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# Entrepreneurship-Growth Nexus: Does the Size of the Informal Economy Matter?

# العلاقة بين ريادة الأعمال والنمو: هل حجم الاقتصاد غير الرسمي مهم؟


Prepared by:

**Lama Radwan**

Supervisor

**Dr. Yousef Daoud**


This Thesis was submitted in partial fulfillment of the requirements for the Master's Degree in Business Administration from the Faculty of Graduate Studies at Birzeit University, Palestine

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**Lama Radwan**


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**Dr. Yousef Daoud**

Approved *by:*

**Dr. Yousef Daoud**

(Chairman of Supervisory Committee) _____

**Dr. Samah Abu Assab**

(Member of Supervisory Committee) _____

**Dr. Tareq Sadeq**

(Member of Supervisory Committee) _____

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**Abstract**

Numerous studies on the relationship between entrepreneurship and economic growth have demonstrated the significant contribution of entrepreneurship to economic growth through creativity, innovation, and the creation of new job opportunities. However, some studies have provided evidence that this contribution does not apply to all countries based on their economic development level, that is, this contribution is less or even not found in less developed countries. Using Global Entrepreneurship Monitor (GEM) data, this paper implements a multiple linear regression model on panel data of a sample of 64 countries over the period (2002-2015), in order to examine the influence of Total Early-stage Entrepreneurial Activity (TEA) on output per worker growth. We investigate whether this influence depends upon the size of informal economy in the country, as one of the first attempts to provide an empirical analysis that relates the informal economy to the entrepreneurship-growth nexus. This will be distinguished for three levels of economic development of the countries: factor-driven economies, efficiency-driven economies, and innovation-driven economies. The results suggest that entrepreneurship would be a key factor in stimulating economic growth for the entire sample of countries, which seems to be more important for less developed countries. Our estimations also show that informal economy seems to have no moderating influence on this relationship. The findings of this study could be of interest to policymakers, as it provides new insights in understanding the relationship between entrepreneurship and economic growth, which would help to establish new polices that would increase the positive influence of entrepreneurial activity according to its different consequences across countries with different stages of economic development.

**ملخص تنفيذي**

أظهرت العديد من الدراسات حول العلاقة بين ريادة الأعمال والنمو الاقتصادي المساهمة الكبيرة لريادة الأعمال في النمو الاقتصادي من خلال الإبداع والابتكار وخلق فرص عمل جديدة. ومع ذلك، قدمت بعض الدراسات أدلة على أن هذه المساهمة لا تنطبق على جميع الدول بناءً على مستوى التنمية الاقتصادية في هذه الدول، أي أن هذه المساهمة أقل أو حتى غير موجودة في البلدان الأقل نمواً. باستخدام بيانات مرصد الريادة العالمي Global Entrepreneurship Monitor (GEM)، تطبق هذه الورقة نموذج انحدار خطي متعدد على بيانات لعينة من 64 دولة خلال الفترة الزمنية (2002-2015)، من أجل دراسة تأثير إجمالي نشاط ريادة الأعمال في المراحل المبكرة Total Early-stage Entrepreneurial Activity (TEA) على نمو الناتج الاجمالي لكل عامل. نحن نحقق فيما إذا كان هذا التأثير يعتمد على حجم الاقتصاد غير الرسمي في الدولة، كواحدة من المحاولات الأولى لتقديم تحليل تجريبي يربط حجم الاقتصاد غير الرسمي في عدة دول بالعلاقة بين ريادة الأعمال والنمو الاقتصادي لهذه الدول. سوف يتم التمييز بين ثلاثة مستويات من التنمية الاقتصادية للبلدان: الاقتصادات التي تحركها العوامل Factor-driven economies، والاقتصادات التي تحركها الكفاءة Efficiency-driven economies، والاقتصادات المدفوعة بالابتكار Innovation-driven economies. تشير النتائج إلى أن ريادة الأعمال تشكل عاملاً رئيسياً في تحفيز النمو الاقتصادي لعينة البلدان بأكملها، والذي يبدو أكثر أهمية بالنسبة للبلدان ذات مستويات التنمية الاقتصادية الاقل او بما يعرف بالبلدان النامية. تظهر تقديراتنا أيضًا أن الاقتصاد غير الرسمي يبدو أنه ليس له تأثير على هذه العلاقة. قد تكون نتائج هذه الدراسة ذات فائدة لواضعي السياسات، حيث إنها تقدم رؤى جديدة في فهم العلاقة بين ريادة الأعمال والنمو الاقتصادي، مما سيساعد على إنشاء سياسات جديدة من شأنها زيادة التأثير الإيجابي لنشاط ريادة الأعمال وفقًا لتداعياته المختلفة عبر البلدان بمراحل مختلفة من التنمية الاقتصادية.

# Chapter One: Introduction

## 1.1 Overview

The literature on entrepreneurship-growth nexus is abundant; several studies recognized the positive role of Small- and Medium-Sized Enterprises (SMEs) or self-employment on economic growth and development, through increasing employment, innovation, and welfare (Ács & Naudé, 2013; Wennekers & Thurik, 1999). Others emphasized knowledge spillovers, increasing competition, and providing diversity among firms, that was proposed to have a positive impact on growth (Audretsch, 2007; Hessels & Van Stel, 2011). However, lack of consensus on a well framed theoretical framework of entrepreneurship in economic theory may have led to contradictory or inconclusive national empirical findings, which might be related to country specific differences such as their level of economic development (Van Stel et al., 2005), which is our area of investigation. Hence, this research aims to employ a theoretical structure that explains and/or expands the different frameworks.

The theoretical, as well as empirical contexts of this relationship examined in the literature reflects its multidimensional nature. These dimensions (individual, firm, country, sectoral, industrial factors and regional levels) have been utilized by several studies, for example, Noseleit (2013) and Van Stel and Carree (2004) focused on sectoral and industrial factors, while Ivanović-Djukić et al. (2018) and Wong et al. (2005) resorted to the presence of different types of entrepreneurship. On the other hand, Wennekers and Thurik (1999) analyzed different measurements of entrepreneurship in a theoretical framework linking entrepreneurship to economic growth.

This study contributes to the existing literature by using an endogenous growth model in which the effect of entrepreneurship on growth allows for these different (and seemingly conflicting views) magnitudes. Using a relatively long panel of countries from varying degrees of levels of development allows for capturing differences within and between countries. At the group level, one expects that the impact of entrepreneurship on output per worker may allow for the catching up hypothesis if the relationship is stronger in countries that are less developed. Our study also contributes to the existing literature by addressing the endogeneity of entrepreneurial activity rates by using skill perception and fear of failure as instruments. These instruments capture individual characteristics, thus are highly correlated with entrepreneurial activity rates, and they would satisfy exclusion restrictions allowing for causal inference.

This study also compliments the existing literature on growth and entrepreneurship by introducing the size of the informal economy to the entrepreneurship-augmented growth model. Informal economy has been widely viewed as a negative phenomenon; however, the findings of the empirical studies on the relationship between informal economy and economic growth are inconclusive. Some studies show the impact of informal economy on economic growth is positive (Adam & Ginsburgh, 1985; Sakanko & Ewugi, 2017), while others show a negative one (Eilat & Zinnes, 2000; Loayza, 1999), or differs among developed, transition, and developing countries (Gerxhani, 2004; Schneider & Klinglmair, 2004), which makes this relationship "considerably ambiguous" (Schneider, 2008), hence requires further investigation.

Moreover, there has been little attention given to the relationship between informal economy and entrepreneurship (Petrova, 2016; Williams & Nadin, 2010). This may be due to the negative view of the informal economy; however, in recent decades, a growing research suggests that the informal economy may not be completely negative

because it provides entrepreneurial qualities, treating the informal economy as an "asset that needs to be harnessed" rather than an impediment to growth (Williams, 2005; Williams & Round, 2007). Therefore, in order to study the entrepreneurship-growth nexus at the national level, the broad relationship between entrepreneurship, economic growth, and informal economy would be a critical area of investigation, which may be important in understanding the dynamic nature of entrepreneurial activity and its varied contributions in growth across countries.

### 1.2 Research Problem and Research Question

The debate on the entrepreneurship-growth nexus has not been settled. Several studies suggested that the impact of entrepreneurship on economic growth differs among countries depending on their level of economic development, as many have indicated a positive impact in developed countries (Dejardin, 2000; Lepojevic et al., 2016; Naudé, 2008). However, several studies indicated the positive influence of only those considered fast growing types of entrepreneurship in these countries rather than entrepreneurship in general (Valliere & Peterson, 2009; Wong et al., 2005). While in developing countries, the relationship is more complex and is likely to have variety of results, and some studies concluded that entrepreneurship has less of an impact on economic growth in developing countries than it has in developed ones (Van Stel et al., 2005), or even has no significant impact (Sabella et al., 2014). However, there is also some evidence on a positive impact in these countries (Urbano & Aparicio, 2016), which is higher and more significant in some cases (Bampoky et al., 2013). Moreover, prior empirical studies on cross-national comparison between countries with different levels of economic development faced challenges in confirming the theoretical hypotheses of the role of entrepreneurship in the growth process due to lack of available comparable data. Investigation of entrepreneurship-growth nexus, especially for

developing countries, is found to be under researched area of investigation and typically depends on small samples and short-term investigations (Naudé, 2008).

The discrepancy in the empirical findings was considered to be a consequence of different macroeconomic factors between countries (Acs, 2006); As such, some studies have pointed out that the presence of informal economy may explain these different findings (Acs, Desai, & Hessels, 2008; Ivanović-Djukić et al., 2018). However, to the best of our knowledge, no empirical evidence relates informal economy to explain the variation in this relationship. In this regard, this study seeks to provide an empirical analysis in order to examine the impact of entrepreneurship on economic growth incorporating the influence of informal economy on this impact. This approach may explain such variation between countries of different development levels. Therefore, the research addresses the following questions:

1. How does entrepreneurship influence economic growth?
2. Does the level of development matter?
3. Does this influence depend upon the informal economy size?

### 1.3 Research Objective

The purpose of this research is to analyze, theoretically and empirically, the role of entrepreneurship in stimulating economic growth at a national level by using panel data modeling techniques on a set of for 64 countries spanning over a period of fourteen years (2002-2015). Using a conceptual framework that links entrepreneurship to economic growth, we examine the effect of total entrepreneurial activity on economic growth distinguishing between three groups of countries according to their level of economic development (factor-driven economies, efficiency-driven economies, and innovation-driven economies). In addition, the research will test whether the size of

informal economy in the country is a relevant variable in either affecting growth directly or indirectly through its moderating impact on the relationship between entrepreneurship and economic growth.

### 1.4 Research Scope

The scope of this study targets national level data on countries within different levels of development, which have different environmental characteristics. Porter (1990) defines competitiveness according to the nation's capacity to innovate, distinguishing between three stages of economic development: factor-driven stage, efficiency-driven stage, and innovation-driven stage (Acs, Desai, & Hessels, 2008). Countries in the factor-driven stage do not create knowledge or innovation, and are characterized by low-cost efficiencies in production; they are also dependent on non-agricultural self-employment, and on small manufacturing and service firms. In the efficiency-driven stage, countries increase their reliance on more educated workforce and larger manufacturing firms with basic services, it is also marked by a transition from self-employment to wage employment, but still lack the higher significant growth rates, due to capital and labor substitution, which lowers returns from self-employment and increases returns from wage employment. While in developed countries, innovation-driven stage is characterized by lower rates of manufacturing firms and higher rates of services small firms, which provide more opportunities for entrepreneurship that is more innovative and knowledge based (Acs, Desai, & Hessels, 2008). It is important to make a distinction between these stages of economies development in order to capture different consequences of the relationship between entrepreneurship and economic growth.

### 1.5 Research Importance

This study is important as it complements the existing literature in understanding entrepreneurship relation to economic growth and contributes to both theoretical and practical insights of this relationship. On the one hand, this study offers a structural framework that reconciles different findings attempting to fill conceptual and theoretical gaps in defining entrepreneurship and linking entrepreneurship to economic growth, as we discuss several definitions of entrepreneurship, which might have led to these different findings. Accordingly, we employ a well-defined measure that contributes to fill measurement gaps that were found in previous work, which we discuss further in the next chapter. In addition, this study would be of value to economists and academics who attempt to understand factors that enhance national growth. Growth models that depend on only labor and physical capital factors of productions (Solow, 1956), may not be able to fully explain national growth variations, as many economists turned the attention to the importance of other factors such as technological progress and investment in knowledge and human capital (Plosser, 1992; Romer, 1986). Hence, entrepreneurship, as one form of human capital, is important as well. However, the extant empirical evidence is rarely based on theoretical approaches that relates entrepreneurship to growth theory. Depending on conceptual frameworks of more recent studies (Audretsch, 2007; Audretsch & Keilbach, 2004a, 2004c, 2005) on linking entrepreneurship to economic growth, this research incorporates entrepreneurship into a growth model as an additional factor of production.

