entrepreneurs. Therefore, since literature has shown that opportunity entrepreneurs are more innovative than necessity entrepreneurs (Mrożewski and Kratzer, 2016), a risk-taker entrepreneur is likelier to innovate.

However, there is no consensus about the relationship between risk-averse entrepreneurs and innovation. For instance, Koellinger (2008), using the GEM database from 2020 to 2004, found no significant effect of risk loving entrepreneurs on innovation compared to risk-averse individuals. However, they claimed this lack of significance might be associated with how risk aversion is measured in the GEM dataset. Moreover, van der Zwan et al. (2016) demonstrated that in Asia, risk loving individuals are more likely to be involved as opportunity entrepreneurs than necessity entrepreneurs. However, the general sample did not find a significant effect of risk attitudes between opportunity and necessity entrepreneurs.

Furthermore, the theory states that risk attitudes may vary according to the economic reference points of each individual. Therefore, according to their reference point, an individual with nothing to lose is usually riskier than one in a gain position. In this sense, unemployed or necessity-driven individuals are expected to be more innovative than opportunity entrepreneurs (Koellinger, 2008).

In summary, there are diverse points of view regarding risk entrepreneurs and their relationship with innovation. Therefore, this study intended to complement the debate about the relationship between these two factors and contribute empirical evidence to the current literature.

H2: Risk-loving entrepreneurs are more likely to innovate than risk-averse entrepreneurs.

H2a: Risk-loving entrepreneurs are more likely to create product innovations than risk-averse entrepreneurs.

H2b: Risk-loving entrepreneurs are more likely to develop process innovation than risk-averse entrepreneurs.

2.3 Country characteristics

In addition, Entrepreneurship and innovation do not occur in an exogenous environment. Different factors could hinder or encourage entrepreneurship or innovation. Therefore, it is important to analyze the national context of entrepreneurs (GEM, web page).

Taxes and regulations

Due to the importance of innovation and entrepreneurship in economic growth, governments design and implement various public policies to encourage these activities (Lundstrom and Stevenson 2005; Wong et al. 2005). Entrepreneurs need government support to help overcome the risk associated with innovation (Wu et al. 2010) or with financial backing (Audretsch, 2004).

Financial support from the government can be translated into taxed releases, loans, or a communication channel between investors and entrepreneurs (Wong et al., 2005). However, not all regulations or public policies promote innovation; some can even hider this activity (Patanakul and Pinto, 2014). According to the theoretical framework proposed by Patanakul and Pinto, 2014, an effective policy encourages innovation if it considers three conditions:1) creates a favorable environment,2) creates an environment for innovation to flourish, and 3) a clear and specific goal and target. On the one hand, having a favorable business environment encourages the firm to undertake innovative activities. This can be through taxes credits or other fiscal policies. Secondly, it is important that the policies can stimulate innovation to flourish. This can be through improvements in infrastructure and communication and by encouraging the exchange of ideas and information among the various actors. Finally, the policy must have a clear and specific goal. For example, public environmental policies encourage renewable energy use (Patanakul and Pinto, 2014). Moreover, in a study by the World Bank in Latin American countries suggested that when the environment is favorable, entrepreneurs take risks and invest in innovation (Lederman et al., 2014).

Also, the impact of public policies on innovation can depend on the type of innovation. Some can encourage process innovation, while others can produce product innovation (Ashford, 2000). For example, in the case of environmental public policies, this

may encourage changes in processes rather than the creation of new products and services (Hoogendoorn et al., 2015). This may occur since regulating how a product is produced is easier than changing the product itself (Hoogendoorn et al., 2015).

The theoretical framework proposed by Patanakul and Pinto (2014) argued that government support through a tax credit or fiscal stimulus for small enterprises promotes innovation. However, there is insufficient empirical evidence of how tax credits affect entrepreneurs' innovation (Wang & Kesan, 2017). Wang & Kesan (2017), based in Chinese SMEs, found that software and IT industries increase R&D investments and patents with a favorable corporate tax policy. However, the value-added tax policies did not significantly impact R&D and patent applications.

Empirical studies have shown that environmental regulations promote innovation. However, this depends on several factors, such as the measure of innovation, industry, and the type of environmental regulations (Hoogendoorn et al., 2020). For example, Hoogendoorn et al. (2020) found a negative relationship between environmental taxes and process innovation in a cross-sectional dataset from GEM and a multilevel model. However, they did not find significant evidence for product innovation. Nevertheless, with a cross-level interaction, they suggested that green startups develop more product innovations than process innovation in a country with stronger environmental regulations. This may happen because some legislation may encourage the consumption of green products, which may pressure the firm to create this type of product (Hoogendoorn et al., 2015).

This study differs from others since it does not study how tax affects SMEs' innovations but how these policies affect nascent entrepreneurs' decisions to innovate (product or process innovation). In this study, the measure of governmental support from the GEM is used. The measure captures the "Taxes or regulations are either size-neutral or encourage new and SMEs" (GEM, n.d.).

H3: Innovations are more likely to occur in countries that encourage the formation of SMEs through public policies.

H3a: Product Innovations are more likely to occur in countries that encourage the formation of SMEs through public policies.

H3b: Process Innovations are more likely to occur in countries that encourage the formation of SMEs through public policies.

Free entry

One dimension considered in free competitive markets is the free entry of firms into the economy (OCDE,2021). A competitive market must fulfill several conditions like a high number of competitors, common knowledge about opportunities, and free entry into the market (Cournot,1938). Therefore, in some cases free entry and exit are associated with free perfect competition, while in some cases, high entry barriers can lead to a monopoly scenario (Lynham, 2018). These barriers are considered legal, technological, or market pressures that prevent new firms from entering the market (Lynham, 2018).

Diverse literature has studied the relationship between competition and innovation. However, the effect competition has on innovation may vary. On one side, Schumpeter (2008) suggested that high competition hinders innovation. With increased competition (high entry of firms into the market), imitations are more likely to occur. Therefore, there are low incentives to innovate (Aghion and Howitt 1996). Also, when the competition is limited, entrepreneurs may innovate to gain a technological advantage and a temporal monopoly power.

Conversely, tough competition may induce firms to innovate to make a profit and survive, known as the escape competition effect (Aghion et al., 2018). Moreover, in a high-competition market, entrepreneurs can learn from others and become more innovative (Nakara et al., 2019). An empirical study by Darnihamedani (2016) found that tough competition increases a startup's innovation due to the escape competition effect. In summary, "In a free competitive market, each firm innovates and develops risky strategies to gain a competitive advantage over its rivals"(OCDE,2021).

Free market entry may affect the two types of innovation differently. Klepper (1996) studied the sectorial patterns of innovation in the industry life cycle. He observed six regularities of an industry's life cycle, three related to entry and exit:1) Over time, the entry slows down, 2) The number of producers increases at the early stages but later decreases, and 3) The market share stabilizes.

In a young industry stage, most product innovations are introduced by new enterprises. Therefore, in the early stages, there are mainly product innovations compared to process innovation; however, this is the opposite in later stages. This does not mean that in the early

stages, there is no process innovation; however, there is much more product innovation compared to process innovation. To explain the above, Keppler argued that incumbents focus on process innovations, leading to a decrease in the average cost, hence a decline in prices. This implies that less innovative incumbents exit the market. However, new nascent entrepreneurs can enter with a new product that could let them earn monopoly profits. Nevertheless, incumbents continue increasing production and decreasing prices, which creates barriers to new enterprises (Klepper, 1996).

When there is free entry into the market, there are more product innovations than process innovations in the early stages. Therefore, this research intended to demonstrate the following hypothesis.

H4: Innovations are more likely to occur in countries where entrepreneurs can easily enter the market.

H4a: Product innovations are more likely to occur in countries where entrepreneurs can easily enter the market.

H4b: Process innovations are less likely to occur in countries where entrepreneurs can easily enter the market.

Moderating effect of IPR

Also, this paper studies the effect of opportunity-driven entrepreneurs on innovation in a country with high protection of property rights (IPR). Specifically, this research examines if the positive impact of opportunity-driven entrepreneurs on innovation diminishes in a country with strong protection of IPR. The institutional framework has shown that the protection of IPR can promote innovation activities (Rapp et al., 1990). Furthermore, without the protection of IPR, the innovator does not receive any compensation, which discourages him from continuing to do these activities. Therefore, since there are no incentives to innovate, everyone waits until someone else tries to develop a product or process innovation. Then no one will innovate, and there will be technological backwardness. Therefore, intellectual property rights are an essential factor that impacts individual economic behavior (Rapp et al., 1990).

Nevertheless, literature has also demonstrated that excessive protection of IPR can harm innovation. This is because strong “IPR may inhibit the free flow and diffusion of

scientific knowledge" (Gangopadhyay & Mondal, 2012). Some authors proposed an inverse U-shaped relationship between innovation and IPR. On one side, strong IPR may increase the benefits of the inventor; however, on the other side, it may limit the diffusion of knowledge (Gangopadhyay & Mondal, 2012). In the paper by Ács and Sanders (2008), they found that high patent protection encourages knowledge creation; but, it discourages commercialization. This is because the investor's income increases, so it is no longer attractive for the entrepreneur to commercialize the invention. Therefore, their study found that the relationship between innovation and the protection of property rights has an inverted U-shape. When the protection is very low or very strong, this discourages innovation.

On the other hand, Pathak et al. (2013) research showed a similar relationship between IPR and technological entrepreneurship. They said that strong protection of property IPR discourages technological entrepreneurship in emerging countries. However, this holds in countries with low FDI. The literature continues to be diverse regarding the relationship between IPR and innovation.

It is important to study the effect of IPR on opportunity-driven entrepreneurs since, as stated in the literature, opportunity entrepreneurs are the agents that innovate (Mrożewski and Kratzer, 2016). In other words, opportunity entrepreneurship generates innovation and, therefore, economic growth (Slow, 1956, Romer, 1986, Wong et al., 2005). However, strong IPR may hinder opportunity-driven entrepreneurs from innovating (Pathak et al, 2013). Thus, these results could help policymakers to set an optimal level of IPR.

There is almost non-existent literature on how strong IPR could affect driven opportunity entrepreneurs' decision to innovate. Also, most research studied the effect of IPR on innovation or product innovation, but not in process innovation. Therefore, this study intends to demonstrate the following hypothesis:

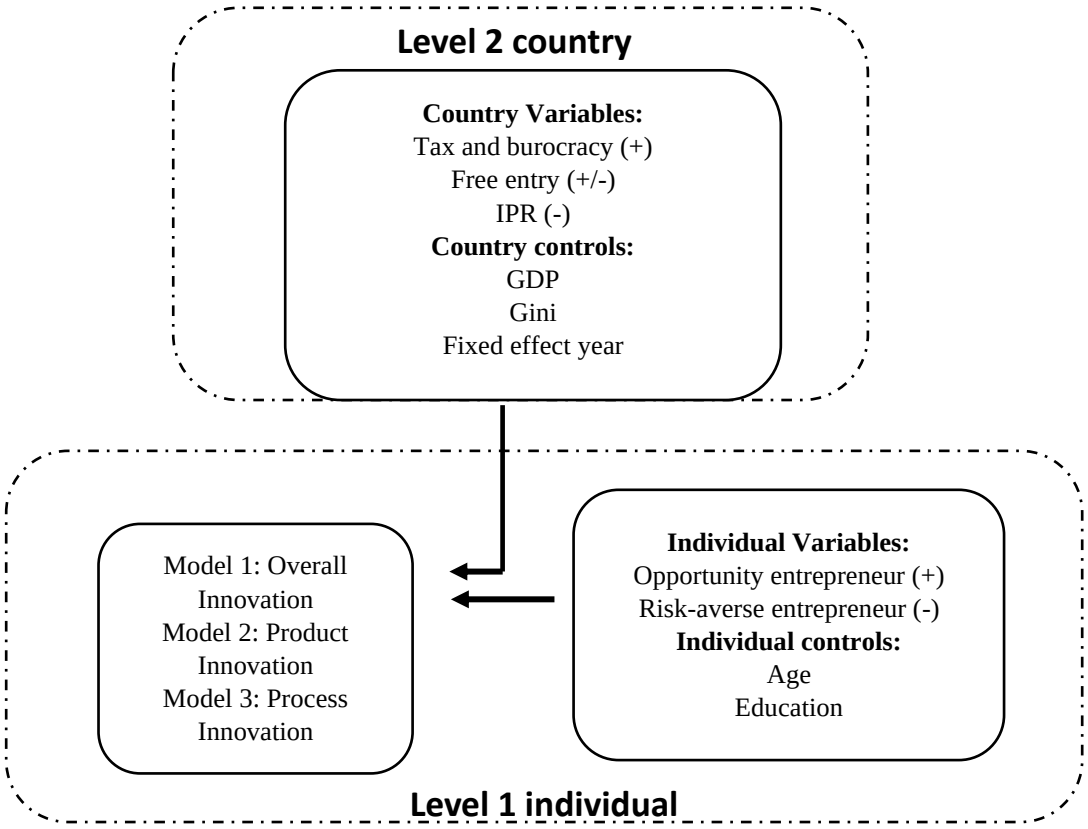
H5: Strong protection of intellectual property rights negatively moderates the positive effects of opportunity-driven entrepreneurs on their innovation performance.

