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School of Economics and Management

Entrepreneurship and Economic Growth: Evidence from GEM Data

Josefine Lundin
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Supervisors: Emre Aylar · Pontus Hansson

Abstract

There is a widespread perception among scholars and policymakers that a link exists between entrepreneurship and GDP growth. Based on data from 33 OECD countries between 2001 and 2011, this essay aims to empirically investigate the impact of entrepreneurship on economic growth. More specifically, this essay seeks to analyze how entrepreneurship contributes to different types of economic growth. In doing so, I distinguish between two types of economic growth: *intensive growth*, measured as GDP growth, and *inclusive growth*, measured as real disposal household income. The empirical results provide three main findings. First, the results show strong support of a positive relationship between entrepreneurship and intensive growth, applying both an OLS and 2SLS method. The latter method is used in an attempt to reduce possible endogeneity of entrepreneurship. Second, a non-linear relationship between entrepreneurship and intensive growth seems to exist. Third, using an *Error Correction Model (ECM)* for panel data, this essay find strong support for a positive long-run relationship between entrepreneurship and inclusive growth. However, this result does not appear in the short-run. This study confirms previous research on the relationship between entrepreneurship and intensive growth. In addition, the significant effects on inclusive growth have, to the best of my knowledge, never been shown empirically before within the OECD countries. Thus, this study ad further to the current entrepreneurial literature by showing that entrepreneurship not only affects GDP growth but also inclusive growth.

Key words: Entrepreneurship; Intensive and Inclusive growth; GEM-data

Contents

Introduction

There is a widespread perception among academics and policymakers that a relationship between entrepreneurship and economic growth exists. Schumpeter (1904) pointed out over one hundred years ago that entrepreneurship is crucial for understanding the determinants of economic growth. The theoretical literature suggests that entrepreneurship affects economic growth through various ranges of behaviors (Valliere and Peterson, 2009). Yet, entrepreneurship has still not found a place in empirical research on the sources of economic growth. In the growth literature, there is a lack of research that problematizes and empirically examines the link between entrepreneurship and growth. (Alvesson and Sandberg, 2011).

The lack of empirical research is partially due to the difficulty in defining the role of entrepreneurial activity and the difficulty of finding a comparable measure in cross-section settings. The measure provided by the *Global Entrepreneurship Monitor (GEM)* potentially closes this gap (Reynolds, 1999). Several studies (e.g. Wong et al., 2005; Stel et al., 2005; Blanchflower, 2000), using the GEM measure for entrepreneurship, have found a positive effect of entrepreneurial activity on economic growth within the OECD countries. This perception is also supported by the theoretical works of e.g. Stel et al., (2005), Kritikos (2014) and Wong et al (2005).

There is one common feature for most of the above mentioned empirical studies; previous studies restrict the measure of economic growth to gross domestic product (GDP) per capita. This essay aims to contribute to the existing literature by considering two measures of economic growth; *(i)* economic growth in terms of GDP per capita - which hereby will be referred to *"intensive growth"*, and *(ii)* real disposal household income - which hereby will be referred to *"inclusive growth"*. This is motivated by the growing 'beyond GDP' debate concerning the need to complement the GDP measure as an indicator for economic growth (e.g. see OECD, 2014). The current debate leads us to question GDP measures' inability to capture key societal goals. In focus is the need to complement GDP growth with measures, which highlight the inclusive nature of growth. This implies that the growth measure needs to be wide and not only define well-being as maximizing GDP growth (Minty and Lessaer, 2013). In addition, since entrepreneurship theoretically is assumed to affect intensive and inclusive growth differently, both measures show relevance for empirical investigation.

Thus, this essay aims at answering the following research question: - *Does entrepreneurship affect intensive and inclusive growth?* Doing so, this essay considers yearly data covering 33 OECD countries between 2001 and 2011. The chosen sample is motivated by the similarity in terms of growth patterns and potential explanatory variables between the OECD countries that enables the investigation of the causal effect between entrepreneurship and economic growth.

This essay contributes to existing literature in several ways. First, to the best of my knowledge, no analysis of the relationship between economic growth, divided into intensive and inclusive growth, and entrepreneurship has been carried out. Second, this essay uses a larger data set compared to previous studies that have empirically analyzed the link between GEMs measure of entrepreneurship and intensive growth. Third, addressing the link between entrepreneurship and economic growth using both measures of intensive and inclusive growth provides a more complete and policy relevant description of the relationship.

Specifically, this study seeks to address and depart from the following main problems found in current literature: (1) the meaning of economic growth and how entrepreneurship is linked to various types of growth is unclear (Steyert and Katz, 2004), (2) there is a weak connection between the theoretical concept of entrepreneurship and empirical approximations, and (3), studies on the link between entrepreneurship and growth by comparing e.g. nations or regions over time have not been able to deal with the problem of reverse causality; did entrepreneurship emerge due to growth, or did growth emerge due to entrepreneurship? The first problem will be approached by dividing economic growth into two parts; intensive and inclusive growth. Applying the GEM measurement, in order to measure entrepreneurship, will approach the second problem. Finally, by exploring the econometric specification, the causal link between entrepreneurship and economic growth can be empirically analyzed.

In order to shed light on the relationship between entrepreneurship and economic growth, three different methodology approaches are considered. First, to explore the link between entrepreneurship and intensive growth, an ordinary least squares (OLS) model is applied. The empirical results from the OLS specification confirm previous findings that there exists a positive relationship between entrepreneurship and intensive growth. Second, a two-stage least squared (2SLS) model is estimated to deal with potential endogeneity of entrepreneurship as a complementary analysis. When testing the robustness of the result using a 2SLS model with internal instruments, the result is considered to be robust. Third, to analyze the short-run and long-run relationship between entrepreneurship and inclusive growth a four steps error correction model (ECM) for panel data is applied, as presented by Enders (2010). The results found from the ECM model indicate that there exists a statistically significant long-run relationship between entrepreneurship and inclusive growth. Thus, the essay is able to confirm previous studies that have empirically shown the long-run relationship between entrepreneurship and inclusive growth. However, the relationship is not statistically observed in the short-run.

The essay proceeds as follows. The second section defines the two main concepts; entrepreneurship and economic growth. In the third section the theoretical channels between entrepreneurship and economic growth are discussed. In addition, section three reviews previous research within the field of study. The subsequent section presents the econometric specification and description of the variables. The fifth section provides the results from the three methodology methods. Finally, the sixth section presents and discusses the conclusions.

Background

Defining the key term - what is an entrepreneur?

In order to consider the link between entrepreneurship and economic growth attention is first drawn to the definition of “entrepreneurship”. Entrepreneurship is a multidimensional concept and it is therefore hard to find a united definition (Carree and Thurik, 2002). The difficulties in defining entrepreneurship complicate the measurement of the link between entrepreneurship and economic growth. The difficulties arise when linking entrepreneurship, which is on an individual level, to an aggregate level (Audretsch et al., 2006). This section discusses the chosen definition of entrepreneurship and the definitions previously adopted within the literature. Further, in section four the measurement of entrepreneurship is discussed.

This thesis uses Schumpeter´s definition of entrepreneurship, as is commonly argued in the literature of entrepreneurship to be the most suitable definition. Schumpeter (1934) describes entrepreneurs as innovators, implementing change within markets. These entrepreneurs are illustrated by five characteristics: (i) the ability to introduce new methods of production; (ii) the ability to introduce or develop new (or already existing) goods; (iii) the ability to identify new markets; (iv) the ability to exploit new sources of supply; (v) the ability to reorganize business processes. This definition of entrepreneurship implies that entrepreneurs identify new/already existing markets and uses innovative approaches to exploit them.

Within the entrepreneurship literature two dominant definitions can be identified (Audretsch, 2003). First, as argued, Schumpeter´s definition of entrepreneurship is commonly used, especially in more recent empirical research. Second, in earlier literature a large amount of empirical research defines entrepreneurship as self-employment. However, defining entrepreneurship as self-employment is increasingly criticized as an incomplete definition of entrepreneurship (Henrekson and Sanandaji, 2013). Defining entrepreneurship as self-employed is limited since it does not capture the specific characteristics that are discussed when defining entrepreneurship. Regardless, the lack of data previously available made this definition preferable in earlier empirical research. When analyzing the link between entrepreneurship and economic growth, defining entrepreneurship as self-employment, does not fully suffice (Wennekers and Thurik, 1999). For example, it is likely to assume that some individuals are forced into self-employment if other job opportunities are not available. Hence, Schumpeter’s definition includes the fact that entrepreneurship is not an occupation.

Finally, defining entrepreneurship based on Schumpeter’s definition corresponds with the chosen measurement of entrepreneurship. The GEM measure of entrepreneurship aims to capture any attempt by individuals to start up new business.

Defining economic growth: intensive and inclusive growth

The link between entrepreneurship and economic growth can be understood differently depending on what type of growth is considered (Steyert and Katz, 2004). Addressing the link between entrepreneurship and economic growth as both intensive and inclusive growth provides a complete and policy relevant description, with room for academics and policymakers to adopt more fine-grained economic policies. Below the definitions for intensive and inclusive growth is outlined. In addition, the main arguments for dividing economic growth into intensive and inclusive growth are highlighted.

Intensive growth

In this essay, intensive growth is defined as growth in gross domestic production (GDP) per capita. Thus, intensive growth works at a macro level and refers to changes in economic aggregates. Intensive growth is driven by improved ways of using employees and resources, which results from an increase in output. Here, the creation and diffusion of new technologies increases productivity and is theorized to improve economic growth (Van Praag and Verslot, 2007).

Defining intensive growth as GDP growth per capita is far the most dominant definition of intensive growth found within the literature. A small part of previous research has considered other economic aggregates such as total factor productivity, aggregate factor inputs and gross national product.

Inclusive growth

Inclusive growth is in this essay defined as growth that aims to improve living standards in terms of income growth, and is *inclusive* of a large part of the country's labor force (OECD, 2014). Thus, inclusive growth simply implies that the mean of individuals within a country is included and benefited from the growth, in terms of income growth (Stiglitz et al., 2009). This means raising the general level of education and training in the workforce, promoting inclusion of marginalized employees. The concept of "inclusion" should be seen as a concept of creating new economic opportunities. Therefore, inclusive growth can be seen as a part aiming to put a measure of the quality of economic growth (Stiglitz et al., 2009).

The inclusive growth approach takes a long-run perspective as the focus is on an individual level, i.e. the growth takes part on a micro level. Compared to intensive growth, inclusive growth considers the individual as the focus of analysis (Bleaney and Nishiyama, 2002).