On the other hand, this research would be of interest to academics and researchers in the entrepreneurship-growth nexus field of study as it aims to fill gaps in the empirical literature on this relationship including sample sizes, omitted variable biases, heterogeneity, and causality issues (Bjørnskov & Foss, 2016). One major limitation we

found is that the empirical evidence is mostly based on short-term analyses, or one point of time with cross-sectional data, while it is better to investigate such relationship on the long run (Carree & Thurik, 2010). However, using national level data, obtained from the global entrepreneurship monitor (GEM), allows us to have wider investigation that employs panel data over a long-term period of fourteen years (2002-2015), which provides higher number of observations, leading to results that would be more accurate, which emphasizes the importance of long-run entrepreneurship policy planning.

Moreover, distinguishing between different levels of economic development of countries provides additional understanding of economic and business environments that may lead to varying impacts of entrepreneurship. This comparative analysis helps governments and policy makers to expand their knowledge, make better judgments, and reallocate public resources. In addition, it facilitates the identification of specific policies for each type of economy since policy recommendations should be based on the country's circumstances instead of general type recommendations. Furthermore, it contributes to directing the private sector in each development stage towards making informed choices. This study also provides further direction for future research on how should public policy focus on entrepreneurial investments based on the specific settings of the country.

### 1.6 Research Methodology

This study aims to answer the research questions through group comparison techniques by incorporating categorical variables and interaction terms in order to examine the impact of entrepreneurship on economic growth across countries with different levels of development. As for the moderating role of informal economy on this relationship, we also use an interaction term between the informal economy size and the rate of total

entrepreneurial activity of the country. In order to do this, the methodology of this research employs two estimation strategies, an instrumental variables (IV) estimation approach that allows overcoming potential endogeneity issues, and an ordinary least square (OLS) technique that works as a benchmark to analyze the robustness of the results.

### 1.7 Research Structure

This study proceeds as follows. The first chapter is the Introduction, followed by a review of the literature on defining and linking entrepreneurship to economic growth as well as the broad relationship between entrepreneurship, economic growth, and informal economy. The third chapter explains our empirical model and the methodology used in this research, and describes the data and their sources. The fourth chapter presents and analyzes the results and discusses the findings of our study. Finally, the fifth chapter concludes and highlights future study insight.

# Chapter Two: Literature Review

The literature on entrepreneurship and economic growth is varied and abundant, our review of the literature is primarily focused on entrepreneurship and its relation to growth. The first section presents the theory, definitions, and measurement of entrepreneurship. While the second section provides the variety of findings regarding the relationship between entrepreneurship and economic growth under different frameworks. In addition, this section presents some limitations observed in the previous work. The third section briefly discusses evolution of growth theory, in addition to how scholars related entrepreneurship to this theory. Finally, we discuss the relationship of the presence of informal economy with economic growth and entrepreneurship separately, and the link that might be found between the three of them through moderating role of informal economy size in the relationship between entrepreneurship and economic growth.

## 2.1 Entrepreneurship

### 2.1.1 Theories of Entrepreneurship

During the last two decades, entrepreneurship has received considerable attention by researchers. The renewed interest includes different views and opinions about the nature and role of entrepreneurship and its impact on several aspects of the economy. Veciana (2007) classifies these theories under four main theoretical approaches. First, the psychological approach that considers the characteristics and personality of entrepreneurs. Second, the sociocultural approach that discusses the environmental factors that affect entrepreneurs and encourage entrepreneurship that enhances growth. Third, the managerial approach, which focuses on the distinction between entrepreneurs and managers. Finally, the economic approach, which is the focus of this study,

emphasizes the importance of entrepreneurship as an additional factor of production and its role in economic development. These approaches are not considered to be the only ones in entrepreneurship literature, but are the most important and widely used approaches (Veciana, 2007). Accordingly, we discuss some perspectives and theories following this classification.

*Psychological Approach*

The focus of this approach is on the psychological profile that gives the entrepreneurs their unique identity and differentiates them from others as well as the personality characteristics that drives entrepreneurs to be more or less successful. Several personality traits are found to be strongly related to entrepreneurs such as risk-taking behavior, as many have suggested that risk seeking and risk bearing ability are main characteristics of entrepreneurs (Knight, 1921; Palmer, 1971). However, some scholars argued that entrepreneurs are more likely to take "moderate risks in situations where they have some degree of control or skill in realizing profit" (Cunningham & Lischeron, 1991) and prefer to avoid extremely high risks (McClelland, 1961). Another personality trait that had a considerable attention of researchers is the 'need for achievement' or 'achievement motivation' characteristic of entrepreneurs, which reflects those who are hardworking with strong desire to achieve success. McClelland (1961) proposed the importance of this psychological factor as a promoter of economic development claiming that the higher degree of 'need for achievement' in a society the more successful entrepreneurs are developed. In addition, self-efficacy is another characteristic that is commonly related to entrepreneurs, which refers to one's confidence of having the capabilities to start an entrepreneurial activity, as it is found to be a good motivator for successful entrepreneurs to start their businesses (Wennberg et al., 2013). Moreover, viewing an entrepreneur as a decision maker who seeks for the

best business opportunities, Kirzner (1978) suggests that entrepreneurs should have alertness characteristic, by which they can be always alert to market information that gives them the ability to perceive unnoticed valuable opportunities, hence, make right decisions.[1]

*Sociocultural Approach*

According to this approach, social, cultural, institutional, and other environmental factors are important determinants of entrepreneurial activity, as there are several theories on the role of these factors in fostering entrepreneurial entry as well as enhancing the effectiveness and productiveness of entrepreneurial activities. Frameworks within this approach find their roots in the work of Max Weber (Weber, 1905), who emphasized the important role of different cultural factors in the success of some nations compared to others. (Weber, 1905) argued that entrepreneurs' behaviors are highly conditioned by religious beliefs, and linked capitalism spirit, entrepreneurial growth, and economic development in some countries to high prevalence of protestant ethic in these countries. However, this assumption received disagreements by several scholars finding no relationship between Protestantism and economic growth (Cantoni, 2015; Kersting et al., 2020).

Another theory under the sociocultural approach is the theory of social marginality, which assumes that individuals who find themselves less integrated with society or a specific work environment are more likely to become entrepreneurs (Veciana, 2007). According to this theory, those who find their personal characteristics and capabilities contradicting to the roles they have in society, and those who come from certain minorities, as well as unemployed individuals, often tend to establish their own

[1]See Gorgievski and Stephan (2016) for details on other areas of the psychological study of entrepreneurship.

businesses, taking entrepreneurial activity as an alternative to improve their social reality. In addition to this marginality socio-cultural factor, many have recognized networking activities as one of the important social factors that is commonly related to the firms' formation process (Aldrich & Zimmer, 1986; Dubini, 1991; Johannisson, 1988). Network theory suggests that starting up a new enterprise is highly based on its capability to communicate with the surrounding environment and an effective entrepreneur is able to *"plan and monitor networking activities, and attempt to increase network density and diversity"* whether on the personal or the organizational level (Dubini, 1991). Moreover, networking is related to entrepreneurship not only by providing entry facilities, but also by facilitating the growth and survival of these new enterprises (Audretsch, 2003).

Conceptual frameworks that consider institutional factors have a growing considerable attention by researchers in the study of entrepreneurship (Aparicio et al., 2016; Baumol & Strom, 2007; Bjørnskov & Foss, 2016; North, 1990; Urbano et al., 2019). North (1990) describes institutions as *"the humanly devised constraints that shape human interaction*", and distinguishes between two types of them: first, formal institutions, which includes legal factors, political situation, public policies, governance variables and other country regulations; second, informal institutions that refers to values, and attitudes as well as cultural, social, and religious factors (North, 1990). The institutional theory relates entrepreneurial activity to both formal and informal institutions as important factors influencing the process of decision making of entrepreneurs as well as explaining their entrepreneurial behaviors (Urbano et al., 2019). Moreover, several studies have considered the institutional approach in linking entrepreneurship to economic growth, as it is argued that differences of the institutional environment across

countries can explain the different effectiveness levels of entrepreneurship on the economic growth of these countries (Aparicio et al., 2016; Baumol & Strom, 2007).

*Managerial Approach*

This approach is interested on what entrepreneurs do and how they act, and provides a distinction between managers and entrepreneurs from a practical perspective, reflecting the "Managerial behavior" of entrepreneurs (Stevenson & Jarillo, 2007). This leads to the behavioral theory of entrepreneurs, which assumes that entrepreneurs' behaviors differs from their psychological traits, as it aims to reflect entrepreneurial skills and abilities that can be learnt (Veciana, 2007). Researches within this approach mostly focus on entrepreneurs' ability to identify and exploit opportunities, which depends on their ability to learn and explore information (Ardichvili et al., 2003; Shane, 2000; Shane & Venkataraman, 2000; Stevenson & Jarillo, 2007). Moreover, Busenitz and Barney (1997) differentiated between entrepreneurs and managers, identified by firms' founders and non-founders, respectively, through their way of decision making; they found that entrepreneurs have more overconfidence than managers. Other attitudes that reflect entrepreneurial behavior are related to individual's ability to lead, communicate, establish networks, and to bear risks and uncertainty (Veciana, 2007).

*Economic Approach*

The linkage between entrepreneurship and economic growth has been considered in wide strand of literature. One of the important theories that has derived the study of entrepreneurship under the economic approach is the Schumpeterian theory of economic development, which emphasizes the important role of entrepreneurship, as a process of innovation, in enhancing economic development (Schumpeter, 1934). He assumes that these innovative activities are responsible on bringing economic change

and creating shocks in the economy, which causes disturbance of the economic equilibrium, and therefore, brings economic development through the process of transition to new equilibrium state (Schumpeter, 1934). Through this process, Schumpeter (1934) assumes that an increase of entrepreneurial activity rates would bring sustainable economic development that is resulted from the continuous disequilibrium brought by the economic change they cause; hence, entrepreneurship would be considered a new factor of production. Therefore, many researchers have studied the important role of entrepreneurship in stimulating economic growth and development (Acs et al., 2012; Aparicio et al., 2016; Audretsch & Keilbach, 2004a; Braunerhjelm et al., 2010; Hessels & Van Stel, 2011; Wennekers & Thurik, 1999). Moreover, there are some theories suggesting that entrepreneurship does not necessarily create innovation, and that imitative activities can also be included in the entrepreneurial activity and contribute to economic growth through knowledge transfer (Schmitz, 1989), increasing diversity and competitiveness (Davidsson, 2016). Accordingly, Wennekers and Thurik (1999) distinguishes between two major roles of entrepreneurship: first, "new entry" reflecting the process of new business creation regardless the creation of any innovation, and second, "newness" reflecting innovative entrepreneurs.

The different approaches show a broad view of what entrepreneurship is and indicate that there is no specific model on how entrepreneurship would be related to economic growth. In the following sections, we discuss the definition and measurement of entrepreneurship employed in this study and elaborate different findings of studies on entrepreneurship-growth nexus, as well as discussing the conceptual framework we use.

### 2.1.2 Definition

The multiplicity of frameworks used to analyze the entrepreneurship-growth relation finds its roots in the various definitions of entrepreneurship: Carree and Thurik (2003) report three definitions: the Kirznerian entrepreneurship, which focused on perceiving profit opportunities, and the Knightian entrepreneurship, which emphasized on uncertainty and risk seeking behavior of entrepreneurs, in addition to the Schumpeterian definition of entrepreneurship that emphasizes innovation. While Schmitz (1989) proposed the view of entrepreneurship as an imitative process rather than innovative one. Other perspectives of defining entrepreneurship are the economic perspective and the management perspective. The former suggests that entrepreneurship is one of the main factors of production, while the latter suggests that entrepreneurship is a way of managing, Hebert and Link (1989), and Sahlman and Stevenson (1991), respectively[2].