H5a: Strong protection of intellectual property rights negatively moderates the positive effects of opportunity-driven entrepreneurs on product innovation

H5b: Strong protection of intellectual property rights increases the positive effects of opportunity-driven entrepreneurs on process innovation.

The following figure shows the theoretical model of this research

Figure 1: Theoretical Model



Note: The figure was constructed by this author, however the idea was taken from Pathak et al. 2013. This figure explains the relationship of the level 1 and 2 variables with the three dependent variables.

3 Data

A repeated cross-sectional database with individual and country-level variables is constructed to test the different hypotheses. The sample goes from 2014 to 2018 and contains the individual responses of 65 countries. The individual variables were taken from the Adult Population Survey (APS) carried out by the global entrepreneurial monitor carried out each year in 65 countries (not all countries have complete information for the five years)[1]. The country-level variables were taken from the Global Monitor entrepreneurship framework, The World Bank, and the intellectual property rights index. In table 1, there is a description of the variables, the level, and the source from which they were taken.

Table 1: Description of the variables

[1] in appendix A table 1 , It can be found the countries and the number of observations per year for each country.

Description of variables				
Name	Description	Level	Source	Variable
Innovation	Overall Innovation. Categorical variable*	Individual	GEM - APS	Dependent
Iproduct	Product Innovation. Categorical variable*	Individual	GEM - APS	Dependent
Iprocess	TEA: Were the technologies or procedures available more than a year ago? Categorical variable*	Individual	GEM - APS	Dependent
Opportunity	Involved in opportunity early-stage Entrepreneurial Activity. Yes equal to 1	Individual	GEM - APS	Independet
Necessity	Involved in Necessity early-stage Entrepreneurial Activity. Yes equal to 1	Individual	GEM - APS	Independet
Fearfail	Qi4. Would fear of failure would prevent you from starting a business? Yes equal to 1	Individual	GEM - APS	Independet
Tax_bur	taxes or regulations are either size-neutral or encourage new and SMEs	Country	GEM - Framework conditions	Independet
Free_entry	The extent to which new firms are free to enter existing markets	Country	GEM - Framework conditions	Independet
IPR	Intellectual property right protection score	Country	Intellectual property right Index	Moderator
UNEDUC	UNEDUC. UN harmonized educational attaiment	Individual	GEM - APS	Control
male	dummy male equal 1	Individual	GEM - APS	Control
age	What is your current age (in years)?	Individual	GEM - APS	Control
TEAISIC4_1D	TEA: Industry ISIC version 4, 1-digit code	Individual	GEM - APS	Control
Country	Country	Individual	GEM - APS	Control
Gini_final	Gini index	Country	World Bank	Control
GDP	GDP, PPP (constant 2017 international $)	Country	World Bank	Control
Yrsurv	Year survey was administered	Individual	GEM	Control

* The overall innovation, product and process innovation variables are explained in detail in the next subchapter.

The construction and cleaning of the dataset followed different steps:

1. The GEM website contains yearly databases at the individual and country level. The APS responses from 2014 to 2018 were appended as a first step. Then, homogenization of the variables was performed. For example, in the APS 2018 database, the educational level has a different scale than in previous years, so the educational level was recoded for 2018. Likewise, to create the innovation variables, the response categories had to be recoded.

2. Subsequently, a similar process was carried out with the country framework databases. The databases from 2014 to 2018 were merged.
3. At the same time, a database for the country control variables was constructed. First, the data from the world bank and the intellectual property rights data were merged. Then, this controls database was pasted with the country framework conditions dataset.
4. Finally, the dataset of the previous step was merged with the individual responses from step one. This was the final dataset used in the hypotheses analyses. The database is composed of hierarchical variables. That is to say that, for example, all the individual responses of 2014 in the United States have the same GDP value.
5. Finally, the database was cleaned. The observations with missing values were eliminated because these data are not considered in the regression models.

Dependent variable

Although innovation has not had a precise measure, there are three different types of measurement, input, intermediate, and output. Each measure has distinct advantages and disadvantages (Fagerberg, 2013). This study uses an output innovation measure. Although output measures can be less precise than input measures, they reflect the actual innovation.

In this research, innovation, product, and process innovation are constructed using the same methodology as Hoogendoorn et al. (2020). Three questions are taken from the Adult Population Survey (APS), the global entrepreneurship monitor. This survey is done worldwide and contains around 2000 participants per country. However, only the entrepreneurs' responses (part of the Total Early Entrepreneurial Activity) are used in this dataset. The three questions are as follows:

a. "Do all, some, or none of your potential customers consider this product or service new and unfamiliar?" all (value 3), some (value 2), or none (value 1).
b. "Right now, are there many, few, or no other businesses offering the same products or services to your potential customers?" no (value 3), few (value 2), or many (value 1).

c. "Have the technologies or procedures required for this product or service been available for less than a year, between one to five years, or longer than five years?" less than a year (value 3), between 1 to 5 years (value 2), or longer than five years (value 1)

The overall innovation variable is the average of questions a, b, and c. Production innovation is the average of questions a and b, and process innovation is the answer to question c. Note that these variables are ordered categorical variables. The innovation index has seven categories, production innovation five, and process innovation three. For the three innovation measures, a high score means higher innovation. In the next three tables it can be seen the frequency of entrepreneurs in each innovation category. In Table two table 2 it can be seen that about 71% of the entrepreneurs in the dataset have low levels of innovation performance (entrepreneurs in categories 1, 1.3, and 1.7). This supports the definition of entrepreneurship, where not all entrepreneurs are innovators (Davidsson, 2016). A similar situation occurs with product and process innovation. Comparing process and product innovation, 13.55% of entrepreneurs are in the highest process innovation category, while only 11.77% are in the two highest product innovation categories. Three graphs were created to understand the distribution of the dependent variables better. These graphs can be found in the appendix. As can be seen, most entrepreneurs are in the lowest categories of innovation (as well as product and process innovation). This means that most of the entrepreneurs in the sample are low performers on innovation. However, this does not create a selection bias since the number of observations in the dataset is considerable.

Table 2: Tabulation of Innovation categorical variable

	Freq.	Percent	Cum.
1	19497	27.86	27.86
1.3	16076	22.98	50.84
1.7	16091	23.00	73.84
2	10252	14.65	88.49
2.3	5692	8.13	96.62
2.7	1745	2.49	99.12
3	618	0.88	100.00
Total	69971	100.00	

Table 3: Tabulation of Product innovation categorical variable

	Freq.	Percent	Cum.
1	25273	36.12	36.12
1.5	19226	27.48	63.60
2	17235	24.63	88.23
2.5	5948	8.50	96.73
3	2289	3.27	100.00
Total	69971	100.00	

Table 4: Tabulation of Process Innovation categorical variable

TEA: Were the technologies or procedures available more than a year ago?	Freq.	Percent	Cum.
Now New Technology (more than 5 years)	45933	65.65	65.65
New technology (one to 5 years)	14557	20.80	86.45
Very latest technology (newer than one year)	9481	13.55	100.00
Total	69971	100.00	

Independent variables

Different independent variables are constructed since the research aims to answer how several factors affect entrepreneurs' innovation. These variables can be grouped into individual-level and country-level characteristics

Individual-level variables

This research analyzes two individual-level variables: motivation for entrepreneurship and fear of failure. Similar to the dependent variable, two questions from the APS are used to measure entrepreneurs' motivation. On the one hand, Opportunity entrepreneurship is a variable dummy that takes the value 1 if the entrepreneur was motivated by a business opportunity. On the other hand, necessity opportunity is a dummy that takes the value 1 if the entrepreneur were motivated by necessity. Both questions were asked to participants aged 18-64 who are part of the Total Early Entrepreneurial Activity (TEA). TEA is defined as nascent entrepreneurship or owner-managers of a new business with no more than 42 months of activity (Angulo-Guerrero et al., 2017). Table 6 shows that 24% of entrepreneurs are driven by necessity, while 72% are driven by business opportunities. Almost everyone who is not driven by opportunity is driven by necessity. Therefore, in the model, the dummy used is opportunity-driven; it takes value 1 if the entrepreneur is driven by opportunity and 0 by necessity.

Rate of failure

The fear of failure from the GEM survey was taken as a proxy for risk-averse measurement. They asked the entrepreneur if "fear of failure would prevent you from starting a business" (Global Entrepreneurship Monitor, 2014–2018). If the answer is yes, the variable takes values 1 and 0 otherwise. A value of 1 means that the entrepreneur is risk-averse; otherwise is a risk-loving entrepreneur. As shown in Table 6, 29% are risk-averse. Missing values were eliminated from the dataset. These were people who refused to answer or did not know their preferences.

Country-level characteristics

Entrepreneurship and innovation are not exogenous variables. Diverse context characteristics may affect the decision of an individual to create a new enterprise or innovate (GEM, n.d; Romer, 1986). Therefore, two country-level factors are analyzed: free entry into the market and government support.

Free entry and exit

The GEM explains that free entry refers to "The extent to which new firms are free to enter existing markets" (GEM, n.d). The score ranges from 1 to 5; however, in the sample, the minimum score is 1.29, and the maximum score is 3.73. A higher score means free mobility for companies in the market. The average score across countries is 2.55

Government Policies: Taxes and Bureaucracy:

As in the previous case, governmental support is measured in the national expert survey from the GEM. This variable is defined as "The extent to which public policies support entrepreneurship - taxes or regulations are either size-neutral or encourage new and SMEs" (GEM, n.d). The maximum value in the sample is 3.87. That is, no country offers entirely favorable policies to encourage new businesses. The average governmental support across countries is 2.36, which means there are generally few tax and regulatory policies that encourage new enterprises.

Moderator

This research uses the *protection of intellectual property rights* as a moderator variable. For this variable, it uses the International Property Rights index. This index covers about 129 countries and comprises different categories such as political environment and

physical and intellectual property rights. Although this index covers various categories, this study only focuses on the protection of intellectual property rights. The score ranges from 1 to 10, with 10 being strong protection of intellectual property rights (*IPRI Countries*, n.d.). The average IPR score is 5.99, with a maximum value of 9.1 and a minimum value of 2.4.

Controls

This study includes several individual and country-level controls. Several studies have used important controls such as the GINI index, education attainment, GDP, age, and gender (Mrożewski, M., & Kratzer, J. 2016, Ács, Zoltán J.; Sanders, Mark 2008). Age and education attainment are part of the APS, while the others are from the World Bank database (World Bank Open Data | Data, 2014–2018). Since GDP is skewed to the right, a logarithmic transformation is used. A logarithmic transformation normalizes the distribution for better interpretations. Also, the model includes year-fixed effects to control for unobserved characteristics of each year.

As seen in table 5, secondary education is the level with most entrepreneurs, followed by the first stage of tertiary education, which includes bachelor and master's. Also, only 2.27% of entrepreneurs have achieved a PHD degree. On the other hand, 38 years old is the average age in the sample and 57% are male.

Table 5: Tabulation of education

UNEDUC. UN harmonized educational attainment	Freq.	Percent	Cum.
Pre-primary education	1458	2.16	2.16
Primary education or first stage of basic education	5805	8.59	10.74
Lower secondary or second stage of basic education	9792	14.48	25.23
(Upper) secondary education	22419	33.16	58.39
Post-secondary non-tertiary education	8304	12.28	70.67
First stage of tertiary education	18295	27.06	97.73
Second stage of tertiary education	1533	2.27	100.00
Total	67606	100.00	

Table 6: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Innovation	69971	1.5441	.4769	1	3
Product Innovation	69971	1.5766	.5519	1	3
Process Innovation	69971	1.479	.7215	1	3
Necessity	69971	.2409	.4276	0	1
Opportunity	69971	.7261	.446	0	1
fearfail	69971	.2985	.4576	0	1
IPR	69971	5.993	1.4583	2.4	9.1
tax bur	69971	2.3676	.5081	1.28	3.87
free entry	69971	2.5552	.3635	1.29	3.73
education	69971	3.3757	1.4008	0	6
age	69971	38.0544	12.1186	17	79
male	69971	.5738	.4945	0	1
log GDP	69971	27.2891	1.5371	24.047	30.6864
Gini	69971	39.0988	7.4963	23.2	65

The correlation table 7 shows that the correlation between the explanatory variables and the controls is not greater than 0.4. Nevertheless, entrepreneurs driven by necessity *(Necessity)* are highly correlated with entrepreneurs driven by opportunity, at 0.92. Then, only one variable is introduced in the models since one is the opposite of the other. Thus, *Opportunity* is a dummy variable where 1 is an entrepreneur driven by opportunity and 0 by necessity. The other correlations range between 0.01 and 0.1. This means that the model has no multicollinearity, according to the 0.4 thresholds (Kennedy, 2003). Moreover, the Variance inflation factor test is conducted to ensure no multicollinearity in the model. Appendix B shows that no variable exceeds the commonly accepted threshold 10 to indicate multicollinearity (Belderbos et al., 2020).