The key argument for dividing economic growth into intensive and inclusive growth is based on the fact that an increase in productivity does not necessarily translate into sustained improvement in living standard (OECD, 2014). Inclusive growth departs from this discussion arguing that economic growth in terms of productivity is important but not sufficient to generate economic growth. Exclusively focusing on intensive growth can lead to limited understanding of the outcomes of growth. For example, a strong emphasis on intensive growth can lead to increases in GDP growth. However, it is possible to assume that this increase replaces employees and a large part of the workforce does not benefit from an upturn in productivity. This is highlighted as the main argument within the literature for including a measure considering the inclusive part of economic growth when analyzing the link to entrepreneurship. Further, only focusing on inclusive growth might lead to diminishing returns and long-term loss of competitive strength. Therefore, it is of importance that policymakers include and analyze different type of economic growth in relation to policy implications (OECD, 2014). Since intensive and inclusive growth is considered to be linked to each other, both need to be addressed and analyzed when considering economic growth (Stiglitz et al., 2009). Thus, when referring to economic growth, both intensive and inclusive growth is considered.

The relationship between entrepreneurship and economic growth

The following section offers a theoretical discussion and a summary of previous research covering the relationship between entrepreneurship and economic growth.

Theoretical channels of impact

A variety of theoretical models have been presented with the aim of explaining the link between entrepreneurship and economic growth. In most theoretical models, the effect runs from an increase in entrepreneurial activity to a significant effect on economic growth. However, some models highlight the possibility that the causal relationship may go the other way. In a large amount of previous empirical research the relationship between entrepreneurship and economic growth is modeled to allow for a dynamic relationship, e.g. allowing for a not strictly exogenous relationship between the variables. This implies that entrepreneurship can affect economic growth, but changes in economic growth can also affect the level of entrepreneurship.

To date, previous theoretical and empirical studies identify six channels by which entrepreneurial activity has an effect on economic growth. The following section discusses these six channels with the aim of providing a theoretical explanation for the relationship. In summary these are: introduction of new innovations, increased competition, increased employment, a productivity boost, structural change, and macroeconomic stability.

First, entrepreneurial activity affects economic growth through introduction of new innovations. Stel et al., (2005) argue that entrepreneurs may introduce new technologies, develop new products, and create new markets. Compared to already existing firms, new businesses are assumed to invest more in research to develop new opportunities to enter a competitive market. Thus, incumbent firms might be less likely to invest in research and development since it could compete with their already established products and markets. Kritikos (2014) highlight that already established firms to a higher degree miss out on opportunities to adopt new ideas compared to new firms. These innovations established by new firms are assumed to alter economic growth. Thus, formation of new innovations is assumed to have a positive effect on both inclusive growth and intensive growth.

Second, entrepreneurial activity might increase within market competition. By creating new firms and markets, entrepreneurial activity increase the competition for already established firms (Kirzner, 1973). Increased competition has a crowding-out effect on existing firms, resulting in a market with the most productive firms. In addition, increased competition benefit consumers in terms of lower prices and a greater product variety (Kirzner, 1973). In line with Wong et al (2005) it is possible to assume that an increase in competition has a positive effect on intensive growth. However, it is feasible that a crowding-out effect leaves employees without work in the short-run. Thus, within market competition may have a negative effect on inclusive inclusive growth in the short-run.

Third, in some previous studies the effect between entrepreneurial activity and economic growth is considered to run through an increase in employment in the medium-run[1]. It is possible to assume that a higher level of entrepreneurial activity stimulates employment growth by creating new job opportunities in the medium-run. Following this medium-run phase, there is usually a stagnation phase as new firms enter the market and increase the competition. Researchers (see e.g. Carree et al., 2002 and Wennekers et al., 2005) have empirically shown that there exists a non-linear effect between entrepreneurship and economic growth. This existence is assumed to be an effect from the new job opportunities being created in the medium-run and afterwards stagnates in the long-run. Thus, new employment opportunities are assumed to have a positive effect on both intensive and inclusive growth in the medium-run. However, Wennekers et al., (2005) argues that this channel may not be observed and effect inclusive growth in the long-run as new employee opportunities is assumed to stagnate.

Fourth, new firms established by entrepreneurs boost productivity. As mentioned, competition between new and existing firms creates a crowding-out effect, leaving the most productive firms. A market formation with new and already established firms have two impacts. First, increased competition encourages established firms to introduce new innovations in order to increase their productivity as market power decrease. Second, new firms entering the market are forced to be more productive (Acs et al., 2004). This forces new business formations to raise their productivity in order to enter the market. Geroski (1989) empirically show that entrances and exits have a positive effect on productivity using a sample of 21 OECD countries. A boost in productivity as a channel for entrepreneurship to affect economic growth is assumed to have a positive effect on intensive growth. The effect on inclusive growth is assumed to be ambiguous as a boost in productivity does not necessary translate into an increase in inclusive growth (OECD, 2014).

[1] Carree et al., 2002 and Wennekers et al., 2005 assume that this medium-run is between three to six years.

Fifth, entrepreneurial activity promotes structural change within established firms. Kritikos (2014) empirically show that already established firms struggle to adjust to market conditions, trapped into old structural positions. Existing firms fail to adjust to new market situation and lack the ability for "creative destruction", famously portrayed by Schumpeter in 1934. Thus, competition and entry of new firms may have a positive effect on existing firms in terms of forcing them out of a locked-in position (Acs et al., 2004). Further, entrepreneurial activity may create entirely new markets that become the pioneers for future growth process. In line with Geroski (1989), entrepreneurial activity, going through forcing established firms to structural change, is assumed to have a positive effect on intensive and inclusive growth.

Sixth, in the context of entrepreneurial activity, macroeconomic stability is often considered to be crucial for entrepreneurial activity to affect economic growth. Further, this channel can be argued to work as a condition for entrepreneurship (Audretsch et al., 2006). Hence, macroeconomic stability should be observed as a circumstance that gives the other five channels better conditions to operate. For example, within the entrepreneurship literature, established protection of property rights is frequently being highlighted as a condition for entrepreneurship to have an effect on economic growth (Nyström, 2007; Bassanini et al., 2001). Regulatory obstacles to setting up a new firm, such as costly licenses requirement and market entries, is assumed to discourage entrepreneurship. High regulatory obstacles prevent entrepreneurs to quickly react to new business and innovation opportunities. Thus, without good macroeconomic stability aiming to foster economic growth, entrepreneurship may have a negative effect on intensive and inclusive growth.

Literature review

There is a growing literature within the entrepreneurship area covering the linkage between entrepreneurial activity and economic growth. In general, both within and between country analyzes can be acknowledged. The remainder of this section is structured as follows; first an overview of the studies conducted within the entrepreneurship literature is presented. For a more comprehensive literature review, see for instance Audretsch et al., (2006). Second, Table 1 presents a summary over the key empirical studies.

An emerging stand of empirical literature provide evidence for a positive link between entrepreneurship and economic growth, see e.g. (Carree et al., 2007; Wong et al., 2005; King and Levin, 1993; Bassanini et al., 2001). Carree et al., (2007) made a significant contribution to the entrepreneurship literature by finding a positive relationship between entrepreneurship and intensive growth, measuring entrepreneurship as self-employment. Carree et al., (2007) conduct the analysis using data over 23 OECD countries from 1972 to 2004.

Confirming Carree et al., (2007) results, Audretsch et al., (2006) empirically show the existence of a link between entrepreneurship and intensive growth. In addition, the result indicates that the connection between intensive growth and self-employment follows a non-linear relationship, after controlling for different types of economic freedom measures. Yet, this non-linear relationship is only observed when entrepreneurial activity is conditional on protection of property rights.

The conditions for entrepreneurial activity has further been analyzed by Nyström (2007). Nyström (2007) analyzes the determinants of entrepreneurship across 23 OECD countries in the article *'The institution of economic freedom and entrepreneurship: evidence from panel data'*. Since the sample size was inadequate to carry out a panel data analysis with the GEM measure of entrepreneurship, Nyström (2007) uses self–employment rate as an approximation for entrepreneurship. Using panel data between 1972 to 2002 Nyström (2009) finds evidence that entrepreneurship is conditional on protection of property rights.

Wennekers et al., (2005) considers three econometric specifications when modeling the relationship between entrepreneurship and intensive growth; a linear model, an inverse model, and a squared specification. In the same spirit as Audretsch et al., (2006), their result indicates the existence of a non-linear relationship between entrepreneurship and intensive growth. Notable is that this non-linear relationship can only be identified in samples including developing countries. Further, Bassanini et al., (2001) conclude that this relationship is not present when analyzing OECD countries.

For a selection of 37 countries, Wong et al., (2005) concludes that entrepreneurship have a positive effect on GDP per capita growth. However, in contrast to Nyström (2007) and Audretsch et al (2006), the GEM measure of entrepreneurship is used. Wong et al., (2005) divides the measure of entrepreneurship into four subgroups; necessary Total Entrepreneur Activity (TEA), opportunity TEA, high potential TEA and overall TEA. The result suggests that rather than new firms in general; the significant contributions to intensive growth are made by fast growing firms. Thus, the result found by Wong et al., (2005) provides guidelines for policymakers in terms of targeting entrepreneurial activation measures. However, the study was not able to distinguish the role of entrepreneurs in countries with varying growth rates.

Valliere and Peterson (2009) pursue the study of Wong et al., (2005) study by presenting an extension to the growth model. Whereas Wong et al., (2005) include a sample of 37 countries, Valliere and Peterson (2009) include 44 countries for the years 2004 and 2005. In spirit of Wong et al., (2005) the GEM measure is used to measure entrepreneurship. Since Valliere and Peterson (2009) include a bigger sample, their research paper aims to distinguish how different types of entrepreneurship affect intensive growth. After controlling for capital, labor, human capital and interaction term for economic regulations, Valliere and Peterson (2009) confirms the findings of Wong et al., (2005). However, the result that high potential TEA has a significant effect on intensive growth is only observed for high-income countries. In addition, Valliere and Peterson (2009) conclude that there exists a time lag between entrepreneurship and intensive growth using a five year lagged entrepreneurship variable.

Further, Blanchflower (2000) and Carree and Thurik (1999) find conflicting results using data for OECD countries. Blanchflower (2000) include a sample of 23 countries and use self-employment as a measure of entrepreneurship. Blanchflower (2000) find evidence that there exists a negative relationship between entrepreneurship and intensive growth. Carree and Thurik (2002) conjectured that one possible explanation for this result is due to the use of an incorrect measure of OECD labor, which is not comparable across countries. Yet, Carree and Thurik (1999) find similar negative result. Carree and Thurik (1999) offer an analysis showing the consequence of lagging behind in the reforming process from large to smaller firms in manufacturing. Using a sample of 14 manufacturing industries in 13 European countries their result indicates, on average, that self-employment in large firms has a negative effect on intensive growth. The ambiguous results on intensive growth may be explained by the differences in measuring entrepreneurship.