According to Schultz (1975), entrepreneurs are those who are engaged in equilibria activities through reallocating their resources to deal with a given economic disequilibrium and not necessarily creating new firms. While Audretsch (2003) argues that most common and convincing studies viewed entrepreneurship as a process of introducing new things such as new ideas, products, business lines, and economic and business opportunities, etc.. Audretsch (2003) also discussed the view of entrepreneurship as a process of creating change, and related the complexity of defining entrepreneurship to two reasons, in regard of the process of change. Firstly, entrepreneurship is related to the change that takes place in several organizational forms that varies between the individual, spatial, and industrial levels. Secondly, there is no

[2] See Audretsch (2003) for more details.

specific standard for what activities to be considered as a change, and that an entrepreneurial activity that creates change at the individual level would not be as productive as the one that creates change at the spatial and global levels (Audretsch, 2003). This would lead us to another view of defining entrepreneurship, which distinguishes between several types of entrepreneurial activities according to their outcomes, which can be productive, such as innovative activities, or unproductive such as rent seeking activities (Baumol, 1996; Dejardin, 2000; Wong et al., 2005) .

The Schumpeterian definition of entrepreneurship is one of the definitions that supports the idea of introducing new things and innovative change, and is a dominant definition that has been recognized to have great contributions to early theoretical literature of entrepreneurship (Audretsch, 2003; Henrekson & Sanandaji, 2014) and has given remarkable attention to innovative entrepreneurship (Wennekers & Thurik, 1999). According to Schumpeter (1934), an entrepreneur is an innovator who creates change through introducing "new combinations", which includes the introduction of a new good or an existing good with new qualities, a new method of production, a new market, a new source of supply, and a new industrial organization. This definition is employed increasingly in more recent empirical research, due to lack of previously available data reflecting the Schumpeterian entrepreneurship, especially for across countries studies (Henrekson & Sanandaji, 2014).

Some scholars use a broader definition that considers entrepreneurs as individuals who create new businesses (Gartner, 1985), which may correspond with Schumpeter's 'opening of a new market'; however, this view of entrepreneurship as new venture creation is not restricted to those who introduce innovation. This study is more likely to follow this broad definition using the Global Entrepreneurship Monitor (GEM) measure of entrepreneurship that reflects a wide range of new business creation. This

measure is able to capture innovative entrepreneurs and opportunity seeking entrepreneurs reflecting both Schumpeterian and Kirznerian terms, respectively, in addition to other business creators who choose to become entrepreneurs out of necessity and lack of other alternatives (Reynolds et al., 2005). We use this broad definition in order to have wider distinction of the implications of entrepreneurship as a whole at a national level across countries with different levels of economic development.

Another dominant view defines entrepreneurs by those who are self-employed, which is related to as the occupational notion of entrepreneurship (Sternberg & Wennekers, 2005). It was commonly used in a large base of earlier literature, especially the empirical one due to its availability and ease of measurement across countries and over time (Henrekson & Sanandaji, 2014). However, defining entrepreneurship as self-employment is insufficient to reflect and capture all entrepreneurial activity nor does it distinguish entrepreneurs from other self-employed individuals (Levine & Rubinstein, 2018), which makes it narrower definition that might lead to misleading results when it comes to entrepreneurship-growth nexus (Bampoky et al., 2013; Wennekers & Thurik, 1999), and in accordance to the Schumpeterian definition (Henrekson & Sanandaji, 2014).

The diversity and variety in defining entrepreneurship is a result of the variety of using it within several approaches, and therefore using different explanations and opinions on the role of entrepreneurship, which reflects a multidimensional nature of entrepreneurship (Petrova, 2016). Hence, different ways of measuring entrepreneurship are found (Hébert & Link, 1989), which we discuss in the next section.

### 2.1.3 Measurement

Due to the various definitions of entrepreneurship, various measures are encountered. Among those measures are startup rates, nascent entrepreneurship rates, self-employment rates, business ownership rates, among others[3]. Cross-national comparison of entrepreneurship-growth nexus raises some serious issues due to lack of available data on comparable and comprehensive measures of entrepreneurship (Audretsch & Thurik, 2001). The reliance on proxies that are found to be correlated with entrepreneurship and not necessarily reflecting entrepreneurial activity is another confounding factor (Braunerhjelm, 2010). Moreover, literature on national comparison is limited to small sample sizes and short term investigations due to lack of comparable data (Marcotte, 2013). However, the Global Entrepreneurship Monitor (GEM) has changed this. GEM is a large research program that was initiated in 1999 with a sample of 10 countries to reach over than 100 countries by 2018. It has powerful contributions in the study of entrepreneurship providing high quality annual information that allow international comparisons among the participated countries; and contributes in a better understanding of the relationship between entrepreneurship and economic growth at the national level. GEM introduced indicators and measures reflecting entrepreneurship as a "national attribute" through collecting and aggregating individual level data by country (Reynolds et al., 2005). We use one of these national comparable measures in this study, the Total Early-stage Entrepreneurial Activity (TEA), which is the most widely used of GEM measures and it captures those who are owners or involved in setting up a new business as a percentage of adult population (Reynolds et al., 2005).

[3] See Audretsch (2003) for more details.

The presence of various measures of entrepreneurship can be a result of several categories in which it can be measured. For example, the occupational notion of entrepreneurship reflects those who own and manage a business on their own account and risk such as self-employment, which is also referred to as static measure of entrepreneurship reflecting the number of all firms and business owners. On the other hand, dynamic measures focus on new business creation, such as startups and nascent entrepreneurship measure (Sternberg & Wennekers, 2005). Additionally, the behavioral notion of entrepreneurship reflects behaviors of entrepreneurs such as taking economic opportunities and innovation (Sternberg & Wennekers, 2005). Regarding the entrepreneurship-growth nexus, it is better to view entrepreneurship within a dynamic economy, as it has "significant operational meaning" through the change it brings, counter to the static one, which is characterized with repeated actions (Hébert & Link, 1989). Hence, we use the TEA measure, which is able to reflect both dynamic and behavioral notions of entrepreneurship (Sternberg & Wennekers, 2005; Wennekers et al., 2010). Moreover, it provides wide range of data that allows the long-term investigation and the number of observations we employ at a national level comparison.

### 2.2 Linking Entrepreneurship and Economic Growth

Entrepreneurship has been recognized as an important driver of economic growth in a large number of studies (Acs, 2006; Acs et al., 2009; Aparicio et al., 2016; Audretsch, 2003, 2007; Audretsch & Thurik, 2001; Carree & Thurik, 2003; Hessels & Van Stel, 2011; Ivanović-Djukić et al., 2018; Van Stel et al., 2005; Wennekers & Thurik, 1999; Wong et al., 2005). These studies, among many others emphasized the importance of entrepreneurship through its contribution in job creation and providing employment opportunities, introducing innovation and knowledge spillovers, resources reallocation, and increasing competition and productivity.

(Urbano et al., 2019) provide a recent and excellent review of the literature on the link between entrepreneurship and economic growth. The study points to the various frameworks used to examine this relationship. Several studies followed a neoclassic growth model (Audretsch & Keilbach, 2004c; Minniti & Lévesque, 2010). Others utilized the more recent endogenous growth, which aims at finding the factors that explain productivity (Hessels & Van Stel, 2011; Noseleit, 2013). Moreover, more recent articles, following institutional approach in understanding this relationship, use institutional economic theory that takes into account the institutional environment in which entrepreneurship occurs (Baumol & Strom, 2007; Bjørnskov & Foss, 2016). Some scholars (Sternberg & Wennekers, 2005; Wennekers & Thurik, 1999; Wong et al., 2005) have used the Schumpeterian view of entrepreneurship, as an innovation process, and linked it to the hypothesis that entrepreneurship is related to economic development, not only to economic growth, (Urbano et al., 2019).

More recently, a growing number of studies argue that entrepreneurship effect on growth varies by development level. Among these studies, many have highlighted, theoretically and empirically, the significant and positive impact in developed countries (Acs & Varga, 2005; Dejardin, 2000; Lepojevic et al., 2016; Naudé, 2008). In addition, within less developed countries, there are also some studies that pointed to the theoretical underpinnings of a positive effect of entrepreneurship on growth; among those are job creation, increasing business experience, the dynamic nature of enterprises (McMillan & Woodruff, 2002), and the role of SMEs in increasing competition (Carlin et al., 2001). However, some recent empirical studies provide evidence on the existence of a negative or non-significant relationship in less developed countries. Van Stel et al. (2005) examined the influence of entrepreneurial activity, measured by TEA rates, on economic growth and found that it has a positive effect in developed countries but a

negative effect in the case of developing countries. They argued that this negative effect is related to insufficient number of large firms and lower human capital levels of entrepreneurs in less developed countries. Stam and Van Stel (2011) found no significant effect of entrepreneurship on growth in poor countries, and a significant positive effect in transition and rich countries. In addition, in a study conducted in Palestine, Sabella et al. (2014) provided another evidence of a non-significant relationship between entrepreneurship (measured by start-up rates) and economic growth in developing countries. Moreover, some scholars have made distinction between several types of entrepreneurship such as opportunity entrepreneurial activity (OEA), reflecting entrepreneurs seeking advantages of opportunities, necessity entrepreneurial activity (NEA), reflecting those who choose entrepreneurship out of necessity and lack of other alternatives, and high-expectation entrepreneurial activity (HEA) that reflects firms that are expecting to grow fast. Both Lepojevic et al. (2016) and Valliere and Peterson (2009) also found an insignificant impact of all types in developing countries, however, in developed countries, the former found a significant and positive impact of all three types, while the latter found this significant impact of only HEA. This is consistent with the finding that this type makes the greatest impact on growth in developed countries (Autio, 2005) and the highest contribution in net job creation compared to other new firms and entrepreneurship in general (Henrekson & Johansson, 2010). Moreover, Wong et al. (2005) found that only HEA has a significantly positive impact on economic growth through its contribution in enhancing knowledge development and access to innovation, regardless the level of economic development, while entrepreneurship in general and other types of entrepreneurship has no impact.

Reviewing the literature on the entrepreneurship-growth nexus within different levels of economic development, we find some limitations that may explain the different results, especially in the case of developing economies that seems to be unconvincing due to this variety of findings. One of these limitations is that most of these studies depends on one point of time or on short-term investigations, that is less than five years, while many have argued the importance of the availability of long-term period investigations, indicating that entrepreneurship is a long-term process that requires long-term basis planning (Carree & Thurik, 2010; Savrul, 2017; Sternberg & Wennekers, 2005). Moreover, the results of some empirical studies that rely on long-term periods, due to more data availability, are different from those previously done, but seem to reflect similar implications among each other. Some of these studies indicated that total entrepreneurial activity has a positive and significant impact in all stages of development, which is found to be higher in more developed economies (Ivanović-Djukić et al., 2018; Stoica et al., 2020; Urbano & Aparicio, 2016). However, distinguishing between two types of entrepreneurship, (Stoica et al., 2020) found opportunity entrepreneurship to have a greater and significant positive impact in developing countries compared to developed ones, while necessity entrepreneurship found to have a significantly negative impact in more developed countries, and an insignificant one in developing countries. However, they only focus on a sample of 22 European countries, which requires wider national comparison. In addition, Aparicio et al. (2016) found a similar impact of opportunity entrepreneurship using a sample of 43 developed and Latin-American developing countries; they explain their findings by institutional factors that encourage this type of entrepreneurship in developing countries more than it does in more developed countries. Moreover, using data of 53 countries of different levels of economic development, Bampoky et al. (2013) found a positive

impact of entrepreneurship for the entire sample, which gets higher and more significant in less developed countries. We observe a common finding between these studies, depending on long-term periods, which indicates that a positive impact of entrepreneurship on economic growth is found in all stages of economic development. Hence, using a sample of 64 countries covering 14 years (2002-2015), we expect to find this positive impact in all stages of economic development, however, further investigation would help to understand the behavior and the contribution of this positive impact in each stage.