Table 7: Pairwise correlation table

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Innovation	1.000										
(2) Iprocess	0.653***	1.000									
(3) Iproduct	0.869***	0.193***	1.000								
(4) Necessity	-0.056***	-0.017***	-0.062***	1.000							
(5) Opportunity	0.065***	0.028***	0.066***	-0.917***	1.000						
(6) fearfail	-0.019***	0.019***	-0.038***	0.075***	-0.074***	1.000					
(7) IPR	0.038***	-0.081***	0.101***	-0.107***	0.074***	-0.040***	1.000				
(8) tax_bur	0.138***	0.085***	0.123***	-0.073***	0.060***	-0.038***	0.295***	1.000			
(9) free_entry	0.059***	0.017***	0.065***	-0.086***	0.063***	-0.010***	0.456***	0.573***	1.000		
(10) age	-0.019***	-0.055***	0.012***	0.047***	-0.062***	-0.009**	0.157***	0.073***	0.075***	1.000	
(11) male	0.015***	-0.004	0.023***	-0.067***	0.067***	-0.062***	0.062***	0.025***	0.022***	0.006*	1.000
(12) gini_final	-0.034***	-0.051***	-0.011***	0.085***	-0.057***	-0.039***	-0.404***	-0.241***	-0.420***	-0.095***	-0.070***
(13) log_gdp	0.023***	0.006*	0.026***	-0.020***	0.018***	0.039***	0.279***	-0.028***	0.094***	0.047***	-0.004
(14) Pre_primary	-0.014***	-0.005	-0.015***	0.042***	-0.038***	-0.007*	-0.073***	0.051***	-0.051***	0.058***	-0.006*
(15) Primary_educa~n	-0.054***	-0.030***	-0.050***	0.114***	-0.107***	0.027***	-0.149***	-0.087***	-0.088***	0.095***	-0.041***
(16) lower_secondary	-0.037***	-0.016***	-0.038***	0.069***	-0.063***	0.003	-0.082***	-0.039***	-0.042***	-0.014***	-0.020***
(17) secondary_edu~n	-0.003	0.019***	-0.016***	0.010**	-0.006	-0.006	-0.073***	-0.038***	0.010**	-0.095***	0.008**
(18) non_tertiary	0.012***	-0.006*	0.020***	-0.023***	0.016***	-0.006*	0.090***	0.053***	0.018***	-0.012***	0.012***
(19) first_tertiary	0.053***	0.015***	0.059***	-0.121***	0.112***	-0.005	0.187***	0.072***	0.093***	0.032***	0.022***
(20) second_tertiary	0.025***	0.007*	0.028***	-0.031***	0.029***	-0.004	0.008**	-0.010***	-0.039***	0.033***	0.010***

*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

Variables	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(12) gini_final	1.000								
(13) log_gdp	0.027***	1.000							
(14) Pre_primary	0.024***	-0.111***	1.000						
(15) Primary_educa~n	0.149***	-0.047***	-0.044***	1.000					
(16) lower_secondary	0.106***	-0.013***	-0.060***	-0.123***	1.000				
(17) secondary_edu~n	0.059***	-0.027***	-0.102***	-0.210***	-0.284***	1.000			
(18) non_tertiary	-0.070***	0.079***	-0.056***	-0.115***	-0.155***	-0.265***	1.000		
(19) first_tertiary	-0.174***	0.059***	-0.091***	-0.187***	-0.253***	-0.433***	-0.236***	1.000	
(20) second_tertiary	-0.054***	-0.046***	-0.022***	-0.045***	-0.061***	-0.104***	-0.057***	-0.093***	1.000

*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

On the other hand, most variables significantly affect all three measures of innovation. Necessity-driven entrepreneurs negatively and significantly affect the overall, process and product innovation. In contrast, opportunity-driven entrepreneurs have a positive effect on innovation. This suggests the first indication of support for H1, H1a H1b. As for fear of failure, a risk-averse entrepreneur will negatively affect overall and product innovation. However, it positively affects process innovation, suggesting that risk-averse entrepreneurs are more likely to innovate in processes. Analyzing the explanatory variables at the country level, it is observed that free market entry and government support have a positive and significant relationship with innovation.

6. Methodology

The methodology is defined by taking into account two aspects: The hierarchical nature of the data and the categorical order of the dependent variables. A hierarchical dataset is when individual characteristics are nested at a higher level (Sommet & Morselli, 2017). In this case, entrepreneur characteristics are nested in country-level variables. Therefore, a multilevel ordered logistic model is used to analyze the data. A normal ordered logistic regression would raise two major concerns; first, the independence of the residuals' assumption does not hold since the individual characteristics are correlated within countries (Bressoux,2010). Second, the type I error probability is higher if country-level characteristics are not considered. This will occur since the standard errors are very small (Peterson et al., 2012).

The final model is reached by following the steps described by Sommet and Morselli (2017). All of these steps are made for the three dependent variables, and the results can be found in Appendix C.

1. As a preliminary step, the paper suggests cluster or centering the variables to facilitate parameter interpretation. Centering variables refer to when the general mean is subtracted from the predicted variable. On the other hand, cluster is when the cluster-specific mean is subtracted from the predicted variable. However, in this case, this preliminary step is not performed. Centralizing the variables is not necessary for performing a multilevel analysis. In fact, it is suggested that the results are similar in a model where the variables are centered compared to one in which they are not (Echambadi & Hess, 2007). Therefore, in this study, this step was ignored.

2. An empty multilevel ordered logistic model was run as a second step to identify if there is a significant variance between clusters, in this case, between countries. An empty model is run without any explanatory variable.

$$Innovation_{ijt} = \beta_{oo} + u_{ojt} \quad (1)$$

$$Product\_innovation_{ijt} = \beta_{oo} + u_{ojt} \quad (2)$$

$$Process\_innovation_{ijt} = \beta_{oo} + u_{ojt} \quad (3)$$

Here, i refers to a particular individual, j refers to a specific country, while t to an specific year. After running the model, the intraclass correlation coefficient is calculated (see equation 4). The ICC goes from 0 to 1, where 0 means that residuals are independent. If this is the case, it means that an entrepreneur's innovation no varies between countries. Therefore, a normal ordered logistic model should be considered. The results of the empty model and ICC for each dependent variable are shown in appendix c:

$$ICC = \frac{var(u_{oj})}{var(u_{oj}) + (\frac{\pi^2}{3})} \quad (4)$$

As observed, in the three models, the ICC is higher than 0.5, which Heck et al. (2013) consider the minimum variance between countries that is needed for a multilevel model. Other authors consider that any across-country variation above 0 justifies using a multilevel model (Aguinis et al., 2013). The total number of observations is 69,971 clustered in 65 countries. For the overall innovation, The ICC result indicates that 8.8% of the variance of the model is explained by differences between countries, while 91.2% is explained by differences within countries (meaning entrepreneur characteristics). For product innovation, the variance between countries is 5.9%. Finally, for process innovation, 22.3% variance of the model is due to differences between countries. An interesting outcome is that for Process innovation, the variance explained by differences in countries is much higher than product innovation. These results suggest that the country-level characteristics could explain the heterogeneity among entrepreneurs' innovation (Kahn, 2011).

3. In the last step, a multilevel ordered logistic model is necessary for modeling the data. However, a third step is necessary to define the multilevel model that best fits the data. In this third step, the constrained intermediate model (CIM) is compared to the augmented intermediate model (AIM). Both models are similar; the difference is that the AIM estimates a random slope variance, in addition to the fixed effects slope (Sommet & Morselli,2017). This means that the AIM model implies that the effect of the level-1 explanatory variable on the dependent variable varies across countries. The CIM model contains all the level 1 and 2 variables but not cross-level interactions. For this model, only the fixed effect slope is estimated:

$$Innovation_{ijt} = \beta_{oo} + \beta_{10}Opportunity_{ijt} + \beta_{20}fearfail_{ijt} + \beta_{01}tax\&bur_{jt} + \beta_{02}free\_entry_{jt} + \beta_{30}Z + \beta_{03}\Upsilon + u_{ojt} \quad (5)$$

$$Product_{innovation_{ijt}} = \beta_{oo} + \beta_{10}Opportunity_{ijt} + \beta_{20}fearfail_{ijt} + \beta_{01}tax\&bur_{jt} + \beta_{02}free\_entry_{jt} + \beta_{30}Z + \beta_{03}\Upsilon + u_{ojt} \quad (6)$$

$$Process\_innovation_{ijt} = \beta_{oo} + \beta_{10}Opportuity_{ijt} + \beta_{20}fearfail_{ijt} + \beta_{01}tax\&bur_{jt} + \beta_{02}free\_entry_{jt} + \beta_{30}Z + \beta_{03}\Upsilon + u_{ojt} \quad (7)$$

Z refers to all individual – level controls
Υ refers to all country – level controls

As a second step, The AIM model is estimated. This model calculates the residual term of the relevant level-1 variables. In this case, the residual error of opportunity entrepreneurship is estimated to determine if an entrepreneur driven by opportunity has different effects on innovation depending on the country. Therefore, the next model is estimated:

$$Innovation_{ijt} = \beta_{oo} + (\beta_{10} + u_{1jt})Opportunity_{ijt} + \beta_{20}fearfail_{ijt} + \beta_{01}tax\&bur_{jt} + \beta_{02}free\_entry_{jt} + \beta_{30}Z + \beta_{03}\Upsilon + u_{ojt} \quad (8)$$

$$Product_{innovation_{ijt}} = \beta_{oo} + (\beta_{10} + u_{1jt})Opportunity_{ijt} + \beta_{20}fearfail_{ijt} + \beta_{01}tax\&bur_{jt} + \beta_{02}free\_entry_{jt} + \beta_{30}Z + \beta_{03}\Upsilon + u_{ojt} \quad (9)$$

$$Process\_innovation_{ijt} = \beta_{oo} + (\beta_{10} + u_{1jt})Opportunity_{ijt} + \beta_{20}fearfail_{ijt} + \beta_{01}tax\&bur_{jt} + \beta_{02}free\_entry_{jt} + \beta_{30}Z + \beta_{03}Y + u_{ojt} \quad (10)$$

The estimates of the CIM and AIM are stored to perform the loglikelihood test.

4. Finally, the likelihood test is performed to compare both models (for each dependent variable). Appendix C shows that the AIM model fits the data better for overall and product innovation. That means an opportunity-driven entrepreneur has different effects on innovation, depending on the country. For example, for product innovation, 5.9% of the effect of opportunity-driven entrepreneurs on innovation is explained by the difference between countries. This means, that the random slope is relevant in the model. However, when the dependent variable is process innovation, a nonsignificant LR test is observed. This suggests that the residual term of the level-1 variable do not improve the model's fit. Thus, there is no evidence of variation from one between countries for opportunity entrepreneurs (Sommet & Morselli,2017).

In conclusion, the AIM model is better for overall and product innovation (equation 8 and 9), while the CIM model (equation 7) is better for process innovation. For the H5 the cross-level interactions are included in the model.

5. Results

The results for each model are shown below. First, the regression results for the multilevel ordered logistic model are displayed for each dependent variable. Given that only the sign and significance of the estimated coefficients can be interpreted, a second table is generated, which displays the estimated effects in the form of odds ratios. The odds ratios provide useful information about the magnitude of the computed effects. Finally, the third table includes a cross-sectional interaction to test H5.

In model 1 Table 8, it is observed that entrepreneurs driven by business opportunities have a positive and significant impact on the overall innovation level compared to necessity entrepreneurs (β:0.249, P-value<0.0001). Similar observations can be made for product and process innovation (β:0.263 P-value<0.001 and β:0.1101 P-value<0.001). Therefore, this finding suggests that entrepreneurs driven by opportunity are more likely to have higher innovation levels than necessity entrepreneurs. Hence, this result supports hypotheses H1,

H1a, and H1b and is coherent with previous research studies (Mrożewski and Kratzer,2016). Now, looking at fear of failure, it is seen that a risk-averse entrepreneur is less likely to innovate (product innovate) compared to risk-loving entrepreneurs (β:-0.072 P- value<0.001 and β:-0.1016 P-value<0.001). However, the opposite holds for dependent variable process innovation. Risk-averse entrepreneurs are more likely to engage in process innovations than risk-loving entrepreneurs (β:0.0364, P-value<0.05). Therefore, H2 and H2a are supported, while H2b is rejected.

The models also show the impact of country-level variables on the entrepreneurs' innovation levels. Firstly, governmental support for SMEs positively impacts the entrepreneur's process and product innovation level (β:0.0871 P-value<0.05 and β:0.3414 P-value<0.001). However, it does not significantly impact the overall innovation level. Hence, there is not enough evidence that supports H3. However, H3a and H3b are supported by the presented results.

Moreover, in a country where enterprises can easily enter the market, the overall innovation level of an entrepreneur is more likely to increase, as well as the product innovation level (β:0.1186 P-value<0.05 and β:0.1685 P-value<0.001). The coefficient also indicates a positive relationship for process innovation, but the effect is insignificant. These results backed H4 and H4a. For H4b, although an easy entry into the market has no negative effect, the positive impact is insignificant. Then H4b is not supported.

Finally, looking at the controls, we can see that higher levels of education have a positive and significant effect on the three measurements of innovation. As the regression results show, the impact of the control variable age on innovation can be modeled through a parabola. This means that people are very innovative when they are young. However, they become less innovative with increasing age until they reach a specific minimum innovation level. Nevertheless, the entrepreneurs become more innovative again after this low point. On the other hand, being a male does not significantly affect the innovation performance of entrepreneurs. As the country-level controls concern, a higher property rights protection discourages entrepreneurs from innovating, especially process innovations. However, the opposite occurs for product innovation, where entrepreneurs are more likely to develop product innovations in countries with higher protection of property rights. Moreover, GDP positively affects the overall innovation level, specifically process innovation. For product

innovation, the effect is positive but not significant. Lastly, the Gini index has a negative and significant impact on process innovation. Therefore, entrepreneurs living in a country with high levels of inequality are less likely to develop process innovations.