More recent empirical studies (see e.g. Wennekers et al., 2005) have embraced the possible causality problem that can arise when measuring entrepreneurship's effect on intensive growth. A range of studies (see e.g Valliere and Peterson, 2009; Stel et al., 2005; Blanchflower, 2000) have tried to address the endogeneity problem by applying econometric methods that fully or partially solves the problem; using a fixed effect specification model and instrumental variable regression. Yet, the fixed effect approach does not deal with the problem of reverse causality. The instrumental variable regression with valid instruments accounts for the entire endogeneity issue. Further, Valliere and Peterson (2009) consider a lagged dependent variable to lessen possible problems with reverse causality.

Finally, within the entrepreneurship literature, I have recognized one empirical research paper aiming to identify the link between entrepreneurship and inclusive growth. Carree et al., (2002) estimate the first dimension of the vector error correction model (VECM) model to analyze the relationship between entrepreneurship and inclusive growth, measured as real disposal household income. Using a sample including developing and developed countries, Carree et al., (2002) conclude that entrepreneurship both has a positive short-run and long-run effect on inclusive growth.

To conclude, according to previous research, there exist a statistical link between entrepreneurship and economic growth. These empirical findings illuminate two major empirical insights - previous studies using the GEM measure of entrepreneurship conclude that the relationship is positive. Second, possible reverse causality seems to be present when studying the relationship. Still, there is no answer to how entrepreneurship affects different types of economic growth within the OECD countries. No previous research has combined these different types of growth measures and empirically tests the effect of entrepreneurial activity.

Table 1 presents a summary of selected research on the subject, including descriptions of the study, method used and comments on their results.

Table 1: Summary of previous research

Study	Positive effect	Negative effect	Sample and description of study	Estimation method	Comments on the results
Valliere and Peterson (2009)	x		44 countries between 2004 and 2006. GEM measure of entrepreneurship. Controls for macroeconomic factors.	Entrepreneurship variables are introduced both as a direct effect and as an interaction with economic components. Estimated with OLS.	In developed countries, a significant portion of economic growth can be attributed to entrepreneurs.
Wong, Ho, and Autio (2005)	x	x	Use the GEM measure for entrepreneurship and includes 37 countries. Controls for capital and regulations.	The model is estimated using OLS, alternation four different measure of entrepreneurship.	The result indicates that high growth TEA effect economic growth positive.
Bassanini et al., (2001)	x		Use 21 OECD countries between 1971 and 1998 to analyze intensive growth and GEM data. Controls for human capital.	Pooled Mean Group (PMG) procedure.	The study concludes that policies promoting entrepreneurship are important.
Stel, Carree, and Thurik (2005)	x	x	Investigates whether entrepreneurial activity influence GDP growth using 36 countries. Growth competitiveness index is used as a control variable.	The estimated model tries to solve the possible causality problem by measuring growth rates in periods. The model is estimated using OLS.	The effect of TEA indicates to have a positive and significant effect on OECD countries. Yet, the result is not observed for developing countries.
Blanchflower (2000)		x	23 OECD countries between 1966 and 1996, divided into ten year periods. Controls for; age, education and gender.	Two-way fixed effects is used. Also, a lagged dependent variable as an explanatory variable is included. Estimated with ML probit model.	The study show that the rate of self-employment has a negative effect on economic growth.
Carree et al., (2007)	x		23 OECD countries between the period 1972 to 2004. Controls for institutions and capital.	OLS and instrumental approach.	Defines and measure entrepreneurship as business ownership and self-employment.
Wennekers et al., (2005)	x		Regress GEM data for entrepreneurship in 36 countries on per capita income. Controls for business cycles and economic institutions.	Estimate three specifications: a linear relation, an inverse, and a squared specification with 2SLS and internal instrumnts.	The result show that there exist a non-linear relationship between the degree of entrepreneurship and per capita income.
King and Levin (1993)	x		Divide real per capita GDP growth into two components: the rate of physical capital and everything else.	OLS and instrumental approach	Concludes that better financial systems improve the probability of entrepreneurship and thus promote economic growth.
Nyström (2007)	(x)		Uses self-employment as a proxy for entrepreneurship. Controls for protection of property rights, and physical and human capital.	Nyström (2007) estimate an OLS model and a 2SLS model with internal instruments as a test for robustness.	The non-linear result found between entrepreneurship and economic growth is conditional on protection of property rights.
Carree et al., 2002	x		Analyze GEM-data effect on inclusive growth.	First dimension VECM model.	Existence of a long-run and short-run relationship between entrepreneurship and inclusive growth.

Empirical Model and Method

Using the GEM measure of entrepreneurship, the aim of this essay is to analyze the link between entrepreneurship and economic growth, divided into inclusive and intensive growth. The following section provides a description of the chosen data, empirical approach and possible methodological considerations. Finally, the application of the three methodology approaches are described and discussed.

Data

This study use data conducted mainly from the QoG dataset and consists of 33 OECD countries covering annual data between 2001 and 2011 (see appendix A for list of countries). The purpose of this sample is two-folded: firstly, restricting the examination to only OECD countries contributes to a homogeneous data set. Using a homogeneous data set provides tools to analyze the causal effect between entrepreneurship and economic growth. Secondly, the timespan is chosen from an availability perspective.

The chosen variables are based on the approach of previous research, the discussion found in the theoretical framework together with the chosen definitions. Appendix B provides descriptions of the data and their sources. As entrepreneurship and economic growth have few tangible effects and are notoriously hard to measure, the limited data available was taken into consideration. In addition, since potential explanatory variables are small when only including OECD countries, data quality plays a crucial role in the empirical analysis. To lessen potential problems of data quality, harmonized OECD data is used.

Index of Entrepreneurship

When measuring entrepreneurship on either an individual level or on an aggregated level, difficulties arise. Defining entrepreneurship as a set of specific characteristics includes operationalization on an individual level. Capturing individual characteristics within a data set that is comparable over nations and time is simply not possible. Thus, measurements of entrepreneurship will always suffer from inaccuracies and are subject to critique as empirical studies have to rely on proxies that are correlated with entrepreneurship (Braunerhjelm, 2010).

As initially described, the data used to measure entrepreneurship in this essay is from the Global Entrepreneurship Monitor (GEM). The GEM measure of entrepreneurship has compiled a relatively new set of data covering measurements of entrepreneurial activity. The key outcome of the GEM project is the consistent and internationally comparable measure of entrepreneurship; the Total Entrepreneurship Activity (TEA) rates (Wong et al., 2005). The TEA measures the proportion of working-age adults in the population who are either *active* as owner-managers or *involved* in the process of starting-up a business in the span of less than 42 months. Including individuals that both are active and involved in the process allows the measure to capture individuals that have intentions to start a new business. This inclusion corresponds to Schumpeter's definition, as entrepreneurs with the intention of starting a new firm are included (Ahmad and Seymour, 2008). Further, the GEM data consist of supplemented macroeconomic indicators collected from international and national statistical sources. The macroeconomic indicators are normalized to a per capita basis, aiming to be consistent with the TEA rates for hypothesis testing across countries.

The central advantage of using the GEM index as a measurement of entrepreneurship is that it makes it possible to compare entrepreneurship both over time and between countries (Henrekson and Sanandaji, 2013). The GEM measure of entrepreneurship is an average and is a standardized measure based on surveys. Thus, the influence of individual ratings are automatically reduced. Further, the index employs the definition of entrepreneurship described in section two.

A considerable share of previous research on entrepreneurship relies on self-employment data. One obvious reason is the available data for a large number of countries and years. When measuring entrepreneurship as self-employment it is likely that the result indicate a negative link between entrepreneurship and economic growth since the measure captures individuals that are forced into entrepreneurship due to lack of job opportunities (Ahmad and Seymour, 2008). Henrekson and Sanandaji (2013) argues that measuring entrepreneurship as self-employment arise misleading inferences in connection to defining entrepreneurship according to the Schumpeterian definition. This is since measures of self-employment include individuals that do not have an incentive to innovate. In response, new empirical measures for entrepreneurship have developed. A prime example is the GEM project, providing cross-country data on entrepreneurial activity.

Despite GEMs wide success at capturing entrepreneurial activity, recent researchers have argued for some weaknesses. A possible limitation with the TEA measure is that it is unable to capture quality differences across entrepreneurial activity, such as opportunity recognition, creativity and skills. Thus, the measure should be used to give policymakers guidance on the quantity of entrepreneurship, rather than its quality (Acs and Szerb, 2010). Nonetheless, since this study aims at analyzing the link between entrepreneurship and economic growth, the limitations discussed are not a concern.

Indicators of Economic growth

Gross Domestic Product (GDP) has since the 1930s been the most widely known measure of intensive growth worldwide (Lippman, 2009). The measure has been developed and become a standard benchmark used by policymakers and is widely discussed in the public debate (Bleaney and Nishiyama, 2002). The GDP measures the value of all money-based economic activity, and is through its methodological structure comparable both over time and between countries. The major advantage of GDP as an indicator of economic growth is that it is measured frequently, consistently, and widely. As stressed by Minty and Lessaer (2013), GDP has for a long time been seen as a proxy for productivity. Thus, in line with previous research (see e.g. Wennekers et al., 2005; Wong et al., 2005), GDP per capita is used as a measure of intensive growth.

However, as initially described, GDP growth is not an appropriate measure for standards of living in an economy as GDP growth is a measure of total national economic activity. Similarly, GDP growth per capita is not a measure of personal income and even though GDP growth per capita increases, real incomes for the majority may decline (Minty and Lessaer, 2013). Thus, since intensive growth does not capture the inclusive aspect of economic growth, an additional measure is considered. Following Carree et al., (2002), inclusive growth is measured as real disposable household income [2]. While GDP growth per capita is an indicator reflecting the economic activity, household disposable income is seen as an indicator adapted to mimic the quality of economic growth and the welfare situation of individuals. Since inclusive growth is defined as a conception that reflects individuals standard of living in terms of income growth, real disposable household income is a suitable measure for inclusive growth [3] (Klasen, 2010; George et al, 2012; Stiglitz et al., 2009).

The real disposable household income variable is measured in terms of the mean for the whole economy. The key advantage of measuring inclusive growth as a country mean is the ability to perform comparable analysis between countries (OECD, 2014).

To date, the economic growth literature has also considered income inequality as a measure to embody the inclusive part of growth (Lippman, 2009). However, since this essay has chose to define inclusive growth according to the OECD (2014) definition, i.e. the inclusive part only refers to the *large part* of the workforce, it would be misleading to use economic inequality as an indicator for inclusive growth (OECD, 2014). Yet, it is of importance to note when analyzing the result that a change in inclusive growth does not necessarily reflect the same change for a specific group within the country, since inclusive growth measures an average.