This does not mean that all previous studies depends on short-term periods, their different results might be due to other issues such as using unsuitable measures. Sabella et al. (2014), for example, have used a long-term period in their investigation, however, the non-significant relationship may be due to the use of start-up rates as a measure for entrepreneurship, which might not be a sufficient measure and does not capture all entrepreneurial activity, since a large percentage of start-ups may not survive (Valliere & Peterson, 2009). Moreover, this rate depends on official data capturing only registered firms and neglecting informal enterprises (Sabella et al., 2014). However, our study uses TEA which captures formal and informal nascent and young enterprises reflecting more entrepreneurial activity (Acs, Desai, & Klapper, 2008). Moreover, investigating the impact of self-employment on economic growth in developing countries, (Pietrobelli et al., 2004; Yamada, 1996) found a negative impact. As for developed countries, several studies found positive (Acs et al., 2012; Braunerhjelm et al., 2010; Carree et al., 2007), and negative (Blanchflower, 2000; Carree & Thurik, 1999; Salgado-Banda, 2007) relationships, which indicates that this debate is unsettled. Moreover, self-employment includes self-employed entrepreneurs in addition to other self-employed who might not have entrepreneurial characteristics (Levine &

Rubinstein, 2018), and different countries might have different levels of these two types of self-employed people, which may have led to the diverse findings.

Another limitation found is that previous empirical work may suffer from weak methodologies that fails to account for unobserved heterogeneity among different countries (Naudé, 2011). In addition, some studies are subjected to the problem of omitted variable biases due to the lack of consensus on what should be considered as a standard specification and neglecting other relevant factors that basically explain national growth variations (Bjørnskov & Foss, 2016). While, some methods suffer from causality issues, as they do not take into consideration the recursive impact of economic growth on entrepreneurship, we address this issue by appropriately using the IV technique, which we discuss subsequently.

The findings of negative or non-significant effect of entrepreneurship on economic growth in developing countries conflicts with the claim that the more entrepreneurial activity rates in a country, the more economic growth it will have (Dejardin, 2000) since developing countries are found to have much higher rates of entrepreneurial activity than it is in developed countries (Acs, Desai, & Hessels, 2008). Wong et al. (2005) explain this by the existence of higher rates of technologically innovative knowledge-based entrepreneurs in more developed nations. Others related the findings to the variations in institutional and macroeconomic environments across nations (Acs, Desai, & Hessels, 2008; Ivanović-Djukić et al., 2018).

In this research, we examine the influence of the presence of different informal economy sizes in countries with different levels of economic development, as one of the factors capturing the nature of the macroeconomic environments within a country. As such, this study provides an empirical investigation, distinguishing between three

stages of economic development: factor-driven stage, efficiency-driven stage, and innovation-driven stage, following Global Entrepreneurship Monitor (GEM) classification of the selected countries during the period of the study. This classification in GEM is adopted from the World Economic Forum (WEF), "*According to WEF's classification: Factor-driven economies are the least developed. They are dominated by subsistence agriculture and extraction businesses, with a heavy reliance on (unskilled) labour and natural resources. Efficiency-driven economies are increasingly competitive, with more-efficient production processes and increased product quality. Innovation-driven economies are the most developed. In this phase, businesses are more knowledge-intensive, and the service sector expands*"[4].

### 2.3 Economic Growth Models

The recent literature on growth reveals that there are two main growth theories trying to determine what factors affect growth. The traditional neoclassical growth theory (Solow, 1956), and the more recent endogenous growth theory (Romer, 1986). Neoclassical studies of economic growth depends on the traditional growth theory by (Solow, 1956), which highlighted the contribution of labor and physical capital in explaining economic growth as the main factors in the production function. Later on, many have emphasized the important role of human capital in the process of economic growth (Barro, 1992; Mankiw et al., 1992; Mincer, 1981). Mankiw et al. (1992) developed an augmented Solow growth model that includes the human capital as an additional factor of production, which they argued is a better model for explaining international growth variation. More recently, some strands of the literature, beginning with the work of Romer (1986), suggested an endogenous growth theory considering

[4] For more information, see https://www.gemconsortium.org/

additional factors of production. One important distinction between the neoclassical growth models and those based on the 'new' endogenous growth theory, is that the former assumes technological progress is an exogenous factor of growth that was kept out of the model, leaving different technology levels between countries unexplained and uncounted for[5]. However, Romer (1986) have illustrated the importance of knowledge capital as a factor of production in addition to the traditional factors of capital and labor, and the failure of the predictions of the neoclassical model to match the empirical evidence of the long run accelerating growth rates implied by the endogenous growth.

There have been also some attempts to incorporate entrepreneurship in endogenous growth models. Schmitz (1989) linked entrepreneurship to economic growth within an endogenous growth model, which predicts that more entrepreneurial activity will lead to higher economic growth due to greater existing knowledge, arguing that entrepreneurs not necessarily have to be innovators and that they have a key role in promoting growth through transferring and spreading knowledge developed by innovators.

More recent studies (Audretsch, 2007; Audretsch & Keilbach, 2004a, 2004c, 2005), which linked entrepreneurship to regional economic growth, have introduced the concept of entrepreneurship capital, which refers to "the capacity for economic agents to generate new firms" (Audretsch, 2007), as an additional factor of production through its contribution in knowledge spillovers as well as in increasing competition and diversity. Moreover, they have emphasized the positive role of entrepreneurship in

[5] See Gould and Ruffin (1993) and Plosser (1992) for more detailed distinctions.

growth and that regions with higher rates of entrepreneurship will have higher growth rates.

These studies, among others (Acs et al., 2012; Audretsch & Keilbach, 2004b, 2008; Noseleit, 2013), have argued that knowledge may not affect growth directly as it is assumed in Romer's (1986) endogenous view, therefore, they considered entrepreneurship as a conduit of knowledge that serves as a mechanism that facilitates knowledge spillovers and thus generates additional growth. They assumed that knowledge is a necessary, but not sufficient engine of growth, and "*it must be introduced into the market in the form of new methods, products and services which add economic and social value*" (González-Pernía & Peña-Legazkue, 2015). Acs et al. (2009) also pointed that it is "*only a necessary condition for the exercise of successful enterprise in a growth model*". However, most of these studies focus only on the regional economic growth. Nonetheless, some studies (Acs et al., 2012; Braunerhjelm et al., 2010), depending on endogenous growth models at a national level indicated the important role of entrepreneurship in stimulating growth; however their research is limited to samples of only developed countries, which requires wider national comparison.

Therefore, in line with those who indicated the role of entrepreneurship as an additional factor of production at the regional level (Audretsch, 2007; Audretsch & Keilbach, 2004a, 2004b, 2005, 2008), this study aims to employ an endogenous growth model that includes entrepreneurship; however, at a national level with countries of different levels of economic development. Moreover, according to their findings as well as the predictions of Schmitz (1989), that more entrepreneurship leads to higher rates of growth, it might be expected that countries within lower levels of economic

development would have higher impact of entrepreneurship on economic growth as they have higher rates of entrepreneurial activity than it is in more developed countries.

### 2.4 The Moderating Role of Informal Economy

The difficulty of defining and measuring the informal economy led to the use of several definitions and various estimation methods in previous studies according to the context and purpose of that study (Schneider & Buehn, 2018). However, this study will follow the definition of an IMF working paper by Medina and Schneider (2018): "*all economic activities which are hidden from official authorities for monetary, regulatory, and institutional reasons. Monetary reasons include avoiding paying taxes and all social security contributions, regulatory reasons include avoiding governmental bureaucracy or the burden of regulatory framework, while institutional reasons include corruption law, the quality of political institutions and weak rule of law*". They presented estimates of the size of informal economy, as percentage of GDP, for 158 countries, over 25 years using Multiple Indicators Multiple Causes approach (MIMIC). This paper argued that it was one of the first attempts to use light intensity approach as an indicator instead of GDP, in order to avoid the problem of using GDP as cause and indicator variable.

#### 2.4.1 Informal economy and economic growth

The literature linking informal economy and economic growth is diverse and not definitive, thus more research needs to be done in this area (Heintz, 2012) as these studies have not reached any conclusive results. Loayza's (1999) empirical study in Latin American economies found a negative relationship between the informal economy size and economic growth, and related this to the quality of government institutions and policies that would influence the informal economy size in an opposite way to its influence on economic growth. A study by Fichtenbaum (1989) also finds a

negative relationship, indicating that a significant proportion of the productivity slowdown in the 1970s and 1980s in the United States is due to the rapid growth of the informal economy during this period.

However, some studies may support the view of a positive impact of the informal economy on economic growth, through providing "*a dynamic and entrepreneurial spirit which can lead to more competition, higher efficiency, and strong boundaries and limits for government activities*" (Schneider, 2008). Others find a positive relationship through a significant positive impact of the informal economy on consumer expenditures (Bhattacharyya, 1999), or on the growth rates of GDP per capita as the case in Colombia (Schneider, 2007).

Some studies have considered different economic development stages among countries; a study on transition countries by Eilat and Zinnes (2000) concluded that changes in GDP levels are negatively related to changes in the size of informal economy. In contrast, Schneider and Klinglmair (2004) had a different finding for transition countries, they compare the influence among different development stages and concluded that informal economy has a significant influence on economic growth in all of these stages, with a positive influence in developed, industrialized, and transition countries. However, this influence was found to be negative in developing countries. Another example supports this finding for developed countries, a study by Adam and Ginsburgh (1985) in Belgium, which finds a positive relationship. But there is a recent study that may contradict the finding for developing countries, Sakanko and Ewugi (2017) have investigated this relationship in Nigeria from (1985-2014) and found an insignificant positive impact of the informal economy on growth in the long run. Although this is an insignificant impact, but still a positive one.

A literature survey, including a comparison between developed and less developed countries, was provided by Gerxhani (2004), who observed that informal economy in developed countries offers contributions to income and growth which would make it accumulated with the formal one; while informal economy in less developed countries is characterized with low income and yields little accumulation and growth capacity.

### 2.4.2 Informal economy and entrepreneurship

Viewing the informal economy from entrepreneurial perspective, Maloney (2004) developed a view of the informal economy as an "*unregulated micro-entrepreneurial sector*" that is an integral part of the economy. In line with this view, Petrova (2016) finds a strong positive impact of entrepreneurship on informal economy as well as the whole economy, taking into account the role of government policies. In addition, Williams (2007) describes informal economy as an "enterprise hidden culture" that encourages the creation of new enterprises and development. Informal businesses may also be considered as a "kind of productive entrepreneurship" (Smallbone & Welter, 2001). Moreover, Williams (2005) considers the informal economy as a potential "*driver of economic development*", representing a starting point for entrepreneurs to launch their enterprises, who are, latter, given incentives that facilitate the transfer of their work into the formal sector.

This review on the impact of the informal economy on economic growth and entrepreneurship leaves us with the impression that the evidence is varied and circumstantial. In addition, since there are limitations on data availability on estimations of the size of informal economy, due to the difficulty in measuring it, there is lack of empirical studies on informal economy (Elgin & Oztunali, 2014). Moreover, the positive view of the informal economy, within entrepreneurial perspective, does not

consider the level of economic development among countries, in addition, the entrepreneurial activity in the informal economy could be productive and create values, or it could be ineffective to economic growth, as it is in the formal one (Bureau & Fendt, 2011). Thus, this view might not hold for all development levels. Furthermore, the predictions of the positive view are built according to only theoretical basis as well as more qualitative frameworks that relies on questionnaires and interviews collected data, which requires more advanced empirical investigation to test this hypothesis.

This would emphasize the need to provide an empirical study linking informal economy and economic growth in relation to entrepreneurship, considering different development levels, which may lead to different findings at the national level. Therefore, this paper provides an empirical contribution to this literature intending to examine the actual influence of the size of informal economy on the role of entrepreneurship in driving economic growth, through its moderating impact on entrepreneurship and distinguishing between three groups of countries (factor, efficiency, and innovation-driven).

## Chapter Three: Methodology

This chapter presents the data and the methodology used in this study. The first section presents the empirical model and the methodology used. Then we describe our variables in the second section, in addition to their sources. A descriptive statistic of the research data is shown in the third and final section in this chapter.

### 3.1 Empirical Model

This research examines the impact of entrepreneurship on economic growth, and how would this impact differ by the level of economic development. Additionally, we investigate the moderating role of the size of the informal economy on this relationship. Based on the proposed literature, this study aims to investigate the entrepreneurship-growth nexus through the analysis of a growth model that includes entrepreneurship capital and knowledge capital, in addition to the traditional physical capital and labor factors of growth through the capital-labor ratio, as well as human capital.