Table 8: Multilevel ordered logistic model for the three dependent variables

	(1) Innovation	(2) Iproduct	(3) Iprocess
Level-1 variables			
Opportunity	.2495***	.2638***	.1101***
	(.0347)	(.0328)	(.0187)
fearfail	-.072***	-.1016***	.0364**
	(.0152)	(.0155)	(.0177)
Level-2 variables			
tax_bur	.0425	.0871**	.3414***
	(.0389)	(.0394)	(.026)
free_entry	.1186**	.1685***	.0284
	(.0489)	(.0499)	(.0363)
Controls level 1 and 2			
1.education	.0324	.0483	-.0847
	(.0563)	(.0579)	(.0671)
2.education	.0812	.0953*	.0231
	(.055)	(.0565)	(.0649)
3.education	.1098**	.1229**	.1134*
	(.0535)	(.055)	(.063)
4.education	.1853***	.1995***	-.0028
	(.0559)	(.0574)	(.0658)
5.education	.2744***	.2775***	.1457**
	(.0542)	(.0557)	(.0636)
6.education	.4321***	.4111***	.2928***
	(.0709)	(.0725)	(.0813)
age	-.0297***	-.0214***	-.026***
	(.0035)	(.0035)	(.0041)
agesq	.0003***	.0002***	.0002***
	(0)	(0)	(0)
.male	.0013	.0183	-.0185
	(.0139)	(.0142)	(.0164)
IPR	-.0735**	.0876***	-.2563***
	(.0314)	(.0266)	(.0076)
log_gdp	.0918***	.026	.0876***
	(.0329)	(.0375)	(.0065)
gini	.0031	.0054	-.0185***
	(.0056)	(.0054)	(.0016)
Var(Opportunity	.0793***	.059***	
	(.0164)	(.013)	
Var(_cons[country])	.3645***	.2633***	1.0095***
	(.0604)	(.0456)	(.251)
Observations	69971	69971	69971
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

Table 9 shows the odds ratio of the previous models. The odds are the exponential value of the beta coefficient (from the earlier models). When the odds ratio is higher than one, it means beta is positive, while values below one indicate a negative effect (Pathak et al., 2013). First, individual-level characteristics are analyzed. The odds of being in higher innovation levels are 28% higher for opportunity entrepreneurs than necessity entrepreneurs, keeping everything else fixed. Furthermore, for opportunity entrepreneurs, the odds of creating product innovations are 30% higher than for necessity entrepreneurs, keeping everything else fixed. Lastly, the odds for an entrepreneur to develop process innovation is 11% higher for those driven by opportunity instead of necessity, keeping all variables fixed. The effects for the three dependent variables are significant at a 1% level.

On the other hand, the odds that an entrepreneur has higher levels of innovation are 7% lower when people are risk-averse instead of risk-loving, holding everything else fixed. However, the effect varies according to the type of innovation. For product innovation, the odds of an entrepreneur creating product innovations are 10% lower when the entrepreneur is risk-averse compared to risk-loving; everything else fixed. While for process innovation, the odds of an entrepreneur developing process innovations is 3.7% higher when the entrepreneur is risk-averse compared to risk-loving; everything else fixed. The effects for the overall innovation and product innovation are significant at a 1% level, while for process innovation, it is significant at a 5% level

Now, it is analyzed the explanatory country-level variables in the model. Firstly, when the governmental support increase by 1 point, the odds that an entrepreneur creates product innovation increase by 9.1%, and everything else fixed. The effect is significant at a 5% level. A similar relationship happened with product innovations. When the governmental support increases by 1 point, the odds that an entrepreneur's developed process innovations increase by 40%, all variables fixed. The effect is significant at the 1% level.

Secondly, looking at free entry, we observe that when the entry in the market increases by 1 point, the odds that an entrepreneur has a higher level of innovation increase by 13%, all variables fixed. The effect is significant at the 5% level. However, this result in the overall innovation is due to product innovation. When the easy entry into the market increases by 1 point, the odds that an entrepreneur creates a product innovation increase by

18%, all variables fixed. The effect is significant at the 5% level. An easy entry into the market does not affect entrepreneurs' developing process innovation.

Table 9:: Odds ratio multilevel ordered logistic regression for each dependent variable

	(1) Innovation	(2) Iproduct	(3) Iprocess
Level 1 variables			
Opporunity	1.2834***	1.3019***	1.1164***
	(.0445)	(.0426)	(.0209)
fearfail	.9305***	.9034***	1.037**
	(.0141)	(.014)	(.0184)
Level 2 variables			
tax_bur	1.0434	1.0911**	1.407***
	(.0406)	(.043)	(.0366)
free_entry	1.126**	1.1835***	1.0288
	(.055)	(.0591)	(.0373)
Control level 1 and 2			
1.education	1.0329	1.0495	.9188
	(.0582)	(.0608)	(.0616)
2.education	1.0846	1.1*	1.0234
	(.0596)	(.0621)	(.0664)
3.education	1.1161**	1.1308**	1.12*
	(.0597)	(.0622)	(.0706)
4.education	1.2036***	1.2207***	.9972
	(.0673)	(.0701)	(.0656)
5.education	1.3158***	1.3198***	1.1569**
	(.0713)	(.0735)	(.0736)
6.education	1.5404***	1.5084***	1.3401***
	(.1092)	(.1094)	(.109)
age	.9707***	.9788***	.9743***
	(.0034)	(.0034)	(.0039)
agesq	1.0003***	1.0002***	1.0002***
	(0)	(0)	(0)
male	1.0013	1.0185	.9817
	(.0139)	(.0144)	(.0161)
IPR	.9291**	1.0916***	.7739***
	(.0292)	(.0291)	(.0059)
log_gdp	1.0961***	1.0264	1.0915***
	(.0361)	(.0385)	(.0071)
gini	1.0031	1.0054	.9817***
	(.0057)	(.0054)	(.0016)
	(974.9986)		
/var(Opportunity)	1.0825***	1.0608***	
	(.0178)	(.0137)	
/var(_cons[country])	1.4398***	1.3012***	2.7443***
	(.087)	(.0593)	(.6889)
Observations	69971	69971	69971
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

Table 10: Cross-level interaction included in the model

	(7) Innovation	(8) Iproduct	(9) Iprocess
Level-1 variables			
Opportunity	.2846**	.0809	.4403***
	(.1383)	(.1256)	(.0789)
fearfail	-.072***	-.1016***	.0359**
	(.0152)	(.0155)	(.0177)
Level-2 variables			
tax_bur	.0425	.0905**	.3413***
	(.0391)	(.0397)	(.026)
free_entry	.1207**	.1645***	.0285
	(.0492)	(.0501)	(.0363)
Controls level 1 and 2			
1.education	.0324	.0481	-.0867
	(.0563)	(.0579)	(.0671)
2.education	.0812	.0958*	.0164
	(.055)	(.0565)	(.0649)
3.education	.1097**	.1236**	.1046*
	(.0535)	(.055)	(.0631)
4.education	.1854***	.2002***	-.0108
	(.0559)	(.0574)	(.0658)
5.education	.2746***	.2782***	.1389**
	(.0542)	(.0557)	(.0637)
6.education	.4323***	.4115***	.2851***
	(.0709)	(.0726)	(.0813)
age	-.0297***	-.0215***	-.0258***
	(.0035)	(.0035)	(.0041)
agesq	.0003***	.0003***	.0002***
	(0)	(0)	(0)
male	.0012	.0183	-.0185
	(.0139)	(.0142)	(.0164)
IPR	-.0659*	.0515	-.2123***
	(.0376)	(.0352)	(.0127)
.Opportunity*IPR	-.0059	.0301	-.0565***
	(.0218)	(.0198)	(.0131)
log_gdp	.0974***	.0344	.0871***
	(.0356)	(.0385)	(.0065)
gini_final	.0028	.0053	-.0185***
	(.0057)	(.0054)	(.0016)
Var(Opportunity)	.075***	.0565***	
	(.0161)	(.0124)	
Var(_cons[country])	.3723***	.271***	1.0012***
	(.0651)	(.048)	(.249)
Observations	69971	69971	69971
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

Finally, Table 10 shows the cross-level interaction between IPR and opportunity-driven entrepreneurs. The odds interpretation of a cross-Level interaction can be complex. Therefore, In this research, the significance of the product term approach I used (Sommet & Morselli, 2017). As it can be seen, the interaction term for innovation and product innovation is insignificant. However, when overall innovation is the dependent variable, Opportunity, and IPR separately are still significant, while with product innovation, both variables are no longer significant. In the discussion, this issue is discussed in detail. On the other hand, for process innovation, the effect is negative and significant (β:-0.056 P-value<0.001). This indicates that an opportunity entrepreneur's positive impact on process innovation is diminished in a country with strong protection of property rights.

In the following table it is summaries the results from this section:

Table 11: Results Summary

Hypothesis	Main model Result	Support hypothesis
H1	positive and significant	yes
H1A	positive and significant	yes
H1B	positive and significant	yes
H2	Negative and significant	yes
H2A	Negative and significant	yes
H2B	positive and significant	No
H3	Insignificant	No
H3A	positive and significant	Yes
H3B	positive and significant	Yes
H4	positive and significant	Yes
H4A	positive and significant	Yes
H4B	Insignificant	No
H5	Insignificant	No
H5A	Insignificant	No
H5B	Negative and significant	Yes

6. Robustness Analysis

Industry heterogeneity may affect the results. For example, if the entrepreneur is part of the technological and communication industries is more likely to innovate than entrepreneurs that start a business in other sectors (Tech, 2022). Therefore, in this section, the models are run for different industries to verify the results from the previous section.

In table 11 it is observed the industries in the dataset and the number of observations per industry. This division by industry is made by the GEM and is a variable part of the dataset. 37% of the entrepreneurs in the sample are part of the retail trade, hotels, and restaurants industry. The second industry with the highest number of entrepreneurs is financial intermediation, real state, and professional and administrative services 13.19% of the sample observations.

Table 12: Tabulation of industry

TEA: Industry ISIC version 4, 1-digit code	Freq.	Percent	Cum.
AGRICULTURE,FORESTRY,FISHING	3913	6.07	6.07
MINING,CONSTRUCTION	3435	5.33	11.39
MANUFACTURING	5634	8.73	20.13
UTILISATION, TRANSPORT, STORAGE	2064	3.20	23.33
WHOLESALE TRADE	4469	6.93	30.25
RETAIL TRADE, HOTELS & RESTAURANTS	24133	37.41	67.67
INFORMATION AND COMMUNICATION	2493	3.86	71.53
FINANCIAL INTERMEDIATION, REAL ESTATE ACTIVITIES AND PROFESSIONAL AND ADMINISTRATIVE SERVICES	8509	13.19	84.72
GOVERNMENT, HEALTH, EDUCATION, SOCIAL SERVICES	8137	12.62	97.34
PERSONAL/CONSUMER SERVICE ACTIVITIES	1715	2.66	100.00
Total	64502	100.00	

Table 13 shows the average innovation present in each industry. It means it is possible to see in which sector the most innovative entrepreneurs are located. The industry with higher innovation is information and communication with 1.704, followed y consumer services with 1.613. In both cases, product innovation is higher than process innovation.

Table 13: Average innovation per industry

Industry	**Innovation**	**Product**	**Process**
AGRICULTURE,	1.439	1.459	1.400
MINING,CONST	1.411	1.447	1.339
MANUFACTURIN	1.599	1.649	1.497
UTILISATION,	1.434	1.458	1.386
WHOLESALE TR	1.542	1.567	1.492
RETAIL TRADE	1.550	1.564	1.522
INFORMATION	1.704	1.751	1.611
FINANCIAL IN	1.507	1.547	1.426
GOVERNMENT,	1.539	1.594	1.428
PERSONAL/CON	1.613	1.706	1.426

Since there are ten industries, only the multilevel ordered logistic models' results are shown, not the odd ratios. Therefore, the sign and significance are interpreted, not the magnitude. To summarize the results, three tables are shown below. Each table displayed each sector's coefficients for the four main explanatory variables (two individual and two country levels). The complete coefficients can be found in appendix D. The first row, all industries, are the results from the previous section, so the comparison is easy. There are three tables since each represents one of three dependent variables (overall, product, and process innovation).

In table 14 it is observed the results for each sector when overall innovation is the dependent variable. First, the opportunity variable is positive and significant for every industry, the same as the previous section's results. Therefore, the results suggest that no matter the sector, an opportunity-driven entrepreneur is more likely to have higher innovation levels than necessity-driven entrepreneurs. Thus, H1 is supported. In table 15, the dependent variable is product innovation. As the main model results, opportunity entrepreneurs have a positive and significant effect on product innovation. Hence, H1B is backed. However, in table 16 (process innovation as dependent variable), not every industry behaves as the main model results. Six of the ten industries have insignificant results when entrepreneurs are driven by opportunity. This suggests that for process innovation, being an entrepreneur driven by opportunity has no significant effect compared to necessity entrepreneurs.