Control variables

To be able to analyze the causal link between entrepreneurship and economic growth, control variables are required (Wooldridge, 2013). Because of the sample size, this study has been parsimonious with the choice of independent variables, focusing on the key control variables. Following the theoretical framework discussed in section three and previous empirical literature, this study controls for; human and physical capital, economic stability, and protection of property rights (see appendix C for descriptive data). In addition, the OECD sample allows the use of yearly data instead of averages over time. As a consequence, a business cycle variable is included to control for annual variation in output. For a more comprehensive discussion of the driving forces of economic growth within the OECD countries, see for example Bassanini and Scarpetta (2001).

The variables represents; human capital measured by average years of schooling (Edu); physical capital measured as capital stock (C); economic stability mea-

[2] The variable is adjusted for inflation

[3] For the more interested reader, see for instance Minty and Lessaer (2013) for a extensive discussion about indicators of inclusive growth to complement GDP growth.

sured by inflation (Inflation) and government expenditure (Gexp); protection of property rights (Prights), and business cycles measured by a lagged five year average economic growth variable (GDP(-5))

In line with previous empirical findings, average years of schooling, capital stock and protection of property rights are expected to have a positive effect on economic growth. Further, economic fluctuations, inflation, and government expenditure are expected to have a negative effect on economic growth (see e.g. Barro and Sala-i-Martin, 2004). All of the above control variables are collected from the Quantity of Government (QoG) dataset (QoG, 2015a).

Approach

This essay departs from a quantitative and deductive approach to get a general picture how entrepreneurship affects intensive and inclusive growth. In deductive theory the existing information within the area of study decides what data should be collected. The method choice aligns with the aim of this study since I am performing an empirical analysis based on panel data including large samples. More specifically, based on previous literature and the prediction of channels through which entrepreneurial activity affect economic growth, two distinct hypotheses are formulated:

Hypothesis 1: entrepreneurial activity will have a positive effect on intensive growth.

Hypothesis 2: entrepreneurial activity will have a positive effect on inclusive growth.

Following Reynolds et al (2000, 2001) and Wong et al (2005), the TEA measure of entrepreneurship is expected to have a statistical positive effect on intensive growth. Further, following Carree et al., (2005) entrepreneurial activity is predicted to have a positive effect on inclusive growth. By testing these hypotheses this essay extends the knowledge of the link between entrepreneurship and economic growth. Hence, the results of the essay could shed light on how policymakers can influence different types of economic growth.

The hypotheses are tested using three different methodology approaches. The first hypothesis is analyzed using a OLS estimator and an instrumental approach. The second hypothesis is analyzed using an ECM model. Using three different methodology approaches complement each other in the purpose to get a complete picture of how entrepreneurial activity affect economic growth. Further, the methodology approaches are customized to capture the different theoretical channels through which entrepreneurship is assumed to affect intensive and inclusive growth.

Model specification

The data used within this study is panel data, i.e., data combining a cross-section and a time-series. Panel data techniques have the advantage of allowing for individual heterogeneity. Hence, this enables the researcher to control for unobserved individual-specific effects. These unobserved individual-specific effects can be controlled for using either a random or a fixed effect. The choice between the two specifications is dependent on the nature of the data (Verbeek, 2008). If the observations within the data are randomly drawn from a large population, a random effect specification is preferred. However, if the observations correspond to country specific effects that are not random and the inferences are conditional on the observed units, a fixed effect model is most suitable (Wooldridge, 2013).

In line with previous research this study uses an OLS model with fixed effect (see appendix D for Hauseman test on fixed or random effects) to analyze the first hypothesis. Since it is likely to assume that the degree of entrepreneurship is not constant over the chosen time span, the fixed effect is applicable. Thus, the model applied allows for different intercepts in the sample countries. In addition, when analyzing variables over a longer time span, fixed effect is preferred (Clark and Linzer, 2012).

The advantage of using an OLS model is that the method provides an intuitive way of examining the link between entrepreneurship and economic growth. The disadvantage is, as previously discussed, a biased OLS estimator if the model suffer from simultaneous causality. Formally, the estimated OLS model with one-way fixed effects are:

$y_{i,t} - \bar{y} = (\alpha_{i,t} - \bar{\alpha}) + (x_{i,t} - \bar{x})^{'}\beta + (\varepsilon_{i,t} - \bar{\varepsilon})$ (1)

$y_{i,t} - \bar{y} = (x_{i,t} - \bar{x})^{'}\beta + (\varepsilon_{i,t} - \bar{\varepsilon})$ (2)

The above model is specified as a regression model in deviations from individual means, observed in equation (1). By withdrawing the mean of each variable, equation (2) contains no country specific effects as we assume that the effects are constant over time. i and t represents the cross-country and time-dimensions and $(\varepsilon_{i,t} - \bar{\varepsilon})$ is the error term. Further, $y_{i,t} - \bar{y}$ is the dependent variable, economic growth, and $(x_{i,t} - \bar{x})^{'}$ reveal a vector of explanatory variables, including entrepreneurship. The coefficient β from equation (2) can also be obtained by specifying a least squares dummy variable (LSDV) estimator that includes dummies for each country and time.

$y_{i,t} = \beta x_{i,t}^{'} + \sum_{j=1}^{N} \tau_j d_{i,j} + \varepsilon_{i,t}$ (3)

where $d_{i,j} = 1$ if i=j and zero otherwise. Since the considered time dimension is fairly large, both a one-way fixed effect with country dummies and a two-way fixed effect with both country and time-specific effects will be explored as baseline regressions. Assuming that the error term is identically independent distributed, this model will control for all endogenous problems related to unobserved country and time specific factors. This enables me to control for possible omitted variables and homogenous shocks.

To control for heteroscedasticity, heteroscedasticity-consistent (HAC) standard errors are applied. In addition, since the data may suffer from first-order serial correlation, two specifications can be applied. The first option to treat the potential serial correlation is to use a first order autocorrelation model AR(1). The second option is to include a lagged dependent variable to incorporate over time persistence (Beck, 2001). Thus, a lagged five-year average dependent variable will be the default in all regressions. In addition, this variable may also capture effects and controls for temporary business cycles. Based on the large number of observation, normality is assumed (Verbeek, 2008).

All variables are controlled for stationarity (see appendix E for test results). As a consequence, GDP per capita, capital stock and entrepreneurship is differentiated and measured in terms of the natural logarithm. Finally, inflation, property rights and average school years is measured in terms of the natural logarithm.

Exploring the model

To be able to analyze the causal link between entrepreneurship and economic growth it may be informative to extend the econometric specification (Henrekson and Sanandaji, 2013). In addition, exploring the model enables me to both control for the theoretical implications discussed in section 3 and the robustness of the result.

Lagged and non-linear effects

In a large amount of previous empirical research (see e.g. Wennekers et al., 2005 and Blanchflower, 2000), a lagged entrepreneurship variable has been considered in different dynamic models. Wong et al (2005) highlight the possibility that there exists a lag between the period of firm formation and the period of achieving economic growth. Thus, it is motivated to shed light on a potential delay effect between entrepreneurship and economic growth. Following Wong et al., (2005) the lagged effect is assumed to be five periods. Wong et al., (2005) empirically show that all periods before do not have a significant effect on intensive growth. In addition, including a lagged entrepreneurship variable may be seen as a remedy to avoid problems concerning simultaneity.

Further, as argued by Carree et al., (2002), there may exist a non-linear relationship between economic growth and entrepreneurial activity. As concluded in section 3, the theoretical relationship is assumed to exist as entrepreneurial activity has an initial positive effect on employment that stagnates in the long-run. To control for these effects a squared entrepreneurship variable is included.

Entrepreneurship conditional on protection of property rights

Theoretically, entrepreneurship may affect economic growth through protection of property rights. Nyström (2007) argues that entrepreneurship only has an effect on economic growth when protection of property rights is developed. To explore this theoretical prediction, an interaction variable between entrepreneurship and protection of property rights will be considered. If a statistically significant interaction effect were found it would support the theoretical hypothesis that entrepreneurship is conditional on sounded property rights.

Robustness test – Instrumental approach

As initially described, problems of simultaneity and reverse causation are common when analyzing the relationship between entrepreneurship and economic growth (Henrekson and Sanandaji, 2013). If entrepreneurship is correlated with the error term the estimates for the ordinary least squares (OLS) will be biased. To handle the problem, both an OLS and two-least squared (2SLS) method approach is used. In a 2SLS regression, the endogenous explanatory variable of significance is instrumented by a variable that has to satisfy two requirements. First, the instrument variable should be correlated with the explanatory variable of interest, i.e. it should exist a first stage. Second, the variable should be uncorrelated with the dependent variable and any other determinants of the dependent variable, i.e. the exclusion restriction holds. By using an instrument approach, only the part of the variation in the explanatory variable of interest, which is not endogenous, is exploited.

In line with previous literature (see e.g. Wong et al 2005; Stel et al., 2005), internal instruments for entrepreneurship and the squared entrepreneurship variable is used. The choice of instruments is motivated by the high probability that the entrepreneurship variable is correlated with its own lag. Regarding the exclusion restriction; it is unlikely that entrepreneurial activity is based on future economic growth. Finally, using an instrumental approach works as a robustness test to analyze the robustness of the result. Hence, the result indicates to be robust if the magnitude of the coefficients remains constant between the two econometric methods.

Error correction model

In order to test the second hypothesis, an Error Correction Model (ECM) for panel data is applied to analyze the relationship between inclusive growth and entrepreneurship. The estimation of an ECM model is executed in two steps. First, the long-run relationship is estimated using a cointegrating equation [4]. Second, the direct short-run effect and the speed of adjustment towards equilibrium are estimated.

Since entrepreneurship and inclusive growth is assumed to follow a long-run relationship, an ECM model is appropriate (Cialani, 2013). In addition, the theoretical framework constitute that inclusive growth is effected by entrepreneurship differently in the short-run and long-run. An ECM model is able to identify both these effects. Based on this, following Carree et al (2002), the first dimension of the VECM model is estimated [5]. The main advantage with the ECM model is that it can be estimated with OLS. In order to estimate the long-run

[4] Estimating the first dimension of the VECM model corresponds to an Engle and Granger Two-Step ECM model. The ECM model identifies how a dependent variable and an independent variable behave in the short-run consistent with a long-run cointegrating relationship (Cialani, 2013).

[5] For clarification; the estimated VECM model within this essay corresponds to the Engle and Granger Two-Step model. See e.g. Cialani (2013) for a deeper methodology discussion regarding the ECM model in panel data settings.

and the short-run relationship, a four-step procedure of cointegration analysis is used. The four steps of analysis are discussed below.

1. Panel Unit Root Testing

The first step of fitting and estimating an ECM model is to examine if the variables contains a unit root. The aim of performing a unit root test is to determine the order of integration. To test for unit root two panel data tests are completed: the Augmented Dicker-Fuller (1979) (ADF) and the Philips-Perron (1988) (PP).