Our estimation strategy is to first use OLS as a benchmark model. However, our identification strategy requires that we implement a two-stage least squares (2SLS) estimation, taking into account the endogeneity of entrepreneurship for a possible causal relation when measuring the effect of entrepreneurship on economic growth, which assumes economic growth might have a recursive effect on entrepreneurship. Many scholars (Acs et al., 2012; Audretsch & Keilbach, 2004b; González-Pernía & Peña-Legazkue, 2015; Van Stel et al., 2005) have considered the aforementioned approach; however, this study is based on panel data, consisting of both time-series and cross-sectional data sets. Panel data techniques provides more variability and more efficient and reliable estimations of the effects, compared to models of only cross-sectional or time-series data, and it allows for addressing unobserved individual

heterogeneity using either random or fixed effects procedures (Park, 2011). In this regard, we employ a fixed effects specification through including country fixed effects that allow for the unobserved heterogeneity across countries[6].

The neoclassical growth model by Solow (1956) links two input factors of production, the stock of capital and labor to output, which can be expressed through a Cobb-Douglas production function of the following form:

$$Y = K^{\alpha} L^{\beta} \tag{1}$$

Where Y is the output growth, K is the physical capital input, L is the labor input, and the output elasticities (in log form), α and β, sum to one, implying constant returns to scale. However, considering the endogenous theory of economic growth, other factors of production should be accounted for. As we have noted, Romer (1986) expanded the Solow model by integrating the knowledge capital into the production function based on the endogenous theory of growth. More recent studies (Audretsch & Keilbach, 2004a, 2004b, 2004c, 2005), incorporated the entrepreneurship capital as a new factor of production and linked it to regional growth. They have also considered the knowledge capital in accordance with Romer's (1986) endogenous growth theory, as well as the traditional capital and labor factors of production leading to a model of the following Cobb-Douglas form:

$$Y = K^{\alpha} L^{\beta} R^{\gamma} E^{\delta} \tag{2}$$

Where R is the knowledge capital input, and E is the entrepreneurship capital input. Assuming constant returns to scale (α + β = 1), and dividing both sides by L, we get:

[6] We have implemented a Hausman test in order to compare between fixed and random effect specifications, and the null that random effect model is preferred was rejected at 1%. Moreover, a Wald test for adding time-fixed effects indicated that we do not need to include them in our model, since we failed to reject the null that the coefficients for all year dummies are jointly equal to zero.

$$\frac{Y}{L} = \left(\frac{K}{L}\right)^{\alpha} R^{\gamma} E^{\delta} \quad (3)$$

Several scholars have applied this model on studies at the regional level, in accordance with the endogenous growth theory of knowledge as well as entrepreneurship (Audretsch, 2007; Audretsch & Keilbach, 2008; González-Pernía & Peña-Legazkue, 2015) which has an important role in rehabilitating the relationship between entrepreneurship and regional growth and the role of entrepreneurship as a conduit of knowledge. However, we use this model in our investigation of entrepreneurship impact on economic growth at the national level. Using national level data allows us to consider variations in socio-economic variables that vary across countries but are homogeneous across regions in the same country. Moreover, several studies have discussed the limited ability of the traditional neoclassical Solow model to account for growth rates' variations across countries, and the importance of endogenous growth models in better explaining these variations, especially in the long term (Gould & Ruffin, 1993; Plosser, 1992; Romer, 1986). Moreover, we take into account the importance of human capital in explaining growth differences across countries (Barro, 1992; Mankiw et al., 1992), so we include a human capital index in the model.

Therefore, according to the model in equation (3), and the additional human capital input, we use the following form of Cobb-Douglas function, which will be our baseline model to investigate the impact of entrepreneurship on economic growth:

$$y_{it} = \beta_1 + \beta_2 k_{it} + \beta_3 H_{it} + \beta_4 R_{it} + \beta_5 E_{it} + \varepsilon_{it} \quad (4)$$

Where i denotes countries and t denotes time, y = Y/L is the output per worker (where L measured by total employment force), k =K/L is the capital per worker input, H is the human capital input, R is the knowledge input, and E is the rate of entrepreneurial activity. The measurement of these variables is subsequently.

Our analysis (estimation by OLS and 2SLS) begins by utilizing the full sample of countries, using the baseline model presented in equation (4). Then we take into account three groups of countries according to their stage of economic development: factor-driven, efficiency-driven, or innovation-driven stage in order to compare the influence of entrepreneurship between different stages through a categorical distinction between these stages using a dummy variable of the level of economic development (LOD) to represent the stages. Hence, our second model specification would estimate the following equation:

$$y_{it} = \beta_1 + \beta_2 k_{it} + \beta_3 H_{it} + \beta_4 R_{it} + \beta_5 E_{it} + \beta_6 LOD + \varepsilon_{it} \quad (5)$$

We also use an interaction term between the level of economic development and entrepreneurship in order to investigate the influence of the level of economic development on the entrepreneurship-growth nexus, as follows:

$$y_{it} = \beta_1 + \beta_2 k_{it} + \beta_3 H_{it} + \beta_4 R_{it} + \beta_5 E_{it} + \beta_6 LOD + \beta_7 E * LOD + \varepsilon_{it} \quad (6)$$

Finally, we examine the moderating role of the informal economy size (IES) on the relationship between entrepreneurship and economic growth as well as its direct impact on growth. In order to do so, we include IES and an interaction term between IES and E, as follows:

$$y_{it} = \beta_1 + \beta_2 k_{it} + \beta_3 H_{it} + \beta_4 R_{it} + \beta_5 E_{it} + \beta_6 LOD + \beta_7 E * LOD$$

$$+\beta_8 IES + \beta_9 E * IES + \varepsilon_{it} \quad (7)$$

Moreover, in order to solve for possible endogeneity problem of entrepreneurship and the simultaneous relationship with economic growth, we perform an instrumental variable approach, in particular, the 2SLS estimator. In this approach, entrepreneurship is instrumented by variables that reflect individual entrepreneurial perceptions that

influence the creation and simulation of entrepreneurial activity, which we describe in the next section.

Several studies have emphasized the importance of using interaction terms, whether in economic fields or other sciences, as it is essential in understanding the theoretical development about the conditions that may affect known relationships, in terms of strength and direction (Aguinis & Gottfredson, 2010; Andersson et al., 2020). It provides researchers with the ability to expand these relationships and investigate their dependence on new factors that may have not been considered in previous studies, which is what we do here concerning the level of economic development and the moderating role of informal economy size on the entrepreneurship-growth nexus.

Moreover, we use a dummy variable for the level of development and an interaction term for the level of development with entrepreneurship in order to make group comparison among countries with different levels of economic development. This approach provides better understanding of group differences allowing for both intercept and slope to differ between these groups, and is a much better technique than estimating separate models for each group, which may contain loss of statistical power and therefore misleading results (Williams, 2015).

### 3.2 Sample and Data

The sample combines macroeconomic and entrepreneurship data on 64 countries that participated in the Global Entrepreneurship Monitor (GEM), over the period (2002-2015). Those countries are classified according to their levels of economic development into factor-driven, efficiency-driven, and innovation-driven countries[7]. In addition to

[7] GEM adopted this classification from the World Economic forum (WEF), which we refer to for the classifications of countries for the years before 2008, since GEM started to use this classification in 2008.

the GEM database, we use different secondary sources to collect macroeconomic data from World Bank database, International Monetary Fund (IMF) database, and Penn World Tables (PWT). We choose our variables depending on the theoretical and empirical approaches of the previous related studies.

Based on the theoretical framework, the dependent variable is output per worker (GDP/L). Many studies used this variable to investigate growth patterns (Aparicio et al., 2016; Mankiw et al., 1992; Wong et al., 2005). As for our main independent variable, we use Total Early-stage Entrepreneurial Activity (TEA) to represent entrepreneurship, which we obtain from GEM annual reports along the period of the study. These reports are based on primary data collection across countries, using two key data sources: The Adult Population Survey (APS), and National Expert Survey (NES).[8] Moreover, according to previous research and the literature on growth theory, we include other independent variables, which are widely used determinants in explaining economic growth. Based on Solow (1956), we account for the capital-labor ratio, measuring the physical capital by the gross capital formation (GKF), divided by total employment, representing the capital per worker (GKF/L). We also include human capital index (HCI), following the specification from MRW model (Mankiw et al., 1992). In addition to a measure of research and development (R&D), as a knowledge indicator, based on Romer's (1986) endogenous growth model, measured by the total employment in research and development. Our moderator variable, as we noted earlier, is the informal economy size (IES), estimated as a percentage of GDP by Medina and Schneider (2018). We also include a categorical variable representing the three groups of countries according to their levels of economic development (LOD): factor-driven,

[8] For more information, please see: https://www.gemconsortium.org/

efficiency-driven, innovation-driven countries, in order to examine how the effect of entrepreneurship differs by the level of development.

Aiming to control for the possible endogeneity of entrepreneurship, we include two instrumental variables that influence activity rates: fear of failure and self-efficacy. The choice of instruments is based on theory and empirical literature that have documented a strong relationship between these perceptual variables and entrepreneurial activity rates. Wennberg et al. (2013) find these variables to have an important role in understanding the entrepreneurial behavior. It also helps in capturing "*the entrepreneurial mindsets of each country's inhabitants*" (Reynolds et al., 2005). Moreover, these perceptual variables have significant correlations with entrepreneurship (Arenius & Minniti, 2005). Many prior studies confirm that fear of failure has a negative influence on entrepreneurial activity and acts as a barrier to entrepreneurship entry (Arenius & Minniti, 2005; Daoud et al., 2020; Wagner, 2007; Wennberg et al., 2013). Self-efficacy is a skill perception indicator that refers to one's confidence of having the required skills and capabilities to start an entrepreneurial activity, which has a positive correlation with entrepreneurial entry, and encourages productive entrepreneurship that leads to more economic growth (Aparicio et al., 2016; Wennberg et al., 2013). It is often argued that growth rates are unlikely to be related to perceptual variables, as economic theory postulates several models of growth (Bleaney & Nishiyama, 2002; Gould & Ruffin, 1993), but none of which includes these variables, hence, the exclusion restriction holds.

Our final dataset consists of an unbalanced panel data with 478 observations and 64 countries[9]. Table 1 presents a description of the variables used in this study in addition to their sources.

Table1: Description of the variables

| Variables | Description | Source |
|---|---|---|
| Dependent variable | | |
| GDP/L | Gross domestic product divided by total employment. Data for GDP are in constant 2010 U.S. dollars. | WB |
| Independent variables | | |
| TEA | The percentage of 18-64 aged population who either are owners of a new business (less than 3.5 years old) or are involved in setting up a new business. | GEM |
| GKF/L | Gross capital formation divided by total employment. Data for GKF are in constant 2010 U.S. dollars. | WB |
| HCI | Human capital index depending on average schooling years and return to education. | PWT |
| R&D | The number of researchers working in Research and Development (per million people). | WB |
| Moderator variable | | |
| LOD | Development dummy, 0 for factor driven, 1 for efficiency driven and 2 for innovation driven | GEM |
| IES | The size of informal economy as a percentage of GDP. | IMF |
| Instrumental variables | | |
| Fear of Failure | The percentage of 18-64 aged population who avoid to start a new business due to their fear of failure. | APS |
| Self-efficacy | The percentage of 18-64 aged population who are confident of having the required skills and capabilities to start a new business. | APS |

WB = World Bank.
GEM = Global Entrepreneurship Monitor (annual reports).
PWT = Penn World Tables (version 9.1).
IMF = International Monetary Fund.
APS = Adult Population Surveys by GEM.

[9] See appendix 1 for a list of countries and participation years in GEM.

### 3.3 Descriptive Statistics

Table 2 summarizes the descriptive statistics for the entire sample with the 478 observations[10] over the period of analysis, reporting the means, standard deviations, maximum, and minimum value of the variables used in this study, in addition to the correlation coefficients between them.