On the other hand, the results for fear of failure also vary across industries. Table 14 shows that half of the industries have the same results as the main model. This suggests that a risk-averse entrepreneur is less likely to innovate in mining, construction, manufacturing, retail, hospitality, financial, administrative and professional services, and Government, Health, Education, and Social, than a risk-loving entrepreneur. However, being a risk-averse entrepreneur for the other five industries does not significantly affect their innovation performance. When the overall innovation is split into product and process, in most sectors, averse entrepreneurs negatively affect product innovation compared with risk-loving entrepreneurs; however the effect is not significant for all industries. On the contrary, only two industries have significant results for process innovation, although they differ in the sign. Government, Health, Education, and Social are the sectors that have similar results as the main model. This suggests that being an risk-averse entrepreneur is not significant when developing process innovations (in almost all industries).

Moving to the country-level variables, the results are even more heterogeneous across industries. In our main model, governmental support did not significantly impact entrepreneurs' overall innovation level. However, in table 14 we observe that governmental support through taxes and bureaucracy encourages entrepreneurs' innovation in financial, professional, administrative services, Government, Health, Education, and Social sectors. This result is coherent with H3. However, in agriculture, governmental support has a negative and significant effect. Therefore, government support decreases entrepreneurs' innovation performance in the agriculture industry. A similar situation is seen for product innovation. In four industries, governmental support positively impacts entrepreneurs' product innovation. However, as shown for overall innovation, the agriculture sector has opposite results. Finally, for process innovation, governmental support only encourages entrepreneurs' innovation in the manufacturing industry.

Table 14: Coefficients of the multilevel ordered logistic model when overall innovation is the dependent variable.

	Coefficients			
Industry	**Opportunity**	**Fear of fail**	**Tax_bur**	Free_entry
All industries	.2457***	-.0726***	.0433	.1234**
Agriculture, Forestry, Fishing	.2863***	-.1083	-.4985***	.2881
Mining, Construction	.1924**	-.128*	.2044	.3714*
Manufacturing	.1944***	-.1911***	.1066	.2243
Utilisation, Transport, Storage	.3058***	.0289	.1802	.2893
Wholesale trade	.1957***	-.0245	.0327	.3446*
Retail trade, Hotels, Restaurants	.141***	-.0602**	.0884	.0655
Information and Communication	.2974***	-.0717	.0429	.2739
Financial, Real estate, Professional and Administrative Services	2573***	-.113**	.1849**	.0042
Government, Health, Education, Social	.1867***	-.0887**	.1829*	.0488
Personal/Consumer services	.359***	-.0854	-0.0014	.1626

*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

Table 15: Coefficients of the multilevel ordered logistic model when product innovation is the dependent variable.

	Coefficients			
Industry	**Opportunity**	**Fear of fail**	**Tax_bur**	**Free_entry**
All industries	.2714***	-.1036***	.0982**	.1505***
Agriculture, Forestry, Fishing	.2792***	-.1288*	-.4643***	.3026
Mining, Construction	.1574*	-.17**	.2944**	.5473**
Manufacturing	.2491***	-.2014***	.075	.2404
Utilisation, Transport, Storage	.3552***	-.0448	.2639*	.2521
Wholesale trade	.1776**	-.0377	-.0247	.3307*
Retail trade, Hotels, Restaurants	.1523***	-.0787***	.1229*	.1128
Information and Communication	.2899***	-.1407*	.1011	.1631
Financial, Real estate, Professional and Administrative Services	2903***	-.1421***	.2037**	.0343
Government, Health, Education, Social	.2459***	-.1291***	2383***	.1331
Personal/Consumer services	.528***	-.0647	.0934	.1444

*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

Finally, For two industries, it can be observed that countries, where enterprises can easily enter the market have a positive and significant impact on entrepreneurs' product innovation (table 15). On the other hand, as the result of the main model, a country with an easy enterprise entry into the market does not significantly affect process innovation for any industry.

In conclusion, industry heterogeneity can influence the results; therefore, the findings can vary from the main model. Of the several hypotheses shown in this study, two are totally supported by the main model and the robustness check results. These hypotheses were H1, and H1A. Driven opportunity entrepreneurs positively and significantly influence the entrepreneurs' overall innovation (and product innovation). Also, free entry into the market does not significantly affect entrepreneurs' process innovation in any industry.

Table 16: Coefficients of the multilevel ordered logistic model when process innovation is the dependent variable.

	Coefficients			
Industry	**Opportunity**	**Fear of fail**	**Tax_bur**	**Free_entry**
All industries	.1075***	.0404**	.3357***	.0494
Agriculture, Forestry, Fishing	.2491***	-.0142	-.2238	-.0142
Mining,Construction	.143	.0036	.0014	-.0893
Manufacturing	.034	-.1096*	.2241*	-.0359
Utilisation, Transport, Storage	.0241	.1406	.0601	.2841
Wholesale trade	.1513**	-.0005	.1419	.2451
Retail trade, Hotels, Restaurants	.04	.0017	-.0226	.0429
Information and Communication	.2304**	.0979	-.07181	.2062
Financial, Real estate, Professional and Administrative Services	.0667	-.0103	.0717	-.0312
Government, Health, Education, Social	.07	.0953*	-.0133	-.0928
Personal/Consumer services	-.0648	.011	-.09	-.0626

*Note: *** p<0.01, ** p<0.05, * p<0.1 refers to the significance level*

7. Discussion

This paper analyzed different factors that may influence innovation heterogeneity among entrepreneurs. This section discussed the main results from the previous sections. Firstly, as seen in table 11, Hypothesis H1, H1A, and H1B are supported by the data. This means that entrepreneurs driven by opportunity have a positive and significant impact on innovation compared with necessity-driven entrepreneurs (product and process). As in Hoogendoorn et al. (2020) results, opportunity-based entrepreneurship positively affects the three types of innovation. This is because necessity entrepreneurs are "forced" to start a new business since they do not have an alternative option (Van der Zwan et al., 2016). However, opportunity entrepreneurs look for high-quality opportunities, which usually translates into high innovation levels (Anokhin & Wincent, 2011, Shane,2009). Necessity entrepreneurs are more likely to be in developing countries; therefore, they have additional challenges, such as poor human capital, and financial restrictions that may affect innovation performance (Hessels et al., 2008). Also, driven opportunity entrepreneurs are likelier to product innovate regardless of the industry. However, an opportunity-driven entrepreneur did not impact process innovation in five sectors.

On the other hand, risk-takers entrepreneurs have opposite effects depending on the type of innovation. Innovation is a risky and complex activity (Koellinger, 2008). Factors like financial resources, customer preferences, and costs make this activity risky and uncertain (Hamilton and Harper 1994; Gifford 1992). Therefore, risk-loving entrepreneurs are more likely to innovate than risk-averse entrepreneurs. As Seen in table 11, hypotheses H2 and H2A are supported. However, there is not enough evidence for hypothesis H2B. The result suggests that risk-loving entrepreneurs are more likely to product innovate than risk-averse entrepreneurs; nevertheless, the opposite occurs with process innovation. This may be because product innovation carries higher imitation risks than process innovation(Bergfors & Larsson, 2009). Product innovations are generally industry-specific innovations rather than company specific. In comparison, process innovations are more organizational-specific innovations. Therefore, it is easier to imitate product innovations than process innovations. Thus, product innovations carry a higher risk of being imitated by competitors (Damanpour, 1996; Bergfors & Larsson, 2009). On the other hand, product innovations carry an additional risk than process innovation, which is the product reception by consumers. Process innovation is an innovation within the company related to production methods or techniques.

On the other hand, product innovation "aims to meet customer requirements by designing and introducing new products to the market that meet the needs of customers" (Maier, 2018). Therefore, risk-takers entrepreneurs engage in product innovations, while risk-averse entrepreneurs develop process innovation. These results can differ when looking at different industries. The robustness check shows that risk-averse entrepreneurs do not affect the likelihood of innovating in some industries.

Moving to the country-level variables, government support through tax or regulatory incentives for start-ups increases the likelihood that an entrepreneur will develop a product or process innovation. Several authors have confirmed that innovation is essential for economic growth (Slow, 1956, Romer, 1986, Wong et al., 2005). Therefore, governments may try to increase these activities through different public policies. As seen in the results of table 12, hypotheses H3a and H3b are supported. The results show that high governmental support increases entrepreneurs' process and product innovation likelihood. The odds ratio suggests governmental support is more critical for the process than product innovation.

Nevertheless, not all taxes or regulations can benefit innovation (Patanakul and Pinto, 2014). As stayed by Patanakul and Pinto (2014), an effective public policy to stimulate innovation and entrepreneurship should strive for a favorable environment, create a basis for innovation to flourish, and have clear goals and targets. Tax incentives contribute to a favorable business environment; however, other factors make an effective public policy. With the GEM measure is not possible to identify which specific policies or taxes benefits are taken into account. This could be one reason why government supporter does not positively affect product and process innovation for every industry. Some policies can encourage particular sectors or innovations like environmental innovations (Hoogendoorn et al., 2020). For example, as Wang & Kesan (2017) showed, innovation increased in software and IT industries in China after the corporate tax reform. Still, the value-add reform did not have a significant effect. On the other hand, taxes, and regulations that encourage SMEs harm entrepreneurs' product innovation for the agriculture industry. In some cases, regulations can "create barriers to innovation by increasing the uncertainty and costs of the development process" (OCDE, 2000). However, with the GEM measure, it is impossible to identify which regulations or tax benefits are taken into account. Therefore this could be part of a future investigation.

A free entry market positively and significantly affects entrepreneurs' innovation, specifically, product innovation; however, it does not significantly impact process innovation. These results supported hypotheses H4, H4A but not support H4B. H4B stay that process innovations are less likely to occur in countries where entrepreneurs can easily enter the market. Although the results did not show a negative effect, it shows that free entry into markets is insignificant in entrepreneurs' decision to develop process innovation. These results are in line with the Keppler 1996. When there is a high entry and exit of firms into the market, product innovations are higher than process innovations. While in later stages, with less free entry, incumbents focus more on process innovation. Keppler (1996) explained this phenomenon, arguing that when incumbents develop process innovation, average costs decrease, hence prices. Therefore, for new entrants to capture some monopolistic profit, they must enter the market with new products. Also, it is vital to consider entrepreneurs in this sample are nascent entrepreneurs, therefore new in the market. This could explain why nascent entrepreneurs develop more product innovations in a country with high free entry

into markets. However, this result is not significant for all industries. Only wholesale trade, mining, and manufacturing have significant results for product innovation.

Finally, the interaction term shows that in a country with high protection of IPR, the positive effects of opportunity-driven entrepreneurs on process innovation diminish. In other words, opportunity-driven entrepreneurs are less likely to develop process innovation in a country with strong protection of IPR. Therefore, this demonstrated that IPRs are important when deciding to process innovation. This is aligned with the theory and empirical studies, which argue that strong protection limits knowledge spillovers and decreases innovation (Gangopadhyay & Mondal, 2012). However, there is no evidence of product innovation. This can be explained for two reasons, an econometric reason and a theoretical one.

As observed in model 2 (without the interaction term), opportunity entrepreneurs and IPR are significant and positively impact product innovation. However, when the interaction is introduced, both the independent variables (opportunity and IPR) and the interaction term are no longer significant. On the one hand, this may be since the interaction is highly correlated with the opportunity variable, which may generate multicollinearity problems and, therefore, non-significant results. On the other hand, differences between product and process innovation may be expected since each type of innovation may require different types of IPR. Product innovation implies developing a new product or service and improving an existing one. Companies can gain a competitive advantage with this innovation, creating new demands and finding new opportunities (Maier, 2018). Otherwise, process innovation is less visible to consumers. So it is when equipment, technological, and software changes help reduce production and distribution costs. (Maier, 2018; Fagerberg, 2013). These differences between innovations could imply different necessities of IPR. The protection of IPR is a general measure; however, it does not differentiate into patent protection or copyrights. Since product innovation is more visible to the general public, stronger patent protection could be crucial for this type of innovation.

Finally, looking at the results from the robustness checks, it is observed that industry characteristics play an essential role in the likelihood of developing process and product innovation. Firstly, some industries can be more innovative, so the relevance of each factor analyzed in this study may differ. For example, in 2022, industries with the more innovative incumbents were pharmaceuticals, information technologies, electronics, semiconductors,

and chemicals and materials (Tech, 2022). Also, an important thing to consider is that each industry can be at a different stage of the industry life cycle (Keppler, 1996), which could also affect the results. Also, as Breschi et al. (2000) studied, each industry can be at a different Schumpeterian pattern of innovation. These Schumpeterian patterns are called Mark I and Mark II. Mark 1 is when an industry has a large number of innovators. This suggests a high number of entries and exits, high technological opportunities, limited generic knowledge, and low appropriability and cumulativeness. On the other side, Mark II is characterized by a stable number of innovators. Therefore, there are few entries, a high knowledge base, low opportunity conditions, and high appropriability and cumulativeness (Breschi et al., 2000). Moreover, it is known that in the industry in mark 1, there are more product innovations; in mark II, there are more process innovations (Breschi et al., 2000). However, in this research is complex to explain the reasons for differences in results per industry; hence one can analyze this in future research.

8. Limitations

There are several limitations to be considered in this research. Firstly the innovation measure may be less precise than the input measure of innovations. The output measure of innovation can be a closer indication of innovation, but there are self-reported. Consequently, entrepreneurs could choose a particular response because of external pressures and a different understanding of the question.