2. Cointegration Analysis for Panel data

If the conclusion in step one is that the variables contains a unit root and are integrated of the same order the second step is to inspect whether there exists a long-run relationship between the two variables, i.e. if the variables are cointegrated. To determine if the variables are cointegrated, the residuals are tested using the Engle-Granger (1987) test for panel data.

3. ECM

Given the evidence of a cointegrating relationship, the long-run relationship between entrepreneurship and inclusive growth can be further estimated to obtain the short-run effects. To model the short-run relationship and the speed of adjustment towards equilibrium, an ECM model is estimated.

The estimated model is:

$\Delta y_{i,t} = \alpha + \beta_1 \Delta x_{i,t-1} + \beta_2 R_{i,t-1} + \varepsilon_{i,t}$ (4) where,

$y_{i,t}$= inclusive growth,
$x_{i,t-1}$= lagged entrepreneurship
$R_{i,t-1}$= lagged residuals obtained from step 2.

4. Diagnostic Check

The final step in the cointegration analysis is to test the adequacy of the model. The ECM model assumes that the residuals mimic a white noise process. Thus, the last step is to test for serial correlation and normality.

Analysis

In the following section the main results from the econometric specification discussed in section 4 are presented. First, the results obtained from the baseline regression will be discussed, followed by the extensions of the baseline regression. Finally, the key results from the ECM specification are outlined.

Baseline regressions

Table 2 below demonstrates the results from estimating the baseline regression with one-way fixed effects (column 1) and two-way fixed effects (column 2). The country and yearly dummies will not be included and presented in Table 2 for the sake of brevity but will be discussed below.

Table 2: Baseline regressions, with one-way (1) and two-way fixed effects (2)

	(1)	(2)
Variables	GDP growth per capita	GDP growth per capita
TEA	0.218	0.103
	(0.084)	(0.029)
Inflation	-0.499***	-0.462***
	(0.048)	(0.059)
C	0.641**	0.591**
	(0.031)	(0.107)
Edu	0.750**	0.841**
	(0.012)	(0.097)
GDP(-5)	0.033***	0.014***
	(0.003)	(0.011)
Gexp	-0.040	-0.032
	(0.006)	(0.009)
Prights	0.311*	0.210
	(0.003)	(0.009)
Constant	1.724**	1.695**
	(0.081)	(0.053)
Observations	321	321
R-squared (within)	0.306	0.328

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$

The first thing to note is that the coefficient for entrepreneurial activity indicates an insignificant result. As initially described, the entrepreneurial activity variable aim to capture individuals in the workfare who are either active or involved in a starting-up firm. Although the variable shows an insignificant result, the magnitude of the coefficient is in the expected direction. This result is consistent with previous findings reported by Audretsch et al., (2006). However, this result contradicts the statistical significant findings made my Wong et al (2005) and Wennekers et al., (2005). The insignificant result might indicate a misspecification of the model or a spurious result and it should be interpreted carefully.

Turning attention to the intercept, in both baseline specifications, the intercept is positive and significant on a 5 percent level. It is intuitive to assume that there exists intensive growth in the absence of the independent variables. Thus, a positive and significant intercept indicate that there still exists additional variables that affect intensive growth but are left outside the model (Bassanini and Scarpetta, 2001).

Inflation is negative and significant on a 1 percent level in both specifications, suggesting that a higher inflation inhibits intensive growth. In addition, the coefficient is high, indicating that inflation has a large influence on intensive growth, i.e. a 1 percent higher inflation decrease intensive growth by 0.499 percent using country fixed effect in column 1. Finally, as argued by previous researchers, a low and stable inflation rate may be seen as an approximation for stable macroeconomic institutions. Consequently, the empirical result in Table 2 suggests that stable institutions promote intensive growth.

It is worth noting that the capital stock variable seems to follow the theoretical prediction that an increase in capital stock has a positive effect on intensive growth. The coefficient is significant on a 5 percent level and varies between 0.641 and 0.591 in the two specifications.

As expected, a higher level of education seems to have the larges impact on intensive growth with a coefficient size of 0.841 using two-way fixed effects. Thus, the result suggests that a 1 percent higher average school year increase intensive growth by 0.841 percent. The high and significant coefficient size is in line with previous research (see e.g. Bassanini and Scarpetta, 2001; Barro and Sala-i-Martin, 2004:543).

Further, to control for economic fluctuations, a lagged five average year GDP per capita variable is included. The lagged GDP per capita variable turns up strongly significant on a 1 percent level. The high significance level could be explained by persistence in the data. The magnitude of the coefficient indicates that economic fluctuation has a positive effect economic growth. In addition, the coefficient size follows previous research in respect to a small coefficient size (see e.g. King and Levin, 1993). However, the magnitude of the coefficient contradicts previous empirical findings. Wong et al., (2005) argue that economic fluctuations is an indicator of economic instability and is assumed to have a negative influence on intensive growth. Thus, the economic fluctuation measure shows rather ambiguous results in Table 2. The coefficient is statistically significant but the magnitude of the coefficient is positive for both specifications. Moreover, it should be taken into consideration that the five-year averages GDP variable might lack the ability to control for business cycles if the sample countries does not have synchronized business cycles, explaining the ambiguous result.

Government expenditure is expected to have a negative effect on intensive growth (see e.g. Barro and Sala-i-Martin, 2002). However, the empirical results in Table 2 indicate that government expenditure has an ambiguous effect on intensive growth. In addition, compared to previous research (see e.g. Audretsch et al., 2006) the coefficient seems to be small, with a coefficient value of -0.040 using one-way fixed effect and -0.032 using annual two-way fixed effects. One possible explanation for the insignificant result is highlighted by King and Levin (1993). King and Levin (1993) argue that government expenditure is not necessary targeted to affect intensive growth and an ambiguous result is therefor anticipated.

Moving on to the protection of property right variable. Using a one-way country fixed effect, protection of property right seems to have a significant effect on intensive growth at a 10 percent level. However, the two-way annual time fixed effect indicate that protection of property right is insignificant. The insignificant result found for property right could be explained by the low variance between the countries. Thus, due to the low variance the model is not able to capture any significant relationship between protection of property right and intensive growth. When Valliere and Peterson (2009) provide an analysis including both developing countries and OECD countries a significant result for the property right variable is identified. In addition, one possible explanation to this result is the impact from controlling for time effects (column 2), which provides the significant loss. However, even though the variable does not indicate a significant result in column 2, the coefficient has the sign predicted by the theoretical framework in both specifications.

It should be noted that introducing a two-way time fixed effect decreases the coefficient size for a share of the explanatory variables. It seems that some of the explanatory variables are correlated with both the time and the country dummies. However, since protection of property rights is the only variable that changes interpretation in terms of statistical significance level and magnitude of the coefficient, both specifications indicate to provide unbiased estimates. Thus, the results seem robust and the model is able to control for heterogeneous effect using one-way and two-way fixed effects (Verbeek, 2008).

Turning to the fit of the model, the within R-squared value suggest that the independent variables explain around 30 percent of the variation in the intensive growth variable. The low rate of explanation can be explained by the existence of low variance in the data. In addition, notable and taken into consideration should be the possibility of remaining autocorrelation, explaining some of the ambiguous result found in Table 2.

Results from exploring the model

Below the baseline regression is explored with the empirical strategies discussed in section 4.2.2. Each estimated equation controls for inflation, capital stock, education, business cycles, government expenditures and protection of property rights. The presented tables do not include the result from these variables and the full regression output can be found in appendix G.

Allowing for non-linear relationship and including lagged effects

To be able to control for persistency between entrepreneurship and economic growth as discussed by Valliere and Peterson (2009), a lagged entrepreneurship variable is considered. Further, according to Wennekers et al., (2005), the relationship between entrepreneurship and economic growth may be non-linear. Table 3 presents the regression results after including a squared and a five period lagged entrepreneurship variable.

Table 3: Non-linear relationship and lagged effects with country (1) and yearly fixed effect (2)

	(1)	(2)
Variables	GDP growth per capita	GDP growth per capita
TEA	0.101**	0.105*
	(0.031)	(0.092)
$(TEA)^2$	-0.011**	-0.001**
	(0.001)	(0.000)
TEA(-5)	0.211**	0.306**
	(0.001)	(0.009)
Observations	330	330
R-squared (within)	0.410	0.409

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$

Exploring the model with non-linear relationship and including lagged effects provides a result suggesting that entrepreneurship has a positive and significant effect on intensive growth. However, this positive and significant result for entrepreneurship found in Table 3 is not present in Table 2. The significant and positive result for the entrepreneurship variable could be explained by the inclusion of a squared entrepreneurship variable. There exist at least two possible explanations for the change in significance level between the two specifications. First, as mentioned, including a lagged entrepreneurship variable may be seen as a remedy to avoid problems concerning simultaneity. It is therefore possible to assume that the baseline model in Table 2 suffer from problems of simultaneity. Second, the result shown in Table 2 may suffer from omitted variables, resulting in an insignificant coefficient.

The coefficient size for entrepreneurship is fairly small and indicate that a 1 percent increase in entrepreneurial activity increase intensive growth by approximately 0.103 percent. Yet, this significant result is in line with some previous research (see e.g. Bassanini, Scarpetta, and Hemmings, 2001) that finds a small effect for entrepreneurship on intensive growth. The positive result between entrepreneurship and intensive growth gives further evidence to support the theoretical channels of impact outlined in section 2. Since a significant and positive result is observed in Table 3 it is reasonable to assume that some of the theoretical channels work.

Turning to the squared entrepreneurship variable aiming to capture a non-linear relationship between entrepreneurial activity and intensive growth. The squared entrepreneurship variable seems to follow the result found by Carree et al (2002) and is significant on a 5 percent level in column 1 and 2. Theoretically, a non-linear relationship is present as employment initially increases when entrepreneurs enter the market. Notable is that this result contradicts Wennekers et al., (2005) conclusion that a non-linear effect is only observed within developing countries.

Further, the lagged significant relationship theoretically predicted to exist between entrepreneurship and intensive growth is not present in Table 3. As previously mentioned, Wong et al (2005) argues for the existence of a time delay before entrepreneurial activity transforms into economic growth. Yet, the coefficient show the theoretically expected sign. Even though the result is not significant the lagged variable seems to have a larger effect on intensive growth compared to the not lagged variable. However, the insignificant result seen in Table 3 is in line with Blanchflower (2000) empirical study. Blanchflower (2000) argue that this is since GDP growth has a tendency to fluctuate, which problematizes the ability to distinguish a lagged effect between entrepreneurship and intensive growth.

Turning attention to the control variables. The signs and effects of inflation, capital stock, education, government expenditures and protection of property right are robust to the earlier specification in Table 2 (see Table 14 in appendix G). The lagged dependent variable, aiming to capture business fluctuations and first-order serial correlation, changes its significant level from 1 percent in table 2 to a 5 percent level.

Finally, the within R-square value has increased due to the inclusion of additional explanatory variables. The within R-square value suggests that the independent variables explain 40 percent of the variation in the intensive growth variable.