Table 2: Descriptive statistics and correlation matrix[11]

| Variables | Obs. | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Log (GDP/L) | 478 | 10.694 | .880 | 7.489 | 12.356 |
| TEA | 478 | 9.281 | 5.909 | 1.500 | 38.600 |
| Log (GKF/L) | 478 | 9.214 | .873 | 6.055 | 10.811 |
| HCI | 478 | 3.035 | .456 | 1.737 | 3.742 |
| R&D | 478 | 2758.244 | 2020.449 | 17.376 | 8006.673 |
| IES | 478 | 20.039 | 9.242 | 6.660 | 55.060 |

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Log (GDP/L) | 1.000 | | | | | |
| 2. TEA | -0.584* | 1.000 | | | | |
| 3. Log (GKF/L) | 0.965* | -0.578* | 1.000 | | | |
| 4. HCI | 0.676* | -0.409* | 0.669* | 1.000 | | |
| 5. R&D | 0.750* | -0.478* | 0.757* | 0.671* | 1.000 | |
| 6. IES | -0.649* | 0.359* | -0.698* | -0.630* | -0.634* | 1.000 |

* $p < 0.001$

We note that all variables included have significant variability, which indicates that our sample covers a wide range of countries with several variations explaining the different influences on economic growth between countries with different levels of economic development. In particular, R&D has high variability reflecting different numbers of

[10] The number of observations varies between the three stages of development due to availability of data on each stage; efficiency- and innovation-driven stages has 184 and 254, respectively. However, we were limited by only 40 observations for factor-driven stage, which, however, would still be considered moderately high, compared to small samples considered in previous work, and adequate to detect statistical effects that time series and cross-sectional data cannot.

[11] See Appendix 2 for detailed descriptive statistics for each stage of development.

employees engaged in research and development field among countries of different levels of development, which ranges between about 17 employees/million people in less developed countries and about 8000 employees/million in more developed countries[12]. However, variability of this variable is expected among different levels of economic development, and is a common pattern found in other studies such as González-Pernía and Peña-Legazkue (2015). The average level of entrepreneurial activity is 9.281 with rates varying between 1.5 and 38.6, which also confirms significant variations among the different observations included in our sample. Appendix 2 shows that, according to GEM data, there are differences in entrepreneurial activity rates across different levels of development; factor-driven countries have the highest rates of TEA with mean of 18.015, followed by the efficiency-driven countries with mean of 11.255, while innovation-driven countries have much lower rates with mean of 6.476. Analyzing the correlation matrix, we observe that all independent variables are significantly correlated with the dependent variable. Moreover, although correlations among independent variables are significant, the magnitudes of the correlations between our main variable of interest, TEA, and the other independent variables are less than 0.6, which mitigates the risk of multicollinearity existence, which affect the significance of our estimates. The correlation matrix also indicates that the production factors included in our study have positive and significant correlations with growth. The positive correlations of capital-labor ratio, human capital index, and the R&D endowment with growth are consistent with the neoclassical growth theory by Solow (1956), human capital accumulation as posited by Mankiw et al. (1992), and Romer's (1986) endogenous growth theory, respectively. However, the negative correlation between the level of entrepreneurial activity and the output growth per

[12] See Appendix 2.

worker could be explained by the different economic development levels and that less developed countries have higher rates of entrepreneurial activity (Acs, Desai, & Hessels, 2008; Aparicio et al., 2016; Boudreaux, 2019). This can be seen from Figure 1, which shows simple correlations between the level of entrepreneurial activity and the output growth per worker for each level of economic development. However, this simple correlation does not predict the exact way entrepreneurial activity contributes and cause change to the output growth, hence, well-defined statistical model results are shown in the next chapter in order to better capture this relationship.

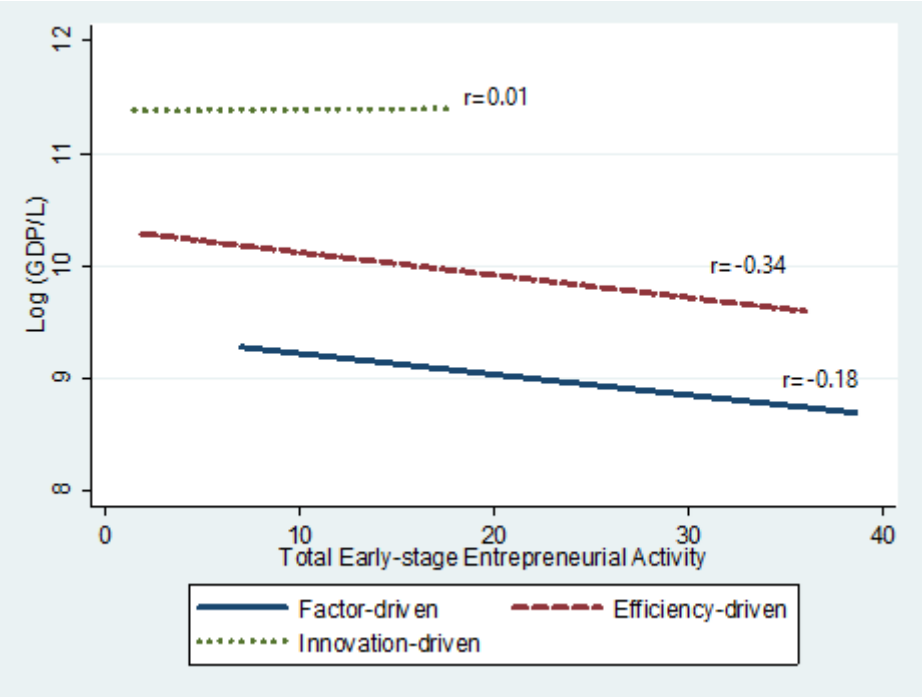


***Figure 1**: The relationship between entrepreneurial activity and output per worker for each level of economic development.*

## Chapter Four: Results and Discussion

The identification strategy of the empirical model requires that the model be estimated using instruments for entrepreneurship. As such, we estimate the model using two specifications: the 2SLS estimator and the pooled OLS estimator with time fixed effects to be used as a benchmark. In this chapter, we present several specifications and discuss the results of the estimated regressions. The regressions use data of 64 countries that participated in GEM during the period (2002-2014) in order to assess the effect of entrepreneurial activity on economic growth. Both estimations techniques are applied on the entire sample of countries and on the three groups of countries according to their levels of economic development. Finally, our estimations also examine the moderating role of the informal economy size on the entrepreneurship-growth nexus.

Regression results are presented in Tables 3 and 4. Table 3 shows the OLS estimation results, while Table 4 shows the 2SLS estimation results. These regressions use TEA to measure entrepreneurship, and the log of output per worker, to measure economic growth. Both methods include the same model specifications, by which we assess the effect of entrepreneurship on economic growth through a growth model that includes entrepreneurship and knowledge as determinants, in addition to the traditional production factors. Model 1 shows the effect of entrepreneurial activity on economic growth for the entire sample of 64 countries including entrepreneurship (TEA) in addition to the other production factors: log physical capital per worker (log (GKF/L)), human capital index (HCI), and the knowledge indicator (R&D). Model 2 highlights the differences of the effect of entrepreneurial activity between the different groups of countries according to their levels of economic development, by adding a factor variable (level of development (LOD)) which has three categories: Factor-driven

Table 3: OLS estimation results

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| TEA | 0.00227* | 0.00228* | 0.00736*** | 0.01142** |
| log (GKF/L) | 0.289*** | 0.231*** | 0.232*** | 0.194*** |
| HCI | 0.241*** | 0.232*** | 0.250*** | 0.226*** |
| R&D | 0.0000310*** | 0.0000287*** | 0.0000304*** | 0.0000271*** |
| LOD: Efficiency-driven | | 0.244*** | 0.323*** | 0.362*** |
| Innovation-driven | | 0.286*** | 0.405*** | 0.455*** |
| TEA*LOD | | | -0.00499** | -0.00705*** |
| IES | | | | -0.00617** |
| TEA*IES | | | | -0.000112 |
| Constant | 6.932*** | 7.193*** | 7.054*** | 7.550*** |
| Country dummies | Yes | Yes | Yes | Yes |
| N | 478 | 478 | 478 | 478 |
| $R^2$ | 0.997 | 0.997 | 0.998 | 0.998 |
| Adjusted $R^2$ | 0.996 | 0.997 | 0.997 | 0.997 |

Level of statistical significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: 2SLS estimation results with fixed effects: second-stage coefficients

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| TEA | 0.0175*** | 0.0114** | 0.0224*** | 0.0325* |
| log (GKF/L) | 0.284*** | 0.229*** | 0.233*** | 0.184*** |
| HCI | 0.126* | 0.163*** | 0.290*** | 0.268*** |
| R&D | 0.0000336*** | 0.0000293*** | 0.0000350*** | 0.0000312*** |
| LOD: Efficiency-driven | | 0.242*** | 0.534*** | 0.260*** |
| Innovation-driven | | 0.316*** | 0.729*** | 0.324*** |
| TEA*LOD | | | -0.0184*** | -0.0234*** |
| IES | | | | -0.00634 |
| TEA*IES | | | | -0.000282 |
| Constant | 7.436*** | 7.646*** | 6.976*** | 7.559*** |
| N | 478 | 478 | 478 | 478 |
| $R^2$ Within | 0.4241 | 0.6392 | 0.6578 | 0.6630 |
| Between | 0.8552 | 0.9066 | 0.8630 | 0.8512 |
| Overall | 0.8142 | 0.8669 | 0.8559 | 0.8261 |

Level of statistical significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

stage, Efficiency-driven stage, and Innovation-driven stag. This allows for differences in intercepts between these groups. Allowing for slope differences between groups of countries, Model 3 presents the results for using an interaction term between entrepreneurial activity and the level of development (TEA*LOD) in order to show whether the entrepreneurship-growth nexus varies by level of development. The fourth and last model presents the results of the moderating role of the informal economy size on the relationship between entrepreneurship and economic growth, using the interaction term between entrepreneurial activity and the informal economy size (TEA*IES).

The regression results from both OLS and 2SLS estimations show that the elasticities of the production factors in the models are positive and significant as expected. The estimates for physical capital per worker (GKF/L) and human capital index (HCI) are both within the usual range, and are close to those reported by Mankiw et al. (1992) and other related studies. However, considering differences of TEA impact (using TEA*LOD) in the third model, we can see that the results for HCI are higher and much closer to the results of (Mankiw et al., 1992), as it explains between 25-29 percent of the cross-country variation in output per worker. This may indicate the importance of human capital factor in differentiating the influence of entrepreneurship among different countries. The estimates for R&D are also positive and significant as expected in the endogenous growth theory by Romer (1986); however, their effect is very small although significant[13].

As for entrepreneurship effect, both estimations in Tables 3 and 4 shows that TEA coefficients for the entire sample are positive and significant, which is consistent with

[13] This might be caused by the high variability of this factor for our sample of countries, which was discussed in chapter 3.

several previous studies that have confirmed this positive relationship (Acs et al., 2012; Audretsch, 2007; Hessels & Van Stel, 2011; Ivanović-Djukić et al., 2018; Urbano & Aparicio, 2016; Wennekers & Thurik, 1999). This also supports the hypothesis that entrepreneurship is a factor that stimulates economic growth and productivity (Audretsch & Keilbach, 2004b, 2004c, 2005, 2008), confirming the ability of endogenous growth models to account for entrepreneurship (Wennekers & Thurik, 1999). However, the magnitudes of TEA coefficient in Model 1 differ between the two estimations. On the one hand, the OLS estimation shows that a 10% change in entrepreneurial activity (TEA) rates is associated with only about 0.02% change in economic growth, expressed by output per worker, this is significant with $p < 0.05$. On the other hand, in the 2SLS estimation, Model 1 shows a higher and more significant ($p < 0.001$) effect of entrepreneurial activity that indicates a 10% change in TEA is associated with about 0.18% change in the output per worker.

Regarding the differences among groups of countries: factor-driven, efficiency-driven, and innovation-driven countries, the results of adding LOD in Model 2 in Tables three and four provide an evidence of significant differences across the three groups, showing that at a given rate of TEA, the log output per worker is higher for innovation-driven and efficiency-driven stages relative to the factor-driven stage. We notice that the base outcome of the three levels of development is the factor-driven stage, and the results for the other categories of LOD are both positive and significant, which indicates that they have higher levels of output per worker. In other words, we observe that the efficiency driven countries are about 24% higher relative to factor driven. Countries within the innovation-driven stage are about 29-32% higher output per worker relative

to the base category. The results from Model 2 are presented in Figure 2[14], from which we can see a notable shift of output per worker levels between factor-driven and efficiency-driven stages. This can be explained by the shift of the countries within the efficiency stage into more productive and competitive economies that are also associated with huge transfer into wage employment from high rates of self-employment in factor-driven stages (Acs, Desai, & Hessels, 2008), as self-employment is found to be negatively related to economic growth in some samples (Blanchflower, 2000; Salgado-Banda, 2007). In addition, this stage move from depending on small firms to large ones, which allows it to catch up faster to the levels of output in more developed stages.