The analysis of the cross-sectional level variable may have some issues. There is still no clear way of interpreting the interaction term or how it should be calculated.(Kolasinski & Siegel, 2010). Since the calculation can be complex, this research uses a simple significance of the product term to analyzed the interaction term. However, the sign, value, and significance may be biased (Sommet & Morselli, 2017). Moreover, some studies suggest that for a cross-sectional interaction term a 100 level-1 units and 80 level-2 should be included in the model for a correct estimation. However, this research has only 65 level-2 units (Sommet & Morselli, 2017).

On the other hand, as observed in the results of robustness checks. There may be unobserved industry variables that may be affecting the results. Therefore, there can be an issue of industry heterogeneity or unobserved industry characteristics that may be causing bias in some results.

There are some problems with country-level variables when the sub-sample analysis is performed. For example, the free entry market is a country-level variable. However, assuming that all industries have the same level of entry of firms into the market is a strong assumption. As explained by Keppler (1996), each industry can be in a different stage of the industry life cycle. A more mature life cycle would imply less entry of new entrepreneurs. Therefore, the results of this variable in the robustness checks should be taken with caution. Instead, a detailed analysis should be made by industry, where it is possible to measure precisely how easily firms can enter the market for a particular industry.

Finally, the model may suffer from omitted variable bias. For instance, one underlying factor may affect innovation (dependent variable) and risk-averse entrepreneurs (independent variable). An omitted variable, in this case, could be the entrepreneurial experience. On the one hand, more years of experience may increase the industry knowledge; then, a person may be less risk averse (risk-loving). On the other hand, having more entrepreneurial experience can also influence the decision to innovate. A person with more experience may have more confidence to innovate and face the challenges of this activity. Therefore, since the correlation of this omitted variable with the independent variable is negative, and the correlation with the dependent variable is positive, we have a negative bias i.e., a downward bias.

9. Conclusion

With repeated cross-sectional data and a multilevel approach, this research studied which factors explain the innovation heterogeneity among entrepreneurs. Using the latest GEM datasets, this paper studied how two individual and two country characteristics affect entrepreneurs' likelihood of engaging in innovative activities. Also, it is investigated how these effects can differ among the types of innovation (product and process innovation). It is important to study which factors promote or discourage entrepreneurs from developing process and product innovation since innovation is essential for economic growth and development (Slow, 1956, Romer, 1986, Wong et al., 2005).

On the hand, it study how the types of motivation and risk attitudes may affect entrepreneurs' innovation. The study found that opportunity-driven entrepreneurs are more likely to develop product and process innovation than necessity entrepreneurs. These results are supported by the robustness check, however, not for process innovation. Opportunity

entrepreneurs are looking for quality opportunities since they do not need entrepreneurship for living; therefore, they create high-quality ventures (Anokhin & Wincent, 2011, Shane,2009). On the other hand, risk attitudes are also essential to determine entrepreneurs' willingness to innovate. Innovation is considered a high-risk activity because it involves costs and uncertainty (Koellinger, 2008). It is observed that risk-averse entrepreneurs are less likely to innovate, or develop product innovations. However, averse entrepreneurs are more likely to develop process innovation. Product innovation may be riskier than process innovation (Damanpour, 1996; Bergfors & Larsson, 2009; Maier, 2018). Product innovation is more visible to the competitors and, therefore easily to imitate (Damanpour, 1996; Bergfors & Larsson, 2009) . On the other hand, the success of a product innovation depends on the adoption by the consumers, something that is not the case with process innovation. Process innovations do not carry this risk since this type of innovation focuses on technological changes to reduce production and distribution costs (Maier, 2018; Fagerberg, 2013). As a public policy implication, governments can create policies to mitigate product innovation's uncertainties and risks (Wu et al. 2010). Therefore, risk-averse entrepreneurs may see fewer barriers to engaging in this type of innovation.

Moving to country-level characteristics, it can be concluded that in countries with a higher level of governmental support to new SMEs (through tax and regulations), entrepreneurs are more likely to develop product and process innovation. This means that a more favorable environment for start-ups incentivizes entrepreneurs to engage in innovative activities, and the effect is positive for both types of innovation. In this case, it is studied how taxes or regulations encourage SMEs; however, there can be diverse public policies to promote these activities, which can be investigated in further research. Moreover, the free entry market aligns with the theory proposed by Keppler (1996), a country where firms can easily enter the market increases entrepreneurs' product innovation.

However, there is no significant effect on process innovation. Keppler (1996) argued that there are more product innovations than process innovations in the early stages, while in more mature industries or markets, the situation is otherwise.

Furthermore, countries with high property rights protection discourage opportunity entrepreneurs from developing process innovation. In some research, IPR has an inverted U-shape relationship with innovation (Ács & Sanders, 2008). Therefore, as an implication of

public policies, the government should be aware of their level of IPR protection as it may disincentivize the entrepreneur to innovate since it limits the diffusion of knowledge (Gangopadhyay & Mondal, 2012). This may be more likely in developed countries, where innovators are mostly opportunity entrepreneurs, and there is strict protection of IPR. However, this is an issue for future research. Finally, although robustness checks do not support all results, this opens a research door on how heterogeneity across industries may influence the probability of an entrepreneur to innovate (product and process).

In conclusion, diverse factors can influence entrepreneurs' likelihood of engaging in innovative activities. The study demonstrates how two individual level and two country characteristics affect entrepreneurs' innovation. These results have various implications for public policy. First, as necessity-driven entrepreneurs are less likely to innovate than opportunity entrepreneurs. Therefore, policymakers may consider how to increase opportunity entrepreneurship instead of necessity entrepreneurship. In particular, developing countries usually have more necessity entrepreneurs than opportunity entrepreneurs, and policymakers do not differentiate between these characteristics, making ineffective policies (Olafsen & Cook, 2016). Moreover, Audretsch et al., (2021) found that government expenditure, corruption, and tax policies impact entrepreneurs' motivation. High taxes and corruption levels discourage opportunity entrepreneurship, and not all government expenditure encourages opportunity entrepreneurship.

On the other hand, policymakers can help mitigate some of the risks associated with innovations, particularly product innovations (Wu et al. 2010). Also, when there is a favorable environment, entrepreneurs tend to take more risks and develop innovations (Lederman et al., 2014). Also, taxes and regulations encourage SMEs' incentive entrepreneurs to innovate. Then policymakers may consider these results to increase the innovation activity in their countries.

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11. Appendix

Appendix A:

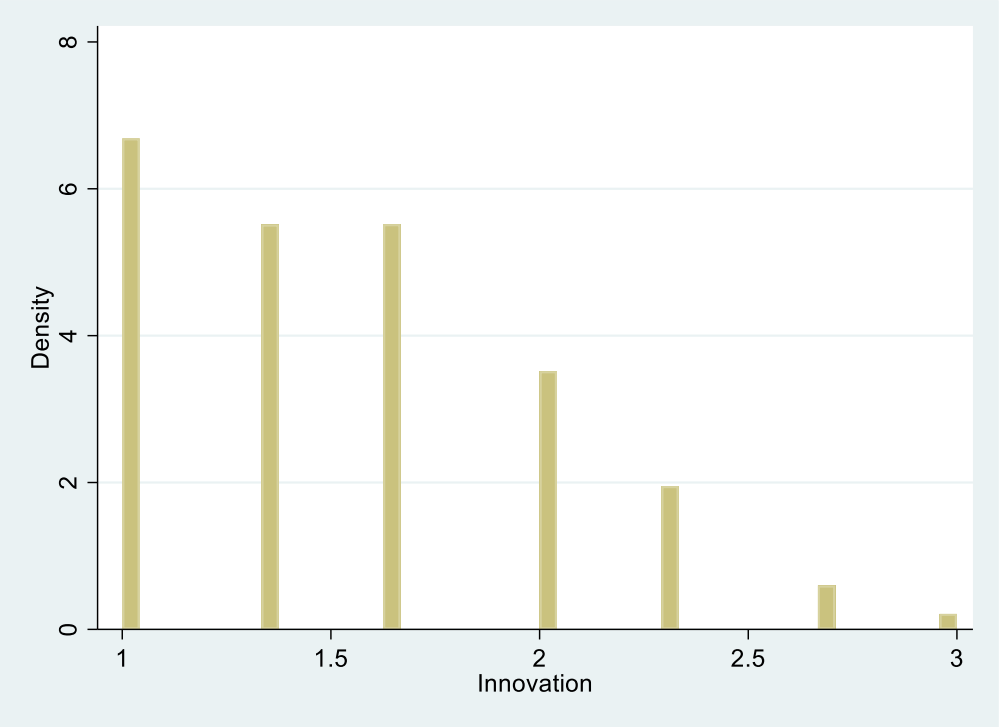
Table 1: Tabulation of number of observations per country and year

Tabulation of country1 yrsurv

	Year survey was administered					
Country	2014	2015	2016	2017	2018	Total
Argentina	303	0	252	114	177	846
Australia	236	0	234	195	0	665
Austria	366	0	386	0	429	1181
Belgium	109	126	0	0	0	235
Botswana	0	721	0	0	0	721
Brazil	1687	412	389	404	377	3269
Bulgaria	0	64	88	71	109	332
Burkina Faso	702	0	0	0	0	702
Cameroon	759	0	669	0	0	1428
Canada	274	355	282	343	316	1570
Chile	0	1420	0	2006	0	3426
China	543	445	350	406	343	2087
Colombia	754	863	515	396	437	2965
Croatia	0	164	173	173	191	701
Cyprus	0	0	225	136	74	435
Ecuador	620	0	595	579	0	1794
Egypt	0	194	364	336	0	894
El Salvador	390	0	264	0	0	654
Estonia	0	256	315	370	0	941
Finland	110	129	132	0	0	371
France	81	0	87	61	90	319
Georgia	0	0	135	0	0	135
Germany	252	195	227	271	229	1174
Greece	154	138	114	96	127	629
Guatemala	438	0	443	0	811	1692
Hungary	183	151	152	0	0	486
India	0	0	0	0	533	533
Indonesia	700	1086	464	168	439	2857
Iran	0	403	413	393	297	1506
Ireland	119	182	207	167	177	852
Israel	0	205	230	222	188	845
Italy	86	101	85	90	78	440
Jamaica	0	0	175	0	0	175
Japan	0	0	0	85	102	187
Kazakhstan	0	197	173	190	0	560
Latvia	0	279	211	227	0	717
Luxembourg	132	185	165	151	0	633
Madagascar	0	0	0	456	456	912
Malaysia	0	59	0	0	0	59
Mexico	430	0	448	674	0	1552
Morocco	0	0	0	261	216	477
Netherlands	180	160	210	195	236	981
Norway	107	117	0	0	0	224
Panama	341	251	260	318	272	1442
Peru	540	446	470	460	430	2346
Philippines	0	388	0	0	0	388
Poland	204	158	165	310	388	1225
Portugal	204	190	164	0	0	558
Romania	163	215	0	0	0	378
Russia	86	0	125	0	105	316
Saudi Arabia	0	0	0	451	0	451
Slovakia	207	187	180	225	194	993
Slovenia	0	115	126	108	120	469

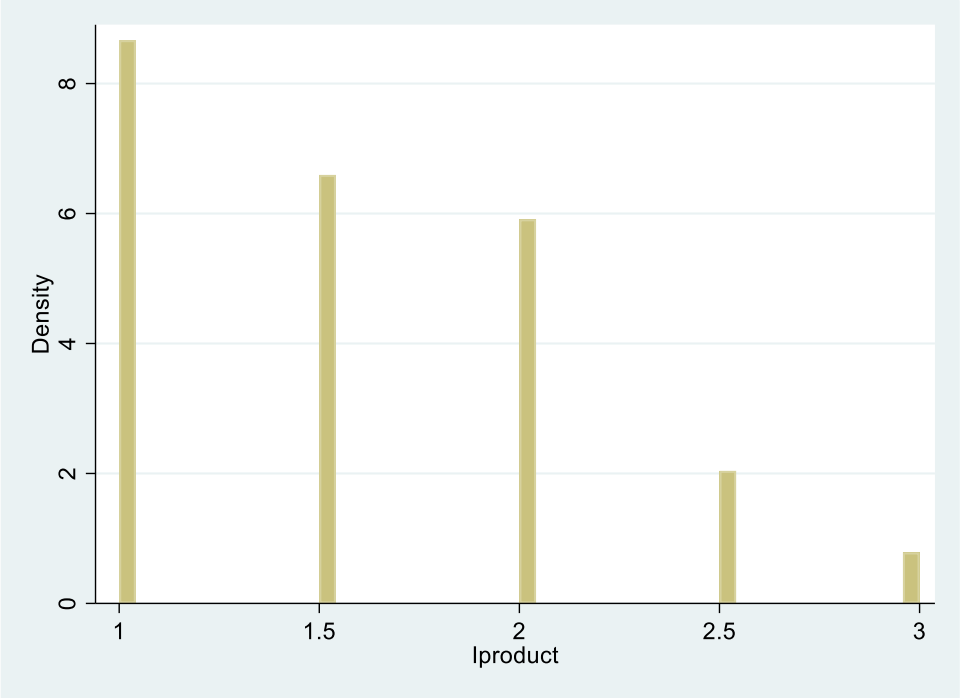
South Africa	207	0	173	293	0	673
South Korea	0	0	121	256	288	665
Spain	1241	1278	986	1234	1211	5950
Sweden	152	286	291	282	253	1264
Switzerland	127	127	220	151	136	761
Thailand	472	398	467	428	411	2176
Turkey	0	0	356	0	301	657
United Arab Emirates	0	0	0	0	195	195
United Kingdom	149	514	630	522	489	2304
United States	371	268	323	235	397	1594
Uruguay	270	243	228	241	252	1234
Vietnam	306	0	0	464	0	770
Total	14755	13671	14457	15214	11874	69971