Exploring the effect on entrepreneurship conditionally on institutional quality

Following Audretsch et al., (2006), an interaction term was created between entrepreneurship and protection against property rights. Table 4 shows the results from the fixed effect specifications when an interaction term is included in the baseline model.

Table 4: Interaction term with country (1) and yearly fixed effect (2)

	(1)	(2)
Variables	GDP growth per capita	GDP growth per capita
TEA	0.021*	0.112*
	(0.067)	(0.003)
TEA*Prights	0.039	0.141
	(0.037)	(0.091)
Observations	330	330
R-squared (within)	0.391	0.310

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$

Similar to Table 3, the entrepreneurial activity variable seems to follow the theoretical hypothesis outlined in chapter two; higher entrepreneurial activity increase intensive growth. In addition, the magnitude of the coefficient seems to remains fairly constant when an interaction term is included. Yet, the significant level has decreased to a 10 percent level. The loss of significant level from excluding the squared entrepreneurship variable and the lagged variable confirms the suspicions that the model in Table 2 is misspecified.

Moving on to the interaction term. According to theory, entrepreneurs effect on economic growth is assumed to go through protection of property right. Yet, the estimated result in Table 4 show that entrepreneurship conditional on protection of property right has an insignificant effect on intensive growth. Thus, it can be concluded, based on the results in Table 4, that entrepreneurial activity is not conditional on protection of property rights. This result contradicts previously empirical studies (see e.g. Nyström, 2007). As previously discussed, the insignificant result for the interaction term might be a consequence of the sample selection only including OECD countries. Since the OECD is fairly similar in terms of macroeconomic factors the variation in the variable may not be large enough to capture significant effects (Bassanini and Scarpetta, 2001).

The control variables considered show a robust result to earlier specifications in Table 2 and 3; those variables who were significant in the previous model show a significant result in the current specification (see Table 15 in appendix G).

Finally, turning attention to the fit of the model. The within R-squared value have decreased marginally compared to Table 3, indicating that the explanation of variation in the intensive growth variable has decreased.

Results from using an instrumental approach

In this section the results obtained from the 2SLS model is presented. As initially described, the application of 2SLS is conducted in this essay in an attempt to reduce the possible endogeneity of entrepreneurship.

The chosen instruments are a one period lagged entrepreneurship variable and a one period lagged squared entrepreneurship variable. Table 5 presents the first stage regression for the two instruments. Staiger and Stock (1997) argues that instruments are to be considered weak if the first-stage F-statistic is less than 10. Since the F-statistic in Table 5 is exceeding 10, I conclude that the instruments do not suffer from weak instrument issues. Further, Appendix F reports the results from testing the exclusion restriction.

Table 5: First stage regressions

	Equation (1)	Equation (2)
	Dependent variable: Entrepreneurship	Dependent variable: Squared Entrepreneurship
TEA (-1)	0.050***	
	(0.032)	
$(TEA(-1))^2$		-0.049***
		(0.005)
Observations	332	332
R-squared	0.0041	0.00471
F-value	20.059	21.491

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$

Table 6 shows the results obtain from estimating the 2SLS regressions in comparison to the baseline OLS model. If the estimated coefficients below show a similar result for both estimation methods, the result is to be considered robust. Column 1 shows the country fixed effect and column 2 illustrate the time fixed effects. The estimated model is the baseline model including the squared entrepreneurship variable. The inclusion of the squared entrepreneurship variable is motivated by its significant effect found in Table 3.

Table 6: 2SLS with country (1) and yearly time fixed effects (2)
Dependent variable: GDP growth per capita

	Equation (1)		Equation (2)	
Variables	OLS	2SLS	OLS	2SLS
TEA	0.183**	0.106***	0.144**	0.128
	(0.004)	(0.057)	(0.003)	(0.119)
$(TEA)^2$	-0.007**	-0.000**	-0.004**	-0.001**
	(0.097)	(0.022)	(0.021)	(0.053)
Inflation	-0.381***	-0.299**	-0.300***	-0.301**
	(0.081)	(0.023)	(0.088)	(0.100)
C	0.453**	0.452**	0.362**	0.472**
	(0.089)	(0.173)	(0.229)	(0.329)
Edu	0.626**	0.628**	0.680**	0.673**
	(0.069)	(0.089)	(0.058)	(0.191)
GDP (-5)	-0.164**	-0.021**	-0.111**	-0.031**
	(0.005)	(0.009)	(0.000)	(0.004)
G exp	-0.367	-0.012*	-0.003	-0.009
	(0.082)	(0.093)	(0.010)	(0.011)
Prights	0.264	0.200	0.195	0.201
	(0.042)	(0.073)	(0.091)	(0.103)
Constant	1.561**	1.491***	1.622**	1.505**
	(0.051)	(0.093)	(0.007)	(0.014)
Observations	321	321	321	321
R-squared (within)	0.409	0.372	0.410	0.391

HAC standard errors in parentheses
$***p < 00.1$, $**p < 0.05$, $*p < 0.1$

The conclusion that entrepreneurship has a statistical significant effect on inclusive growth found in Table 3 and 4 is still present in Table 6. The key result in Table 6 is the consistency in coefficient magnitude and significance level between the OLS and 2SLS. This suggests that the results previously found in Table 3 and 4 can be considered robust. Because of the small difference between OLS and 2SLS, it is possible to assume that the instrumental approach succeeds to account for possible endogeneity of entrepreneurship. In addition, the result indicate that the model does not suffer from problems with omitted variables. Thus, as previously concluded, the insignificant result for entrepreneurial activity present in Table 2 may be due to the exclusion of non-linear effects. Lastly, the 2SLS specification provides higher standard errors compared to the OLS estimator, which indicates that the model is correctly specified with both estimators (Blundell and Bond, 1998).

When specifying the model using a 2SLS approach, the previous conclusion about the presents of a non-linear relationship between entrepreneurship and intensive growth still holds. In all of the estimated equations, the square variable appears to be significant on a 5 percent level. However, it is notable that the coefficient magnitude is very small, indicating that the diminishing effect is small.

Moving on to the control variables. Protection of property right seems not to appear statistical significant on a 10 percent level as in Table 2 using one-way country fixed effects. However, the coefficient size appears to be similar between the OLS and the 2SLS estimator. As previously declare, the insignificant result found for property right could be explained by the low variance within the sample.

Both the capital stock and the average schooling year variable follow the theoretical prediction and have a significantly positive effect on intensive growth. The magnitude of the coefficient and significance level remains fairly equal between the different estimators. Based on this robustness check it is possible to conclude that a higher capital stock and an increase in schooling years promote intensive growth.

A noteworthy result found in Table 6 is the decrease in coefficient size for the economic fluctuation variable when an instrumental approach is estimated. One possible explanation for this is the variables role to control for over-time persistence in the OLS estimator. However, the magnitude of the coefficient is in line with previous empirical findings (see e.g. Wong et al., 2005). This result is not in line with the previously findings in Table 2. It is therefore possible that the previously result presented contains an upward bias and thus should be interpreted carefully.

Further, an interesting result found when estimating the model with 2SLS is that government expenditures appear to become significant on a 10 percent level. In addition, the variable is in line with previous empirical findings showing a negative impact on intensive growth. However, the coefficient decreases in size in both the country and yearly fixed effect case compared to the result found in Table 2.

As illustrated in Table 5, all regression equation estimated with OLS show a low within r-square value explaining approximately 40 percent of the variation in intensive growth. The within R-squared values for 2SLS are invalid and should not be used as a proxy for explanation degree (Blundell and Bond, 1998). Finally, as initially mentioned, one should take into account the fact that the model may still suffer from autocorrelation and thus could explain some of the ambiguous results.

Entrepreneurship's effect on inclusive growth

The second hypothesis in this essay aims to test if entrepreneurial activity has an effect on inclusive growth. Entrepreneurship and inclusive growth is assumed to follow a long-run relationship and thus the first dimension of the VECM model is estimated to capture the long-run relationship, short-run relationship and the speed of adjustment towards equilibrium between entrepreneurship and inclusive growth.

Recalling the model specification in section four, the first step in a cointegrating analysis is to test for the existence of a unit root. To test for unit root, I consider two unit root tests for panel data: the Augmented Dicker-Fuller (ADF) and the Philips-Perron (PP). Testing for unit root enables me to determine the order of integration (Enders, 2010). The results for the panel unit root tests are summarized in Table 7.

The null hypothesis of the ADF-test is that each series in the panel follows a unit root process. The test is conducted by calculating an F-statistic. Further, the F-statistic is compared with a critical value reported by Dickey Fuller (1979). As a complement to the ADF-test, the non-parametric Philips and Perron (PP) (1988) test for panel data is performed. As above, the null hypothesis is the presence of a unit root. Compared to the ADF-test, the PP statistics is calculated differently and allows for serial correlation (Enders, 2010). Hence, the PP-test for unit root is argued to be a suitable complement to the ADF-test.

Table 7: Panel unit root tests

Augmented Dicker fuller (ADF) for unit root in panels

	Levels	First Differences
Variables	Intercept / Intercept and Trend	Intercept / Intercept and Trend
Inclusive growth	0.551 / 1.031	20.041*** / 21.941***
Entrepreneurship (TEA)	0.319 / 0.873	16.591*** / 17.592***

Note: *** indicates significance at p <00.1

Phillips-Perron test (PP) for unit root in panels

	Levels	First Differences
Variables	Intercept / Intercept and Trend	Intercept / Intercept and Trend
Inclusive growth	0.521 / 1.429	29.491*** / 27.281***
Entrepreneurship (TEA)	1.399 / 0.999	16.732*** / 14.820***

Note: *** indicates significance p <00.1

For the inclusive growth variable and the entrepreneurship variable, neither the ADF nor the PP-test are able to reject the null hypothesis. Based on the results from Table 7, both the inclusive growth and the entrepreneurship series are assumed to contain an intercept and a trend. When using the first differences, both the ADF and the PP-test reject the null of unit roots at a 1 percent significant level, suggesting that the series are integrated of order one, I(1).

Since both variables are assumed to contain a unit root it is possible to precede and examine whether there exists a long-run relationship between the two variables, e.g. examine whether the variables are cointegrated. Theoretically, if two variables are cointegrated with each other there exits a linear combination between the variables that are stationary. This implies that there exists a long-run relationship even in the absence of a short-run relationship.

To determine if the variables are cointegrated, an Engle and Granger (1987) test for panel data is used to test the residuals. The idea of the test is to run an OLS regression between the two non-stationary variables and test if the residuals obtained from the regression is stationary. Hence, the estimated equation is:

$Inclusivegrowth_{i,t} = \alpha_1 + \alpha_2 TEA_{i,t} + \varepsilon_{i,t}$ (5), where the error terms is saved.