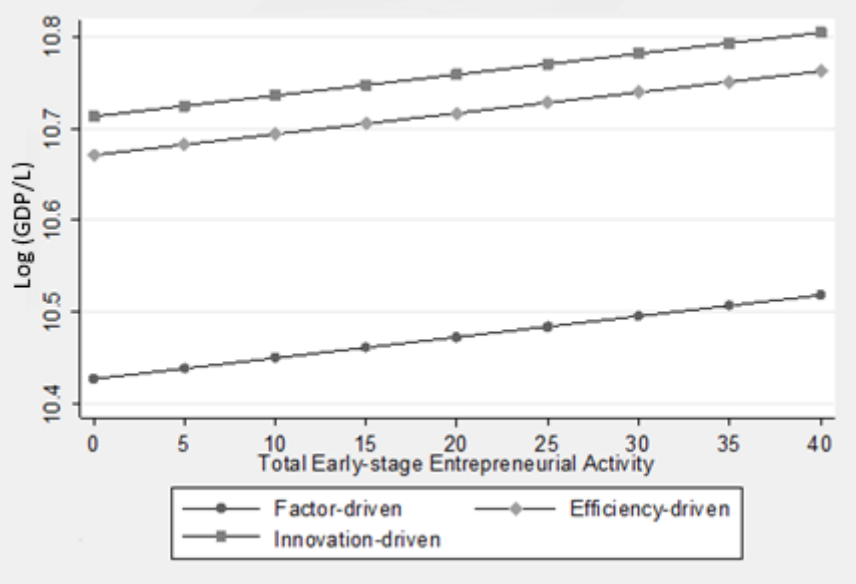


***Figure 2**: Results for the effect of entrepreneurial activity by levels of development.*

For the results from Model 2 in both OLS and 2SLS estimations, we can see that TEA coefficient is still positive and significant, which indicates the importance of entrepreneurship in stimulating economic growth in all levels of development.

[14] The reported graphs in Figure 2 and 3 are from the OLS estimation only, since the graphs from 2SLS are very similar and shows the same behavior of the examined relationship.

Turning to Model 3, including the interaction term TAE*LOD allows for slope differences between the three groups of countries in order to examine the behavior of the effect of entrepreneurship on economic output per worker within each group, which is presented in Figure 3.

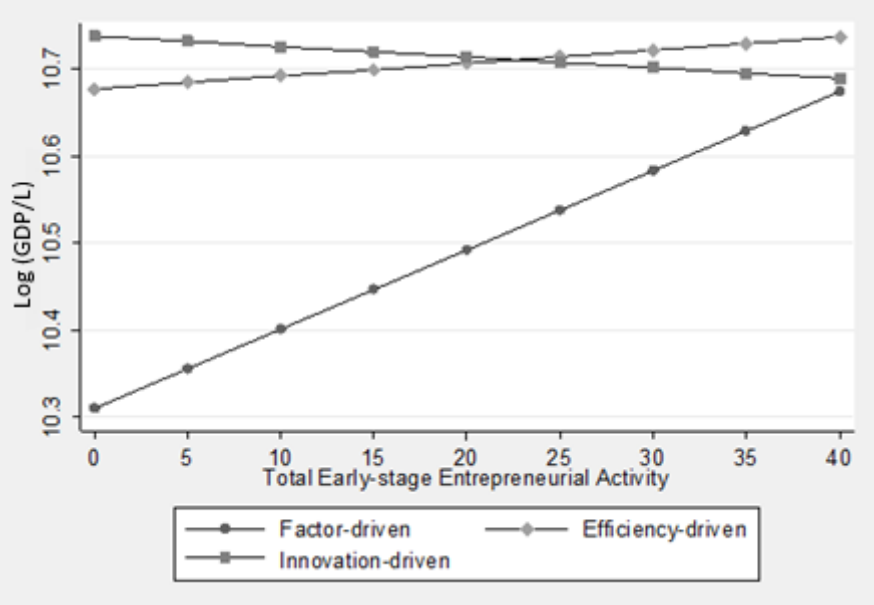


***Figure 3**: Differences of slopes of the effect of entrepreneurial activity between levels of development.*

The coefficient for TEA*LOD in both OLS and 2SLS estimation is found to be negative, which means that the direction of the positive relationship becomes slower in more developed countries, even though they have higher output levels. This means that a sharp increase of entrepreneurship rates in countries within the factor-driven stage is associated with higher increase of economic growth than it is in countries of higher levels of economic development. That is, the response of economic growth to a change in entrepreneurship rates decreases in more developed countries and depending on the relative sizes of coefficients on TEA and the interaction term, the effect of TEA on growth turns negative in innovation driven countries[15]. This variance of the positive

[15] The marginal effect can be written as 0.00736 – 0.00499*LOD (considering the OLS estimation), or 0.0224 – 0.0184*LOD (considering the 2SLS estimation). Substituting LOD value, we get a negative

effect of entrepreneurship might be due to several differences between countries within different levels of development, such as different country policies, regulations, macroeconomic environment, institutional environment that surrounds the entrepreneurial activity within the country. All of these factors contribute to fostering or hindering the positive impact of entrepreneurship according to their role in facilitating a productive entrepreneurial environment that leads to higher levels of economic growth. The result from model 3 differs from the findings of Van Stel et al. (2005), that entrepreneurship has negative (if any) effect on growth within low-income countries and a strong and significant positive one in high-income ones. However, their study was based on a cross-section of 36 countries for a single year (2002). Our findings indicate the positive impact of entrepreneurship in less developed countries in which this impact seems to be higher than more developed ones, which may indicate their need for more rates of entrepreneurship to catch up to the levels of output in more developed economies. This may be explained by the missing role of large firms in less developed countries, which makes small firms the main engines of growth in the process of structural change in these economies (Stam et al., 2011; Stam & Van Stel, 2011). As the country becomes more developed, entrepreneurial rates become lower as they may turn to large firms, which mostly grow through acquisition of existed firms (Stam et al., 2011). This process may also cause the closure of other small firms, leading to lower proportions of small firms in developed countries. Moreover, the negative and positive results in developed and less developed countries, respectively, might be explained by the existence of various types of entrepreneurship, which can be very productive or less productive, hence, lead to different contributions of entrepreneurship

value for innovation-driven countries and higher positive value in factor- than efficiency-driven countries.

as total in these countries. Some scholars pointed out that, in the long run, opportunity-driven entrepreneurship has a strong positive effect on growth in less developed countries, but a lower or no significant one in developed countries (Aparicio et al., 2016; Stoica et al., 2020). In addition, there are several findings that only the high growth potential entrepreneurship (HEA) have truly significant impact in developed countries (Autio, 2005; Valliere & Peterson, 2009). Therefore, defining entrepreneurship as a new business creation and the use of entrepreneurship as total (TEA) as our independent variable may have led to the negative result in these countries, considering the findings that the HEA presents a very small proportion of total entrepreneurship as new firm creation (Autio, 2005; Storey, 2014). Moreover, we are not aiming to reduce the importance of innovation in these countries, (Wong et al., 2005) have distinguished between innovation and new business creation as separate types of entrepreneurships; they confirmed that a very small share of total entrepreneurs are engaged in technological innovation. However, as the entrepreneurship-growth nexus is still under researched in developing countries (Naudé, 2008), the positive result in these countries gives new insights of the possible impact of several types of entrepreneurship in these countries, which might not be the same as in developed ones. Furthermore, this study might differ from those who found negative or insignificant relationship due to their use of unsuitable measures of entrepreneurship that might may lead to misleading results, such self-employment (Blanchflower, 2000; Salgado-Banda, 2007).[16]

The inclusion of the interaction term (TEA*LOD) suggests that the higher output levels found in more developed stages are not necessarily caused by the existing entrepreneurial activity. Rather, it may be due to other factors such as the existence of

[16] The use of these measures is discussed in the second chapter of this study.

more large firms, which are found to be more efficient in developed countries (Bampoky et al., 2013), or better business conditions (Acs, 2006). In addition to better institutional and macroeconomic environment (Acs, Desai, & Hessels, 2008; Ivanović-Djukić et al., 2018).

The negative result for the innovation-driven stage in Model 3, might imply that these countries reach to an optimum level of entrepreneurship, and that more increases in entrepreneurial activity rates would not make that much effect on economic growth in these countries. Some scholars have discussed the idea of an optimal level of entrepreneurship (Audretsch et al., 2002; Bampoky et al., 2013). Bampoky et al. (2013) found that, assuming specific optimal rate of entrepreneurial activity for each country, a deviation (an increase or a decrease) from this optimal level would negatively influence economic growth. They also suggested that this optimal level of entrepreneurship differs between developed and less developed countries, and that it is lower in more developed ones, which indicates that less developed countries need to have higher entrepreneurial rates to reach their optimal levels. Results also imply that entrepreneurship seems to have similar behavior of the other production factors, which is also consistent with that catch-up and cutting-edge effects on growth, that more developed economies grow slower than less developed ones due to the law of diminishing returns in more developed ones, and therefore will have slower responses to changes in entrepreneurship rates. These responses might be negative, indicating declining growth rates, if a country reaches its steady state or deviates from its optimal level of entrepreneurship as illustrated in Bampoky et al. (2013).

Moving to Model 4 that shows the results for the moderating role of the informal economy size on the relationship between entrepreneurship and economic growth, the small and insignificant coefficients of the interaction term TEA*IES, in both OLS and

2SLS estimations, imply that IES does not have any significant role in moderating this relationship. Moreover, this result would not differ between the three groups of countries according to their levels of development, which have the same insignificant impact. Further, the negative coefficient of IES shown in both Table 3 and 4, which is significant in the OLS estimation with $p < 0.01$, implying a negative direct impact of the informal economy size on economic growth, which supports the findings in several previous studies (Fichtenbaum, 1989; Loayza, 1999). The findings from model 4 contradict the hypothesis that the informal economy may have a positive impact on economic growth through providing entrepreneurial qualities and encouraging productive entrepreneurial activity and thus being a driver of growth and development, which was introduced in some previous literature (Smallbone & Welter, 2001; Williams, 2005; Williams & Round, 2007).

In order to test the significance of the combined contribution of both IES and the interaction TEA*IES to our growth model, we evaluate the difference between models 3 and 4 using the F-test of nested models. The results showed that there was a significant difference between the two models with $p < 0.001$, indicating that the combined effect of these two variables is different from zero and that at least one of them has an effect on growth. Moreover, we have implemented a Wald test on the interaction TEA*IES in order to test whether restricting this variable to zero would harm the fit of the model or not. The result showed there was no evidence that its effect differs from zero, confirming the notion that it had no significant contribution to the model, and that the informal economy size has no significant role in moderating the entrepreneurship-growth nexus.

We notice, in both Tables 3 and 4, that TEA coefficients remain significant and in the same range, using different model specifications, which provides an evidence of

structural validity of our estimations in both regression techniques we used. This stability of TEA coefficients also emphasizes a robust support that entrepreneurship is one important factor enhancing growth.

Turning the attention to the fit of the models, for the OLS estimation results in Table 3, the adjusted $R^2$ values in all models show a well-defined estimation, and good model fits that explains more than 99.5% of the total variance in the growth output per worker. In 2SLS estimations, $R^2$ values also show reasonably good model fits that get better in the models including LOD, which indicates the differences among the groups that is explained in the estimation. In addition, from the within and between $R^2$ values in each model, we can see that this estimation was able to explain about 42-66% of growth variations within countries, and about 85-91% of growth variations between countries. Higher 'between' values indicates the ability of this model to account for national growth variations among different countries, which is one of the main goals of this study. Moreover, the two models (2 and 3) where TEA effect is allowed to be different for three groups of countries perform better results in terms of $R^2$, which indicates that the impact of total entrepreneurial activity differs among different countries. Further, the 2SLS estimation has similar results and very close to those from the OLS, with the same signs, showing the same direction of effects, however, 2SLS captures larger and more significant magnitudes of TEA estimates. This difference indicates that some endogeneity existed, and assumes that the instrumental variable approach was able to account for this possible endogeneity of entrepreneurship. In order to confirm this, we have implemented Sargan (1958) and Basmann (1960) overidentification tests, for the four models in the 2SLS estimation, to indicate the validity of the instrumental variables we use. According to the results of both tests, we cannot reject the null hypothesis that the instrument set is valid and the model is correctly specified. Moreover, we have

checked for the presence of endogeneity problem through a Durbin-Wu-Hausman test (Durbin, 1954; Hausman, 1978; Wu, 1974), which indicated the endogeneity of TEA at 1% significant level. Hence, we are more likely to trust the predicted values from the 2SLS estimation than those from OLS, which clearly suffer from downward bias.