Figure 1: Distribution of observations for the Innovation categorical variable



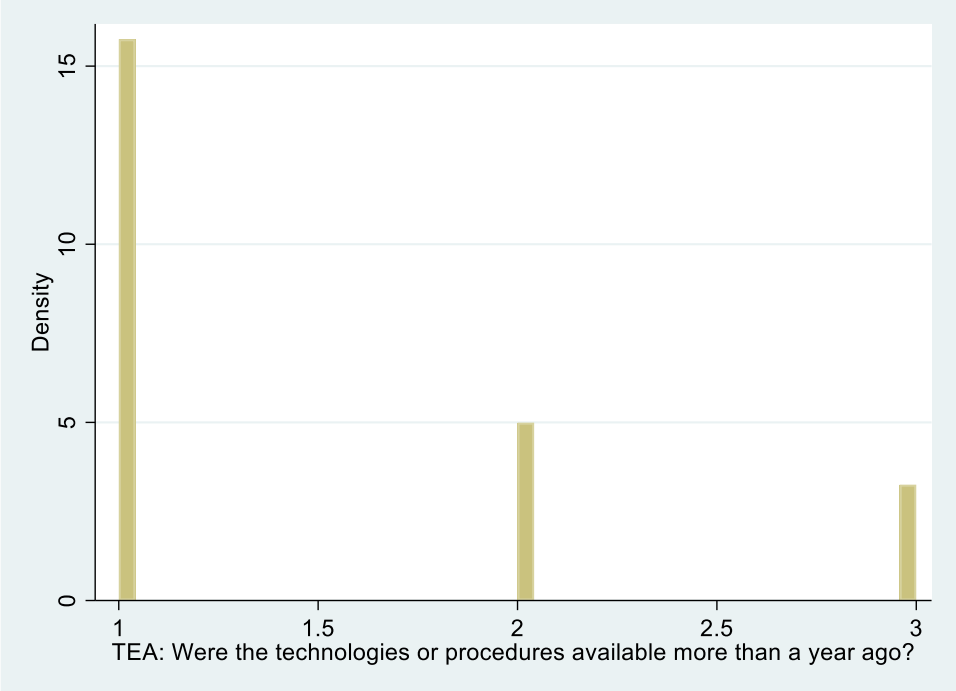
Note: Most entrepreneurs' are in lower categories of innovation. This variable has 7 categories

Figure 2: Distribution of observations for Product Innovation categorical variable



Note: Most entrepreneurs are in lower categories of product innovation. This variable has 5 categories

Figure 2: Distribution of observations for Process Innovation categorical variables



Note: Most entrepreneurs are in lower categories of process innovation. This variable has 3 categories

Appendix B: VIF test

Table 7: Variance inflation factor

	VIF	1/VIF
Opportuninty	1.042	.96
fearfail	1.02	.981
IPR	1.568	.638
tax bur	1.542	.649
free entry	1.886	.53
age	1.059	.944
1.male	1.015	.985
1.education	4.611	.217
2.education	6.776	.148
3.education	11.395	.088
4.education	6.28	.159
5.education	10.599	.094
6.education	2.019	.495
log gdp	1.15	.869
gini final	1.399	.715
Mean VIF	3.557	.

Appendix c:

Table 1: empty multilevel ordered logistic regression with innovation as dependent variable

VARIABLES	(3) Innovation
/cut1	-0.954***
	(0.00857)
/cut2	0.0339***
	(0.00771)
/cut3	1.041***
	(0.00874)
/cut4	2.046***
	(0.0120)
/cut5	3.362***
	(0.0210)
/cut6	4.729***
	(0.0404)
/var(_cons[country])	0.319**
	(0.131)
Observations	69,971
Number of groups	65
ICC	0.088

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: empty multilevel ordered logistic regression with product innovation as dependent variable

VARIABLES	(3) Iproduct
/cut1	-0.580***
	(0.00815)
/cut2	0.552***
	(0.00812)
/cut3	2.011***
	(0.0119)
/cut4	3.385***
	(0.0214)
/var(_cons[country])	0.206***
	(0.0732)
Observations	69,971
Number of groups	65
	0.059

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: empty multilevel ordered logistic regression with process innovation as dependent variable

VARIABLES	(3) Iprocess
/cut1	0.555***
	(0.00912)
/cut2	1.805***
	(0.0120)
/var(_cons[country])	0.948***
	(0.235)
Observations	69,971
Number of groups	65
ICC	0.223

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: model CIM for each dependent variable

	(1) Innovation	(2) Iproduct	(3) Iprocess
Opportunity	.219***	.2481***	.1101***
	(.0158)	(.0161)	(.0187)
fearfail	-.0725***	-.1026***	.0364**
	(.0152)	(.0155)	(.0177)
tax_bur	.0481	.0992**	.3414***
	(.0394)	(.0396)	(.026)
free_entry	.1478***	.1648***	.0284
	(.0499)	(.0503)	(.0363)
1.education	.0282	.0418	-.0847
	(.0562)	(.0578)	(.0671)
2.education	.0773	.0886	.0231
	(.0548)	(.0563)	(.0649)
3.education	.1058**	.1173**	.1134*
	(.0534)	(.0549)	(.063)
4.education	.1818***	.1944***	-.0028
	(.0558)	(.0573)	(.0658)
5.education	.2703***	.2719***	.1457**
	(.0541)	(.0555)	(.0636)
6.education	.434***	.4077***	.2928***
	(.0708)	(.0724)	(.0813)
age	-.0293***	-.0211***	-.026***
	(.0034)	(.0035)	(.0041)
agesq	.0003***	.0002***	.0002***
	(0)	(0)	(0)
1.male	.0004	.0185	-.0185
	(.0139)	(.0142)	(.0164)
IPR	-.0869**	.0074	-.2563***
	(.0349)	(.0319)	(.0076)
log_gdp	.0987**	.0868**	.0876***
	(.0456)	(.0378)	(.0065)
gini_final	.0025	.0059	-.0185***
	(.0057)	(.0054)	(.0016)
/var(_cons[country])	.3311***	.2191***	1.0095***
	(.0612)	(.041)	(.251)
Observations	69971	69971	69971
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 5: AIM model with each dependent variable

	(1) Innovation	(2) Iproduct	(3) Iprocess
Opporunity	.2495***	.2638***	.1096***
	(.0347)	(.0328)	(.0199)
fearfail	-.072***	-.1016***	.0367**
	(.0152)	(.0155)	(.0177)
tax_bur	.0425	.0871**	.3409***
	(.0389)	(.0394)	(.026)
free_entry	.1186**	.1685***	.0293
	(.0489)	(.0499)	(.0363)
1.education	.0324	.0483	-.0844
	(.0563)	(.0579)	(.0671)
2.education	.0812	.0953*	.0231
	(.055)	(.0565)	(.0649)
3.education	.1098**	.1229**	.1138*
	(.0535)	(.055)	(.0631)
4.education	.1853***	.1995***	-.0026
	(.0559)	(.0574)	(.0658)
5.education	.2744***	.2775***	.1458**
	(.0542)	(.0557)	(.0637)
6.education	.4321***	.4111***	.2922***
	(.0709)	(.0725)	(.0813)
age	-.0297***	-.0214***	-.0259***
	(.0035)	(.0035)	(.0041)
agesq	.0003***	.0002***	.0002***
	(0)	(0)	(0)
1.male	.0013	.0183	-.018
	(.0139)	(.0142)	(.0164)
IPR	-.0735**	.0876***	-.2564***
	(.0314)	(.0266)	(.0076)
log_gdp	.0918***	.026	.0873***
	(.0329)	(.0375)	(.0065)
gini_final	.0031	.0054	-.0185***
	(.0056)	(.0054)	(.0016)
/var(1.TEAyyOPP[co	.0793***	.059***	.0721**
	(.0164)	(.013)	(.0328)
/var(_cons[country])	.3645***	.2633***	1.0048***
	(.0604)	(.0456)	(.2517)
Observations	69971	69971	69971
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Test overall innovation
Likelihood-ratio test
Assumption: CIM1 nested within AIM1
LR chi2(1) = 234.90
Prob > chi2 = 0.0000
Note: The reported degrees of freedom assumes the null hypothesis is not on the boundary of the parameter space. If this is not true, then the reported test is conservative.

Test product innovation
Likelihood-ratio test
Assumption: CIM2 nested within AIM2
LR chi2(1) = 197.41
Prob > chi2 = 0.0000
Note: The reported degrees of freedom assumes the null hypothesis is not on the boundary of the parameter space. If this is not true, then the reported test is conservative.

Test Process Innovation
Likelihood-ratio test
Assumption: CIM3 nested within AIM3
LR chi2(1) = -602.63
Prob > chi2 = 1.0000
Note: The reported degrees of freedom assumes the null hypothesis is not on the boundary of the parameter space. If this is not true, then the reported test is conservative.

Appendix D : Robustness checks. Subsamples by industry

Table 1: Multilevel model subsample Utilization, Transport and Storage

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.3058***	.3552***	.0241
	(.107)	(.1096)	(.1135)
fearfail	.0289	-.0448	.1406
	(.0928)	(.0965)	(.113)
tax_bur	.1802	.2639*	.0601
	(.1645)	(.1589)	(.1942)
free_entry	.2893	.2521	.2841
	(.2317)	(.2317)	(.2767)
1.education	-.3802	-.0095	-.908*
	(.4119)	(.4328)	(.4895)
2.education	-.46	-.0798	-.8671*
	(.4038)	(.4232)	(.4749)
3.education	-.2145	.0119	-.434
	(.3955)	(.4146)	(.461)
4.education	.0706	.3283	-.3796
	(.4056)	(.425)	(.4729)
5.education	.2058	.466	-.2654
	(.4025)	(.4216)	(.4693)
6.education	.7211	.6781	.6676
	(.4803)	(.4936)	(.5411)
age	-.0371*	-.0411*	-.0249
	(.0213)	(.0218)	(.0256)
agesq	.0005*	.0005**	.0003
	(.0003)	(.0003)	(.0003)
1.male	-.0003	-.0059	.0521
	(.1059)	(.1094)	(.1307)
IPR	-.0154	.0814	-.1507*
	(.0656)	(.062)	(.0774)
log_gdp	.1304**	.1333**	.0664
	(.0568)	(.0536)	(.0677)
gini_final	.0013	.0097	-.0087
	(.0118)	(.011)	(.014)
/var(1.TEAyyOPP[co)	.0899	.0985	
	(.0855)	(.081)	
/var(_cons[country])	.2434***	.175***	.4017***
	(.0812)	(.0667)	(.1133)
Observations	2126	2126	2126
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 2: Multilevel model subsample Agriculture, Forestry and Fishing

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.2863***	.2792***	.2491***
	(.0883)	(.0883)	(.0826)
fearfail	-.1083	-.1288*	-.0549
	(.0663)	(.0685)	(.0822)
tax_bur	-.4985***	-.4643***	-.2238
	(.1535)	(.1464)	(.1842)
free_entry	.2881	.3026	-.0142
	(.2037)	(.1997)	(.249)
1.education	.159	.2246	-.0358
	(.1566)	(.1639)	(.1939)
2.education	.3309**	.296*	.2659
	(.1616)	(.1685)	(.1978)
3.education	.4149***	.4042**	.2917
	(.1584)	(.1651)	(.1941)
4.education	.6096***	.6514***	.3919*
	(.1761)	(.1823)	(.2145)
5.education	.4547***	.4301**	.398**
	(.1653)	(.1714)	(.2013)
6.education	.3293	.5043*	-.3643
	(.2619)	(.2723)	(.3674)
age	-.0041	.0131	-.0411**
	(.0144)	(.0148)	(.0177)
c.age#c.age	0	-.0001	.0004**
	(.0002)	(.0002)	(.0002)
1.male	.0781	.0798	.0066
	(.0637)	(.0658)	(.0793)
IPR	-.1181*	-.0457	-.1755**
	(.0654)	(.0587)	(.0777)
log_gdp	.141**	.1367***	.0807
	(.0598)	(.0525)	(.071)
gini_final	.0088	.0198*	-.0037
	(.0116)	(.0106)	(.0138)
/var(1.TEAyyOPP[co)	.132**	.1208*	
	(.0658)	(.063)	
/var(_cons[country])	.3543***	.2387***	.5449***
	(.0891)	(.0671)	(.1302)
Observations	3967	3967	3967
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 3: Multilevel model subsample Mining and Construction