Table 8: Panel cointegrating regression

	(1)
Variables	Inclusive
TEA	0.320***
	(0.005)
Constant	0.107***
	(0.000)
Observations	268
R-squared	0.0283

***p <00.1, **$p < 0.05$, *$p < 0.1$

Next, the residuals are tested for unit root using an panel ADF-test presented in Table 9.

Table 9: Results from panel cointegration tests

	Residuals	
	Statistic	p-value
Augmented Dicker fuller (ADF)		
Intercept	0.089	0.000
Intercept and trend	0.015	0.000

$^{***}p$ <00.1, $^{**}p < 0.05$, $^{*}p < 0.1$

As seen in Table 9, the residuals are stationary and thus the inclusive variable and the entrepreneurship variable are panel cointegrated, i.e. there exists a long-run relationship between the variables. However, the Engle and Granger test states that for two variables to be panel cointegrated, all linear combination of two non-stationary variables is stationary. To control for this, I have performed the same analysis when entrepreneurship is the dependent variable and the same conclusion as above can be drawn.

The coefficient for the entrepreneurship variable in Table 8 indicates the long-run relationship between entrepreneurial activity and inclusive growth. As seen in Table 8, the long-run effect of a persistent increase in entrepreneurial activity has a positive effect on inclusive growth, indicating a 0.320 level increase in inclusive growth. Thus, this result supports the second hypothesis stated in this essay; entrepreneurial activity has a positive long-run effect on inclusive growth. Further, the long-run effect follows Carree et al., (2002) result, both in terms of statistical significance and expected magnitude of coefficient. Thus, it is possible to assume that the third channel of impact discussed in the theoretical section; that entrepreneurship may not have a significant effect on inclusive growth in the long-run due to stagnation in employment, is not present.

Since I conclude an existence of a long-run relationship between entrepreneurship and inclusive growth I can proceed to explore the short-run relationship by estimating a ECM model based on panel data. Using the lagged error term obtained from equation 5, the following equation is estimated:

$$\Delta Inclusivegrowth_{i,t} = \alpha + \beta_1 \Delta TEA_{i,t-1} + \beta_2 residuals_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

Since the error term from the equation above is assumed to follow a stationary process, the model is estimated using an OLS model. The estimation results obtained from the second step of estimating the ECM model is shown in Table 10.

Table 10: Results of the ECM estimates

	(1)
Variables	$\Delta Inclusivegrowth$
$\Delta TEA(-1)$	-0.106
	(0.018)
Residuals (-1)	0.009***
	(0.000)
Constant	1.227***
	(0.000)
Observations	232
R-squared	0.072

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$

The coefficient for $\Delta TEA(-1)$ indicates the short-run relationship between entrepreneurship and inclusive growth. Further, the lagged residuals coefficient in Table 10 shows the speed-of-adjustment for the model to return to equilibrium. When the residual coefficient is zero, the long-run relationship indicates to be in equilibrium. However, in practice, the economy is rarely in its equilibrium and the deviations are represented by the Residuals (-1) variable.

The result from Table 10 suggests that entrepreneurship does not appear to have a statistical significant short-run effect on inclusive growth. This result contradicts Carree et al., (2002) significant result found between entrepreneurship and inclusive growth in the short-run. In addition, the expected sign for the short-run coefficient contradict previous empirical findings. However, theoretically, entrepreneurship is expected to effect economic growth by crowding out firms, leaving the most productive firms. As mentioned, this channel may have a negative effect on inclusive growth as unemployment is created in the short-run. Thus, even though the negative effect is not statistically significant, it is possible to argue that the magnitude of the short-run coefficient is due to this theoretical implication. In addition, another explanation for this result may be the difference in sample selection. Carree et al., (2002) includes both developing and developed countries within their analysis that may contribute to a larger variance in the data set.

Further, the error correction mechanism is positive and statistically significant on a 5 percent level, indicating that a positive deviation from the long-run relationship causes a further deviation from the equilibrium. However, the size of the coefficient for speed of adjustment is very small, which is interpreted as a slow deviation from the long-run equilibrium. The coefficient suggests that deviations from equilibrium are corrected at 0.009 percent yearly.

The final step in the cointegration analysis it to examine the adequacy of the model. In the ECM model the residuals are assumed to follow a white noise process. Therefore, the residuals from the ECM model are tested using a LM test for serial correlation and Jarque-Bera for normality.

Table 11: Diagnostic checks for panel data

Serial Correlation LM test

Null hypothesis: No serial correlation

	LM-statistic	p-value
Residuals	5.410	0.921

Normality test

Null hypothesis: Normal distribution
(test on joint components)

	Jarque-Bera	p-value
Residuals	3.107	0.421

As seen above, the residuals are following a white noise process and thus the ECM model in Table 10 can be assume to be correctly specified.

Discussion

The aim of this essay was two folded: to empirically analyze the link between entrepreneurship and intensive growth, and the link between entrepreneurship and inclusive growth. Consequently, two hypotheses where stated and empirically tested. The main results suggest that a higher degree of entrepreneurial activity has a positive effect on both intensive and inclusive growth.

The first hypothesis was investigated applying a baseline model with a one-way country fixed effect and a two-way time fixed effect using GDP per capita as an indicator for intensive growth. The results found in this essay confirms previous empirical research (see e.g. Wong et al., 2005 and Wennekers et al., Reynolds 2005) which have found a significant positive relationship between entrepreneurship and intensive growth. Further, the empirical results support the channels of impact theoretically assumed to link entrepreneurship with economic growth. The relationship between entrepreneurship and intensive growth is theoretically assumed to go through: introduction of new innovations, increased competition, increased employment, a productivity boost, structural change, and macroeconomic stability

To summarize the effect of the control variables, as theoretically predicted, education and capital stock indicate a positive and significant effect on intensive growth. Further, inflation and economic fluctuations show a significant negative effect on intensive growth. Finally, the government expenditure variable and protection of property rights indicate an ambiguous effect. A large part of the control variables seemed to be robust in magnitude and significant when different specifications of the baseline model are estimated.

When extending the baseline regression to allow for theoretical assumptions, for example a time delay between entrepreneurship and intensive growth, entrepreneurship conditional on protection of property rights, and a non-linear relationship, interesting results are shown. Firstly, contradicting previous research, I found little support that entrepreneurship is conditional on protection of property rights. Secondly, time persistence between entrepreneurship and intensive growth is not observed, as predicted. Finally, the results indicate the presence of a non-linear relationship between entrepreneurship and intensive growth.

The results from the OLS regressions may not provide a causal interpretation of the relationship between entrepreneurship and intensive growth if the model suffers from issues of reverse causality. To prevent this problem, this study considers an instrumental approach using internal instruments as a sensitivity analysis. Internal instruments provide suitable instruments, but not perfect ones. Hence, this has to be taken into consideration when analyzing the result. However, as previous discussed, the OLS and 2SLS estimator show similar magnitude between the coefficients, which indicates that the data does not suffer from endogeneity.

Restricting the sample to OECD countries may explain the positive link between entrepreneurship and intensive growth found. Even though this study controls for macroeconomic stability and entrepreneurship's effect on economic growth conditional on protection of property rights, it is still possible to assume the existence of unobserved factors that are specific for OECD countries. These specific factors may include attitudes towards entrepreneurship, the climate for developing new ideas and the premise to take on risk by becoming an entrepreneur. For example, it may be more difficult to take the step in becoming an entrepreneur if the risk of surviving an economic collapse is higher. Therefore, the conclusion drawn should not be extended to other sample settings without carefulness.

In order to improve the analysis between entrepreneurship and economic growth and to present a policy relevant study, this essay considers a second hypothesis: *entrepreneurship will have a positive effect on inclusive growth.* The second hypothesis is investigated using an Error Correction Model (ECM) for panel data, aiming to identify the existence of a long-run and short-run relationship between entrepreneurship and inclusive growth. Using two unit root test procedures for panel data, this essay concludes that entrepreneurship and inclusive growth follows an I(1) processes. These findings were then used to estimate the cointegrating equation by OLS. Further, when estimating the cointegration equation, the existence of a long-run relationship between inclusive growth and entrepreneurship can be identified. Consequently, a higher degree of entrepreneurial activity increases the mean of real disposable income within a country.

Yet, the relationship between entrepreneurship and inclusive growth is not statistically observed in the short-run. The insignificant result contradicts previously empirical findings made by Carree et al., (2002). One possible explanation for this contradicting result may be the selection of data sample. Carree et al., (2002) includes both OECD countries and developing countries, creating a higher variance within the data set. Further, the result suggests that the short-run relationship between entrepreneurship and inclusive growth is negative. Even though the negative result contradict previous findings it can be supported by the theoretical relationship outlined between entrepreneurship and inclusive growth. Recall, entrepreneurial activity is assumed to create a crowding-out effect, leaving employees without work in the short-run and hence have a negative effect on inclusive growth in the short-run.

Finally, recalling the unique features of the GEM measurement to capture Schumpeter's definition of an entrepreneur. Schumpeter argues that an entrepreneur is an individual that has the ability to introduce new methods of production and introduce or develop new goods. As previously concluded, the result will suffer from erroneous since the definition considers characteristics on an individual level and the measure is operationalized on a macro level. The measure may include individuals without these specific characteristics involved in self-employment. Hence, this should be of awareness to the reader when interpreting the results. Further, since economic growth is a wide subject, numerous explanatory factors influence the concept. All estimated models above are simplifications of the real conditions observed. Henceforth, there is a risk that significant explanatory factors are left out, lowering the explanation degree.

Summary and concluding remarks

This paper theoretically and empirically assesses the impact of entrepreneurial activity on intensive and inclusive growth for the period 2001 to 2011 within the OECD countries. To the best of my knowledge, this essay is the first study that divides and empirically shows that entrepreneurial activity both has a positive effect on intensive and inclusive growth. Previous empirical studies of entrepreneurship typically focus on how the degree of entrepreneurial activity affects GDP growth, rather than focusing on if entrepreneurship affects different forms of economic growth. In connection to the growth literature there is a growing debate regarding restricting the measure for economic growth to GDP growth. Recent literature has suggested that GDP, as a measure of growth, is unable to capture key societal goals. In focus is the need to complement GDP growth with measures, which highlight the inclusive nature of growth. Thus, to provide a more policy relevant picture of the link between entrepreneurship and economic growth, this essay considers two types of economic growth: (a) *intensive growth* measured in terms of GDP per capita growth and (b) *inclusive growth* measured in terms of real disposal household income.

Thus, the purpose of this study is to contribute one piece to the puzzle on the link between entrepreneurship and economic growth by answer the research question: *Does entrepreneurship affect inclusive and intensive growth?* In theory, entrepreneurial activity can influence economic growth via several channels. This essay identifies six channels of impact: introduction of new innovations, increasing market competition, increase in employment, boost in productivity, structural changes and macroeconomic stability. Further, definitions of entrepreneurship and economic growth are established that are portable across countries and time to clarify the results.