## Chapter Five: Conclusion

This study was motivated by the conflicting views on the relationship between entrepreneurship and growth. The literature points to either positive or negative relation, depending on the type of data used and study setting. In addition to that, very few studies incorporated the informal economy size into this intersection of relationships. Our research design incorporated the level of development as a mechanism by which we can introduce cohesion to the seemingly conflicting views; it also incorporated the size of the informal economy, which was typically dealt with in isolation. The estimation methodology also adds another advantage to establish causal inference between entrepreneurship and growth.

On the one hand, entrepreneurship has been widely considered a strong driver of economic growth in theory, empirical distinctions between developed and developing countries have brought mixed results. However, the findings of our study indicate that entrepreneurship matters to economic growth more so for factor driven than efficiency and innovation driven. In fact, the marginal effect is largest for factor driven, for efficiency driven, the marginal effect is still positive, but smaller, and slightly negative for innovation driven. This implies that policies aimed at boosting the effect of entrepreneurship on growth are best if directed at factor driven economies. That is not to say that entrepreneurship should be disregarded for more developed economies because of its positive externalities on other aspects of the economy. This research clearly illustrates (Figure 2) that the effect of entrepreneurship on growth of output per worker is still positive for all three levels of development if the relationship is strictly linear; adding the interaction term changes the magnitude of the effect of this relationship, and it is clearly significant. On the other hand, we find no significant influence of the informal economy size on output per worker; OLS estimates in Table

2 indicates this effect is significant, however, this effect is clouded by the endogeneity problem. In addition, in both cases (OLS and 2SLS estimations), the moderating role is insignificant.

The previous evidence shows variety of results, especially in developing countries, in which entrepreneurship-growth nexus mostly assumed to be negative or insignificant. However, using national level GEM data, this study adds to the extant empirical cross-national literature on entrepreneurship by providing wider comparison on the long run. Distinguishing between three groups of countries according to their level of economic development in the second model showed significant differences between these groups. However, consistent with studies which have conducted long-run investigations (Ivanović-Djukić et al., 2018; Stoica et al., 2020; Urbano & Aparicio, 2016), we found that total entrepreneurial activity (considering linear relationship) still has a positive and significant impact on economic growth and in all stages of development confirming the assumption of the existence of long-term relationship between entrepreneurship and economic growth (Carree & Thurik, 2010; Sternberg & Wennekers, 2005), which indicates the need for long-run policy planning in fostering entrepreneurial activity. However, the negative impact in innovation-driven countries illustrated from model 3 is consistent with the findings of (Bampoky et al., 2013), who explained this negative impact by reaching an optimal level of entrepreneurship, which might imply that our sample of developed countries have fulfilled or exceeded their optimal levels. Moreover, this result does not aim to reduce the importance of entrepreneurship in more developed countries as many have illustrated the importance of technological and innovative knowledge based entrepreneurship and high-expectation entrepreneurial activity in these countries (Valliere & Peterson, 2009; Wong et al., 2005), and our focus

on the impact of total entrepreneurial activity in general might have a role in this negative result.

The positive impact of entrepreneurship on economic growth gives new insights to the impact of entrepreneurship on growth rates in less developed countries, which we find to be positive and even higher than it is in more developed ones, contrary to what was previously assumed (Van Stel et al., 2005). Considering the fact that less developed countries are associated with higher rates of entrepreneurship than in developed countries (Acs, Desai, & Klapper, 2008), this finding indicates that the presence of high entrepreneurial activity rates, will lead to higher economic growth rates. Moreover, since less developed countries have high percentage of necessity-driven entrepreneurship (Wennekers et al., 2010), which does not create knowledge or innovation, then entrepreneurs are not necessarily innovators who attempt to create new knowledge. Rather, they could be imitators who contribute to the process of transferring knowledge, thus enhancing economic performance (Schmitz, 1989) for other countries. The policy implication of this finding suggests that policy makers and governments should pay attention to how to provide policies and tools that facilitate the creation of an environment that fosters knowledge exchange between those who are willing to be engaged in entrepreneurial activities, rather than only focusing on innovative activities. These policies should handle several dimensions that may affect the entrepreneurial environment, such as government procedures, socioeconomic factors, improving entrepreneurial education and skills, providing financial and non-financial support, in addition to increasing awareness towards entrepreneurship (Gnyawali & Fogel, 1994).

This study has some limitations regarding the data availability; first, the time span we use (2002-2015) is restricted due to late beginning of GEM project and the used index for the informal economy size, which was measured only until 2015. Second, although

we were able to capture a large number of observations, TEA rates included a number of missing values, as some countries are found to have only one or two observations according to their participation in GEM. In addition, our analysis focuses on total entrepreneurial activity in general. Hence, it would be worthwhile to conduct future studies on the impact of several types of entrepreneurship given the attention to long-run investigations which might bring different findings to complete the analysis. Consequently, this contributes to directing policy makers to provide appropriate incentives and remove obstacles to those considered productive entrepreneurial activities, thus contributing to their survival and sustainability and therefore enhancing national economic growth through the focus on increasing the quality rather than the just the quantity of entrepreneurship.

These findings also provide other important implications for future research; further investigation should help to understand what factors might influence the success or failure of entrepreneurial activities in each stage of economic development. The conclusion that entrepreneurial activity in less developed countries seems to have higher positive impact on growth rates than in developed ones, raises the question of what makes this impact higher even though these countries may suffer from the existence of more macroeconomic problems and have more complex environment. For instance, this study empirically investigated the impact of informal economy size in moderating the relationship between entrepreneurship and economic growth as one macroeconomic factor that differs between countries. However, future studies could address other variables to control macroeconomic and environmental characteristics. Moreover, some scholars highlighted the importance of considering formal and informal institutional factors (Aparicio et al., 2016; Urbano et al., 2019) in explaining the different role of entrepreneurship in stimulating growth among countries with

different levels of economic development. This study accounted for the indirect effect of some informal institutional factors by instrumenting the fear of failure and self-efficacy behaviors of entrepreneurs, which affects the rates of entrepreneurial activity; however, further institutional approaches may provide broader perspective.

Based on these conclusions, practitioners should consider differences among countries within different stages of economic development and distinctions between these stages are required when it comes to analyzing the entrepreneurship-growth nexus. Moreover, building empirical analyses on well-framed theoretical approaches and well-defined measures of entrepreneurship would have great impact on future results in the study of entrepreneurship, giving an attention to the importance of endogenous growth models in reforming the role of entrepreneurship in economic growth.

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## Appendices

**Appendix 1:** List of the sample of countries and their participation years in GEM

| Country | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Australia | × | × | × | × | × | | | | × | × | | | × | × |
| Austria | | | | × | | × | | | | | × | | × | |
| Belgium | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Bolivia | | | | | | | × | | × | | | | × | |
| Botswana | | | | | | | | | | | × | × | × | × |
| Brazil | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Bulgaria | | | | | | | | | | | | | | × |
| Canada | × | × | × | × | × | | | | | | | × | × | × |
| Chile | × | × | | × | × | × | × | × | × | × | × | × | × | × |
| China | × | × | | × | × | × | | × | × | × | × | × | × | × |
| Colombia | | | | | × | × | × | × | × | × | × | × | × | × |
| Costa Rica | | | | | | | | | × | | × | | × | |
| Croatia | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Czech Republic | | | | | × | | | | | × | | × | | |
| Denmark | × | × | × | × | × | × | × | × | × | × | × | | × | |
| Ecuador | | | × | | | | × | × | × | | × | × | × | × |
| Egypt | | | | | | | × | | × | | × | | | × |
| Estonia | | | | | | | | | | | × | × | × | × |
| Finland | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| France | × | × | × | × | × | × | × | × | × | × | × | × | × | |
| Germany | × | × | × | × | × | | × | × | × | × | × | × | × | × |
| Ghana | | | | | | | | | × | | × | × | | |
| Greece | | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Guatemala | | | | | | | | × | × | × | | × | × | × |
| Hong Kong | × | × | × | | | × | | × | | | | | | |
| Hungary | × | | × | × | × | × | × | × | × | × | × | × | × | × |
| Iceland | × | × | × | × | × | × | × | × | × | | | | | |
| India | × | | | | × | × | × | | | | | × | × | × |
| Iran | | | | | | | × | × | × | × | × | × | × | × |
| Italy | × | × | × | × | × | × | × | × | × | | × | × | × | × |
| Japan | × | × | × | × | × | × | × | × | × | × | × | × | × | |
| Kazakhstan | | | | | | × | | | | | | | × | × |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Korea | × | | | | | | × | × | × | × | × | × | | × |

(*Continued*)

**Appendix 1.** (*Continued*)

| **Country** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Latvia | | | | × | × | × | × | × | × | × | × | × | | × |
| Lithuania | | | | | | | | | | × | × | × | × | |
| Luxembourg | | | | | | | | | | | | × | × | × |
| Malaysia | | | | | × | | | × | × | × | × | × | × | × |
| Mexico | × | | | × | × | | × | | | × | × | × | × | × |
| Netherlands | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| New Zealand | × | × | × | × | | | | | | | | | | |
| Norway | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Pakistan | | | | | | | | | × | × | × | | | |
| Philippines | | | | | × | | | | | | | × | × | × |
| Poland | × | | × | | | | | | | × | × | × | × | × |
| Portugal | | | × | | | × | | | × | × | × | × | × | × |
| Romania | | | | | | × | × | × | × | × | × | × | × | × |
| Russia | × | | | | × | × | × | × | × | × | × | × | × | |
| Singapore | × | × | × | × | × | | | | | × | × | × | × | |
| Slovakia | | | | | | | | | | × | × | × | × | × |
| Slovenia | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| South Africa | × | × | × | × | × | | × | × | × | × | × | × | × | × |
| Spain | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Sweden | × | × | × | × | × | × | | | × | × | × | × | × | × |
| Switzerland | × | × | | × | | × | | × | × | × | × | × | × | × |
| Thailand | × | | | × | × | × | | | | × | × | × | × | × |
| Tunisia | | | | | | | | × | × | | × | | | × |
| Turkey | | | | | × | × | × | | × | × | × | | | |
| Uganda | | × | × | | | | | × | × | | × | × | × | |
| United Kingdom | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Uruguay | | | | | × | × | × | × | × | × | × | × | × | × |
| USA | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| Venezuela | | × | | × | | × | | × | | × | | | | |
| Vietnam | | | | | | | | | | | | × | × | × |

**Appendix 2**: Descriptive statistics by stage of economic development

| Variables | Obs. | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Factor-driven stage | | | | | |
| Log (GDP/L) | 40 | 9.075 | .832 | 7.489 | 10.459 |
| TEA | 40 | 18.015 | 7.930 | 7 | 38.6 |
| Log (GKF/L) | 40 | 7.646 | .929 | 6.055 | 9.152 |
| HCI | 40 | 2.289 | .303 | 1.737 | 2.785 |
| R&D | 40 | 355.799 | 312.175 | 17.376 | 1057.494 |
| IES | 40 | 30.787 | 13.354 | 13.82 | 55.06 |
| Efficiency-driven stage | | | | | |
| Log (GDP/L) | 184 | 10.095 | .357 | 8.916 | 10.617 |
| TEA | 184 | 11.255 | 5.988 | 1.9 | 36 |
| Log (GKF/L) | 184 | 8.639 | .360 | 7.564 | 9.385 |
| HCI | 184 | 2.870 | .381 | 2.076 | 3.688 |
| R&D | 184 | 1261.509 | 896.532 | 57.360 | 3462.925 |
| IES | 184 | 24.9 | 7.332 | 11.74 | 47.88 |
| Innovation-driven stage | | | | | |
| Log (GDP/L) | 254 | 11.383 | .333 | 10.630 | 12.356 |
| TEA | 254 | 6.476 | 2.722 | 1.5 | 17.6 |
| Log (GKF/L) | 254 | 9.877 | .373 | 8.858 | 10.811 |
| HCI | 254 | 3.272 | .330 | 2.233 | 3.742 |
| R&D | 254 | 4220.83 | 1552.648 | 1221.798 | 8006.673 |
| IES | 254 | 14.826 | 5.651 | 6.66 | 28.39 |