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.189**	.1547*	.1415
	(.0842)	(.089)	(.0929)
fearfail	-.122*	-.1596**	-.0015
	(.0714)	(.0737)	(.0925)
tax_bur	.1805	.289**	-.0399
	(.1408)	(.1424)	(.1791)
free_entry	.3511*	.4929**	-.0482
	(.2042)	(.2106)	(.2554)
1.education	-.5562*	-.3485	-.8609**
	(.3021)	(.307)	(.3705)
2.education	-.5591*	-.3758	-.84**
	(.2952)	(.2997)	(.3563)
3.education	-.3601	-.2157	-.6312*
	(.2904)	(.2946)	(.3482)
4.education	-.1862	-.12	-.3955
	(.2989)	(.3029)	(.3574)
5.education	-.1313	.0479	-.5133
	(.2944)	(.2984)	(.3516)
6.education	-.3884	-.3329	-.2829
	(.3632)	(.3687)	(.4304)
age	-.0373**	-.0397**	-.0269
	(.0168)	(.0173)	(.0217)
agesq	.0004**	.0005**	.0002
	(.0002)	(.0002)	(.0003)
1.male	-.0575	-.0397	.0446
	(.094)	(.0979)	(.119)
IPR	-.0998	-.0604	-.1158
	(.0655)	(.0659)	(.0844)
log_gdp	.0093	.0225	-.0271
	(.0599)	(.0593)	(.078)
gini_final	.0138	.0234**	-.014
	(.0118)	(.0117)	(.0153)
/var(1.TEAyyOPP[co)	.0675	.0924	
	(.0515)	(.0601)	
/var(_cons[country])	.3348***	.3078***	.6222***
	(.0867)	(.0861)	(.1499)
Observations	3540	3540	3540
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 4: Multilevel model subsample Manufacturing

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.1944***	.2491***	.0345
	(.0676)	(.0635)	(.0662)
fearfail	-.1911***	-.2014***	-.1096*
	(.0537)	(.0545)	(.0656)
tax_bur	.1066	.075	.2241
	(.1141)	(.1062)	(.1408)
free_entry	.2243	.2404	-.0359
	(.1586)	(.15)	(.1972)
1.education	-.0618	-.1346	.1039
	(.1779)	(.1788)	(.2169)
2.education	.0489	-.0679	.1667
	(.1738)	(.1749)	(.2114)
3.education	.1558	.0879	.1855
	(.1683)	(.1693)	(.2046)
4.education	.0754	.0398	.1298
	(.1779)	(.1793)	(.2163)
5.education	.2479	.1409	.356*
	(.1729)	(.1739)	(.2097)
6.education	.6935***	.5127**	.704**
	(.2445)	(.2456)	(.2865)
age	-.0124	-.0091	-.0248*
	(.0119)	(.0121)	(.0144)
agesq	.0001	.0001	.0002
	(.0001)	(.0001)	(.0002)
1.male	-.0212	-.0094	-.0412
	(.0489)	(.0497)	(.0592)
IPR	.0283	.1398***	-.1762**
	(.0546)	(.0465)	(.0748)
log_gdp	.0335	.0065	.0754
	(.051)	(.0419)	(.0711)
gini_final	.013	.0146*	-.0064
	(.0103)	(.0086)	(.0137)
/var(1.TEAyyOPP[co)	.0536	.03	
	(.0357)	(.0255)	
/var(_cons[country])	.2729***	.1614***	.5988***
	(.0667)	(.0421)	(.1323)
Observations	5747	5747	5747
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 5: Multilevel model subsample Whosale trade

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.1957***	.1776**	.1513**
	(.0752)	(.0717)	(.0757)
fearfail	-.0245	-.0377	-.0005
	(.0596)	(.0612)	(.0709)
tax_bur	.0327	-.0247	.1419
	(.1322)	(.1292)	(.1578)
free_entry	.3446*	.3307*	.2451
	(.182)	(.1801)	(.2205)
1.education	.1175	.322	-.1945
	(.2039)	(.2086)	(.2416)
2.education	.1317	.2799	-.0834
	(.195)	(.199)	(.2276)
3.education	.1164	.266	-.1422
	(.1906)	(.1945)	(.2223)
4.education	.197	.3751*	-.1991
	(.1984)	(.2028)	(.2312)
5.education	.2699	.4869**	-.1535
	(.1949)	(.1987)	(.2268)
6.education	.656**	.7688***	.2136
	(.2721)	(.2773)	(.3126)
age	-.02	-.0087	-.0356**
	(.0135)	(.0139)	(.0162)
c.age#c.age	.0002	.0001	.0003*
	(.0002)	(.0002)	(.0002)
1.male	-.2549***	-.1647**	-.2524***
	(.0629)	(.0643)	(.0737)
IPR	.0546	.1313**	-.1449*
	(.0625)	(.0579)	(.0749)
log_gdp	.0348	.0372	.0346
	(.0565)	(.0518)	(.0697)
gini_final	.0175	.023**	-.0083
	(.0113)	(.0106)	(.0138)
/var(1.TEAyyOPP[co)	.0655	.0315	
	(.0482)	(.0385)	
/var(_cons[country])	.3536***	.2878***	.5718***
	(.0802)	(.0677)	(.1294)
Observations	4593	4593	4593
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 6: Multilevel model subsample Retail trade, Hotels and restaurants

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.1419***	.1523***	.0405
	(.0427)	(.0457)	(.0315)
fearfail	-.0602**	-.0787***	.0017
	(.0253)	(.0259)	(.0303)
tax_bur	.0884	.1229*	-.0226
	(.067)	(.0663)	(.0792)
free_entry	.0655	.1128	.0429
	(.0853)	(.0856)	(.1016)
1.education	.1047	.0723	.1383
	(.0812)	(.0834)	(.0991)
2.education	.0292	.0521	-.0118
	(.0796)	(.0818)	(.097)
3.education	.0518	.0554	.0699
	(.0774)	(.0795)	(.0939)
4.education	.1373	.137	.1156
	(.0837)	(.0858)	(.1007)
5.education	.2821***	.2639***	.22**
	(.0804)	(.0826)	(.097)
6.education	.4046***	.3976***	.2571
	(.14)	(.1447)	(.163)
age	-.0305***	-.026***	-.0219***
	(.0058)	(.006)	(.0071)
agesq	.0003***	.0003***	.0002**
	(.0001)	(.0001)	(.0001)
1.male	.0554**	.07***	.0028
	(.0233)	(.0238)	(.0279)
IPR	-.0304	.1091***	-.2338***
	(.0474)	(.0422)	(.0657)
log_gdp	.0712	.0819*	.1234
	(.0502)	(.0446)	(.0762)
gini_final	.0028	.0146**	-.0258**
	(.0081)	(.0074)	(.0109)
/var(1.TEAyyOPP[co)	.0605***	.0691***	
	(.0179)	(.0215)	
/var(_cons[country])	.4027***	.2658***	.8584***
	(.079)	(.0539)	(.1665)
Observations	24947	24947	24947
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 7: Multilevel model subsample Information and communication

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.2974***	.2899***	.2304**
	(.0974)	(.1011)	(.106)
fearfail	-.0717	-.1407*	.0979
	(.0806)	(.0814)	(.0886)
tax_bur	.0429	.1011	-.0181
	(.1379)	(.1334)	(.1616)
free_entry	.2739	.1631	.2062
	(.1875)	(.1843)	(.2149)
1.education	.2744	.2145	.4103
	(.6883)	(.6647)	(.723)
2.education	.5969	.6747	.3888
	(.6355)	(.6066)	(.6579)
3.education	.2734	.3891	.078
	(.624)	(.5942)	(.6445)
4.education	.2929	.3961	.1315
	(.6283)	(.5988)	(.6492)
5.education	.5907	.6471	.4445
	(.6224)	(.5925)	(.6426)
6.education	1.1631*	1.1696*	.8458
	(.6475)	(.6184)	(.6693)
age	-.0321*	-.0362**	-.0025
	(.0176)	(.0182)	(.0196)
agesq	.0004*	.0005**	-.0001
	(.0002)	(.0002)	(.0002)
1.male	.1786**	.2245**	.0695
	(.0887)	(.0903)	(.0984)
IPR	.0005	.0612	-.0692
	(.0553)	(.0519)	(.0721)
log_gdp	.0522	.0021	.1008
	(.0482)	(.0438)	(.0644)
gini_final	-.0015	.0073	-.0153
	(.0106)	(.0099)	(.0137)
/var(1.TEAyyOPP[co)	.0183	.0309	
	(.0448)	(.0362)	
/var(_cons[country])	.1574***	.1022**	.3498***
	(.0609)	(.0431)	(.1121)
Observations	2627	2627	2627
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 8: Multilevel model subsample Financial Intermediation, Real estate, Professional and Administrative Services

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.2573***	.2903***	.0667
	(.0551)	(.0513)	(.0587)
fearfail	-.113**	-.1421***	-.0103
	(.0441)	(.045)	(.0531)
tax_bur	.1849**	.2037**	.0727
	(.0868)	(.083)	(.1078)
free_entry	.0042	.0343	-.0312
	(.1174)	(.1143)	(.1438)
1.education	-.201	.0044	-.4046
	(.2972)	(.3111)	(.3557)
2.education	.1167	.2338	.0593
	(.2742)	(.2867)	(.3207)
3.education	-.0485	.1239	-.1069
	(.268)	(.2802)	(.3132)
4.education	-.122	.0629	-.1631
	(.2701)	(.2824)	(.316)
5.education	-.1	.0744	-.1048
	(.2669)	(.2792)	(.312)
6.education	.0568	.2521	-.0356
	(.2813)	(.2935)	(.329)
age	-.0409***	-.029***	-.0427***
	(.0099)	(.01)	(.0119)
agesq	.0004***	.0003**	.0004***
	(.0001)	(.0001)	(.0001)
1.male	.1932***	.204***	.1042**
	(.0404)	(.0412)	(.0489)
IPR	-.0617	-.0156	-.0766
	(.0446)	(.0393)	(.0606)
log_gdp	.0461	.0431	-.0063
	(.041)	(.0359)	(.0575)
gini_final	-.0024	.0039	-.0091
	(.0082)	(.0074)	(.0114)
/var(1.TEAyyOPP[co)	.018	.0043	
	(.0258)	(.012)	
/var(_cons[country])	.182***	.1195***	.3715***
	(.0432)	(.031)	(.0786)
Observations	8905	8905	8905
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 9: Multilevel model subsample Government, Health, Education, Social

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.1867***	.2459***	.07
	(.0596)	(.0587)	(.0578)
fearfail	-.0887**	-.1291***	.0953*
	(.044)	(.0447)	(.0539)
tax_bur	.1829*	.2383**	-.0133
	(.0964)	(.0932)	(.1195)
free_entry	.0488	.1331	-.0928
	(.1261)	(.1242)	(.1527)
1.education	-.0017	-.0395	-.1265
	(.2643)	(.2646)	(.3301)
2.education	.1186	.0345	.1065
	(.255)	(.2547)	(.3122)
3.education	.2303	.1471	.1304
	(.2507)	(.2501)	(.306)
4.education	.3474	.2059	.3292
	(.2536)	(.2532)	(.3091)
5.education	.3288	.2285	.224
	(.2508)	(.2503)	(.306)
6.education	.1366	-.0281	.2349
	(.2735)	(.2742)	(.3315)
age	-.0374***	-.0195*	-.054***
	(.0106)	(.0108)	(.013)
agesq	.0005***	.0003**	.0006***
	(.0001)	(.0001)	(.0002)
1.male	.0458	.1026**	-.0686
	(.0406)	(.0412)	(.0497)
IPR	-.0271	.0425	-.1341*
	(.0524)	(.0462)	(.0728)
log_gdp	.0031	.0096	.0304
	(.051)	(.0438)	(.0707)
gini_final	.0105	.0139	-.003
	(.0101)	(.0089)	(.0135)
/var(1.TEAyyOPP[co)	.0658*	.0553*	
	(.0339)	(.0312)	
/var(_cons[country])	.3182***	.2129***	.6516***
	(.0691)	(.0505)	(.1388)
Observations	8412	8412	8412
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 10: Multilevel model subsample Personal/Consumer services

	(1) Innovation	(2) Iproduct	(3) Iprocess
1.TEAyyOPP	.359***	.528***	-.0648
	(.1088)	(.1127)	(.1298)
fearfail	-.0854	-.0647	.011
	(.0994)	(.1005)	(.1207)
tax_bur	-.0014	.0934	-.09
	(.1708)	(.1639)	(.2087)
free_entry	.1626	.1444	-.0626
	(.236)	(.2303)	(.2894)
1.education	-.6942	-1.1743*	.5332
	(.5774)	(.6046)	(.7326)
2.education	-.3086	-.8103	.7148
	(.5474)	(.5768)	(.7005)
3.education	-.6015	-1.0927*	.5138
	(.5388)	(.5681)	(.6918)
4.education	-.4193	-.9599*	.7557
	(.5452)	(.5741)	(.6977)
5.education	-.4956	-1.0246*	.6593
	(.5383)	(.5674)	(.6908)
6.education	-.1419	-.4876	.4147
	(.601)	(.6325)	(.7637)
age	.0168	.0313	-.026
	(.0211)	(.0213)	(.0266)
agesq	-.0003	-.0004	.0001
	(.0003)	(.0003)	(.0003)
1.male	-.1518*	-.1229	-.0695
	(.0901)	(.0914)	(.1106)
IPR	-.0807	-.0064	-.1867**
	(.0769)	(.0727)	(.0917)
log_gdp	.096	.0784	.0672
	(.065)	(.0605)	(.0778)
gini_final	.0084	.012	-.0095
	(.0135)	(.0125)	(.0161)
/var(1.TEAyyOPP[co)	.0061	.0084	
	(.0591)	(.057)	
/var(_cons[country])	.3031***	.2393***	.4369***
	(.0932)	(.0798)	(.1483)
Observations	1715	1715	1715
Pseudo R^2	.z	.z	.z
Year fixed effects	YES	YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*