This essay provides three main findings. First, entrepreneurship has a significant result on intensive growth when both a one-way and a two-way fixed effect model are estimated. More importantly, these results are robust when a 2SLS model is estimated using an internal instrumental approach. In addition, the results show that a large amount of the control variables considered have a significant effect on intensive growth. Second, when extending the econometric specification the result support the existence of a non-linear relationship between entrepreneurship and intensive growth. Furthermore, the results indicate that a lagged effect and entrepreneurship conditional on protection of property rights does not exist within the OECD countries. Third, this study confirms the theoretical assumption of the existence of a long-run relationship between entrepreneurial activity and inclusive growth. Thus, the essay is able to confirm the findings of Carree et al (2002); entrepreneurial activity has a positive effect on intensive growth in the long-run. However, a significant relationship is not found in the short-run.

These findings have potentially important implications for entrepreneurial activity and countries' abilities to target different types of economic growth. Especially since there is a growing debate how to measure economic growth. Dividing economic growth into intensive and inclusive growth will therefore give policymakers a guideline how entrepreneurial activity can be targeted. However, these results are promising that more research is needed to better uncover the link between entrepreneurial activity and different types of economic growth. Further research should aim to extend the knowledge on different types of entrepreneurial activity and its effect on economic growth. This could include analyzing if entrepreneurship affects economic growth differently across industries. Thus, much remain to be done within this area of research.

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Appendices

Appendix A - Lists of countries

Source: QoG OECD Dataset (2015a)

Australia	Korea
Austria	Luxembourg
Belgium	Mexico
Canada	Netherlands
Chile	New Zealand
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Slovakia
Germany	Slovenia
Greece	Spain
Hungary	Sweden
Iceland	Switzerland
Ireland	Turkey
Ireland	United Kingdom
Israel	United States
Italy	
Japan	

Description of variables

Variable	Source	Description
GDP growth per capita	World bank (2013)	GDP growth per capita, measured in constant 2005 US dollar. The variable is differentiated and is measured in natural logarithm.
TEA	GEM (2012)	GEM measure entrepreneurial activity as "all start-ups and newly formed businesses that succeed to employ a minimum of 20 employees within a five year span. The variable is measured as percentage of the population between the ages 18-64 that is actively involved in starting a new venture. The variable is measured in natural logarithm.
C	Penn World Table (2012), Hall and Jones (1999)	Data on investments is used to calculate the stock of capital. The investments variable is measured as share of PPP converted GDP per capita at 2005 constant prices. In line with Carree et al (2007) the following formula is used $C_{it} = \dfrac{I_t}{d + g_i}$,where, d indicates the depriciation of capital and g denotes average growth rate of investment during 2000-2010. The variable is differentiated and is measured in natural logarithm.
Edu	Barro and Lee (2010)	Education is measured as average schooling years for the population over age 15. The variable is interpolated from a five-year average to a yearly basis. The variable is measured in natural logarithm.
Inflation	World Bank WDI (2015)	Inflation reflects the annual percentage change in the cost for an average basket of goods and services. To calculate the annual change, the Laspeyres formula is used. The variable is measured in natural logarithm.
Prights	World Bank WDI (2015)	The property right variable reflects a country´s degree of protection for private property rights. In addition, the measure includes and analyzes the independence of the judiciary and the facility for individuals and businesses to administer contracts. The measure range from 0 to 100 and a higher score indicates a higher degree of protection.
Gexp	World Bank WDI (2015)	The government expenditure variable is measuring government consumption as percent of GDP. Government consumption includes all current expenditures for purchases of goods and services.
Inclusive	OECD (2015)	Real household disposable income (adjusted for inflation). The variable is defined as the sum of household final consumption expenditure and includes household savings. The variable also includes the sum of wages and salaries, net property income and wealth.

Data is collected from QoG OECD Dataset (2015a)
Description of variables is from the QoG OECD Dataset 2015 Codebook (2015b)

Descriptive data

	Observations	Mean	Std. Dev.	Minimum	Maximum
GDP growth	363	31337	17205	5697	87716
Entrepreneurship	298	7.425	3.465	1.4	19.39
Inflation	354	3.153	25.426	-4.479	54.400
Education	326	10.293	1.454	5.329	13.090
Gov. Expenditure	362	4.621	0.749	0.692	24.574
Capital stock	368	691.01	209.421	402.4	934.2
Property rights	263	77.506	15.379	50	95
Inclusive	352	30296	10931	9636	67817

Hausman test for Fixed versus Random effect

The Hausman test exams the fixed effect versus the random effect. The null hypothesis compares the estimated coefficients by the random effect with the same as the ones estimated by the fixed effect specification. This infers that the Hausman test examines if the individual effects are uncorrelated with the other regressions in the model. Thus, the null hypothesis is that a random effect is preferred over the fixed effect.

Below the result from Hausman test is presented. The test indicates p-value of 0.027 respectively 0.0241 (testing for cross-section and period random effect). Since the null hypothesis is rejected, a fixed effect specification is preferred.

	Chi-sq. Statistic	Chi-sq d.f	P-value
Cross-section random (Null hypothesis: cross - section random effect is preferred)	14.25	9	0.027
Period random (Null hypothesis: period random effect is preferred)	13.98	9	0.0241

Tests of stationarity

	GDP	TEA	Inflation	Edu	Pright	Gexp	C
Null hypothesis: Common unit root Levin, Lin and Chu t*	17.35***	108.7***	-10.12***	-41.34***	-41.04***	-28.41***	401***
Null hypothesis: Individual unit root							
Im, Peasaran and Shin W-stat	-16.83***	106***	-16.18***	-21.34***	-28.34***	-31.3***	2.53***
ADF – Fisher Chi-square	891.6***	2212**	601.66***	641***	501***	602***	294.2***
PP-Fisher Chi-square	91948*	1997**	634***	639**	505**	598**	702***
Null hypothesis: Unit root, intercept and trend							
Levin, Lin and Chu t*	-21.47***	102.63**	-12.82**	-29.49***	-31.6**	-24.13***	51.17**
Null hypothesis: Unit root, trend							
Im, Peasaran and Shin W-stat	-23.89**	106.34***	-12.43***	-16**	19.14***	-27.28***	42.42**
ADF- Fisher Chi-square	8.92***	402.3***	537***	693***	801***	997***	504***
PP-Fisher Chi-square	1287**	1263**	829***	693**	1249***	1528**	205***

The table shows test results after: GDP per capita, capital and entrepreneurship are differentiated and measured in the natural logarithm. Inflation, property rights and average school is measured in terms of the natural logarithm.

Test of instruments

The assumption that the covariance between the instrument and the error term must be zero has to be fulfilled in order for the instruments to be valid (Verbeek, 2008). In addition, the instruments have to be correlated with the endogenous explanatory variables, in this occasion the entrepreneurship variable and the squared entrepreneurship variable. To test the validity of the instruments, the 2SLS estimator is obtained in two steps. Firstly, the endogenous variable, entrepreneurship and the squared entrepreneurship, is regressed upon the instruments. Secondly, the baseline regression is estimated and includes the instruments (Verbeek, 2008). The first and second step is expressed in equation (1)-(4).

Table 12 present the estimation output from regressing the instrument for entrepreneurship. As can be seen, the instrument is significant and indicates that the variables are correlated. Further, the regression result from equation (2) indicates that the instrument does not have a significant effect on the dependent variable (see Table 12). The same result holds for the squared entrepreneurship variable in Table 13. Hence, the estimated result below proves the validity for the instruments.

$TEA = \beta_1 TEA(-1) + \beta_2 x_{it}^{'} + \sum_{j=1}^{N} \tau_j d_{ij} + \varepsilon_{it}(1)$

$GDP = \beta_1 TEA(-1) + \beta_2 TEA + \beta_3 x_{it}^{'} + \sum_{j=1}^{N} \tau_j d_{ij} + \varepsilon_{it}(2)$

Table 12

	Equation (1)	Equation (2)
	Dependent variable: Entrepreneurship (TEA)	Dependent variable: GDP growth per capita
TEA (-1)	0.050***	-0.005
	(0.032)	(0.000)

HAC standard errors in parentheses
***p <00.1, **p < 0.05, *p < 0.1
Using country and time fixed effect.

$SquaredTEA = \beta_1 (TEA(-1))^2 + \beta_2 x_{it}^{'} + \sum_{j=1}^{N} \tau_j d_{ij} + \varepsilon_{it}(3)$

$GDP = \beta_1 (TEA(-1))^2 + \beta_2 (TEA)^2 + \beta_3 x_{it}^{'} + \sum_{j=1}^{N} \tau_j d_{ij} + \varepsilon_{it}(4)$

Table 13

	Equation (3)	Equation (4)
	Dependent variable: Squared Entrepreneurship (TEA)	Dependent variable: GDP growth per capita
$(TEA(-1))^2$	-0.049***	-0.000
	(0.005)	(0.002)

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$
Using country and time fixed effect.

Regression output

Table 14: Allowing for non-linear relationship and lagged effects

	(1)	(2)
Variables	GDP growth per capita	GDP growth per capita
TEA	0.101**	0.105*
	(0.001)	(0.002)
$(TEA)^2$	-0.011**	-0.001**
	(0.001)	(0.012)
TEA(-5)	0.211	0.306
	(0.001)	(0.009)
Inflation	-0.461***	-0.431***
	(0.099)	(0.105)
C	0.628**	0.582**
	(0.029)	(0.010)
Edu	0.378**	0.391**
	(0.004)	(0.005)
GDP(-5)	0.032**	0.019**
	(0.001)	(0.001)
Gexp	-0.042	-0.042
	(0.009)	(0.002)
Prights	0.300*	0.289
	(0.001)	(0.007)
Constant	1.509**	1.511**
	(0.082)	(0.093)
Observations	330	330
R-squared (within)	0.410	0.409

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$

Table 15: Exploring the effect on entrepreneur conditionally on institutional quality

	(1)	(2)
Variables	GDP growth per capita	GDP growth per capita
TEA	0.021*	0.112*
	(0.067)	(0.003)
TEA*Prights	0.039	0.141
	(0.037)	(0.091)
Inflation	-0.367***	-0.401***
	(0.045)	(0.078)
C	0.509**	0.521**
	(0.056)	(0.089)
Edu	0.700**	0.752**
	(0.082)	(0.087)
GDP(-5)	0.029***	0.019***
	(0.002)	(0.009)
Gexp	-0.038	-0.032
	(0.011)	(0.009)
Prights	0.299*	0.202
	(0.029)	(0.087)
Constant	1.414**	1.485**
	(0.033)	(0.093)
Observations	330	330
R-squared (within)	0.391	0.310

HAC standard errors in parentheses
***p <00.1, **$p < 0.05$, *$p < 0.1$