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# ENTREPRENEURSHIP AND ECONOMIC GROWTH: META-ANALYSIS

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## ABSTRACT

This paper provides an analytical review of empirical studies of the impact of entrepreneurship on economic growth. We try to analyze the variation of this impact across different countries, estimation methods, definitions and measures of entrepreneurship and economic growth. We find that entrepreneurship is a multidimensional concept measured by different ways in all studies selected such as; start ups, TEA, self employment, etc. We find that the high heterogeneity detected between the results of studies is due to the choice of measures of entrepreneurship on the one hand and to the type of country (developed or developing) on the other. Consequently, the type of the relationship between entrepreneurship and economic growth strongly depends on the choice of entrepreneurship measure and the type of country studied.

**KEYWORDS:** Entrepreneurship, Start Ups, Economic Growth, Innovation, Meta Analysis

**JEL:** L26, M13, O31, O47

## INTRODUCTION

In the two last decades, the concept of entrepreneurship has become an active field of research in different social science disciplines. Schumpeter (1912, 1988) has pointed to the importance of the entrepreneur for economic growth. In the field of new technology, entrepreneurial activities need a high level of knowledge on research and development (RD) and a high level of creativity in taking advantage of market niches.

The relationship between economic growth and entrepreneurship capital has been treated in many trends of economic literature. Faced with the ambiguity of the impact of entrepreneurship capital on economic growth, we suggest that researchers and economists should provide a rigorous synthesis of previous studies results. So we propose to apply the meta-analysis technique on studies that treat the relationship between entrepreneurship and economic growth. The meta analysis technique is introduced by GeneV. Glass in 1976, the main objective of this technique is to provide a review of literature based on statistical analysis. Eventually, meta- analysis is used for development and validation theories in the area of entrepreneurship. It's based on five important steps; definition of the scope of the study, the location and selection of studies, the creation of a meta analytical database, the meta analytical data analysis and finally the interpretation of results (Johnson and Eagly, 2000).

The objective of this current paper is to access the effect of entrepreneurship on economic growth across countries. We bring together 18 papers that treat this effect. Our objective is not to test hypothesis but to explore a field of research for congruence or heterogeneity of the results of studies reported in the literature that treat this relation.

This paper proceeds as follows; first, we bring to the fore the relationship between entrepreneurship and economic growth, second, we present the contribution of meta analysis to economic growth, third, we apply meta analysis technique and we explain the prominent steps and finally we present the results of meta analysis.

## ENTREPRENEURSHIP AND ECONOMIC GROWTH

According to Schumpeter (1911), "Entrepreneur is an innovator", he is considered the key factor of economic development. The "destruction process" of Schumpeter (1942) is based on innovation provided by entrepreneur who causes disturbances to economics systems.

This theory stipulates that an increase in the number of firms leads to a higher economic growth. Entrepreneurship concept is omitted from the majority of economic growth models.

Schumpeter theory and subsequent economic work, innovation is considered as a source of economic growth (Lichtenberg, 1993; Engelbrecht, 1997; Coe and Helpman, 1995). Davidsson (2003) has criticized the different recent perspectives of entrepreneurship and supported the view of kirzner (1973).

"Entrepreneurship consists of competitive behavior underlying the market process" (Kirzner, 19736, p 19).

Entrepreneurship manifests itself not only by the entry of new firms to the market but also by the entry of new imitative firms to new market. We can conclude that innovation is a form of entrepreneurship. The economic literature has suggested that entrepreneurship contributes to economic growth through introduction of innovation, increase of competitiveness and enhancement of the rivality (Wennekers and Thurik, 1999; Carree and Thurik, 2003).

Van Stel and al (2004, 2005) found that entrepreneurship activity rate affects positively the level of economic development. Acs and al (2004) found a positive relationship between entrepreneurship and economic performance.

Mrabet, Jebali and Ellouze (2013), have studied the case of 16 MENA countries and they found that entrepreneurship capital measured by startups is a major determinant explaining economic performance.

Balnchflower (2000) found a negative relationship between self employment and economic growth for a sample of 23 OECD countries. Banda- Salgado (2005) studied the case of 22 OECD countries and he found a negative correlation between self-employment and economic growth.

### Contribution of Meta-Analysis to Entrepreneurship

In the field of entrepreneurship, the meta-analysis is a technique that is widely used, because it takes into account all the results of the literature. This approach differs from the narrative approach. The narrative approach is limited to the treatment of information by authors (Tett, Jackson and Rothstin, 1991).

Meta-analysis is based on a multitude of studies, it requires judgments in the definition of the scope of the study and the coding of variables. It can provide the correction of errors in individual studies, estimate the correlation between variables of given population and allow an evaluation of the magnitude of relationship. Consequently, it provides more precise evaluation and often comparable to the validity of the concept and test the variation in the relationship between studies.

# ENTREPRENEURSHIP AND ECONOMIC GROWTH: META-ANALYSIS

## MÉTHODOLOGY

### Sample and Studies Selection

In order to construct our database, we have adopted some criteria; first, we selected all the work from 2000. Second, the subject of paper should be focused on the relationship between economic performance and entrepreneurship capital.

Third, we introduced only the studies which involve the necessary statistics for meta-analysis (pearson Correlation, T-statistic, R- Squared, …). Fourth, the full text of the study should be available. Fifth, the paper must be written in English. The respect for the criteria listed above requires the adoption of two approaches: first, research via internet reveals a relevant database; (a) Science direct, (b) SSRN, (c) Google Schoolar, (d) Proquest. Our research has been based on the following keywords: 'entrepreneurship Capital', 'growth', 'entrepreneurship capital and economic performance', 'impact of entrepreneurship on growth'.

Second, we have consulted the main journal of entrepreneurship, economics and management (Journal of Business Venturing, Small Business Economics, American Journal of Scientific Research, and Research Policy).

In addition, we looked up in the reference cited in the selected studies in order to find other additional studies.

According to the two approaches, we have noted 18 articles (published and unpublished) treating the impact of entrepreneurship capital on economic performance.

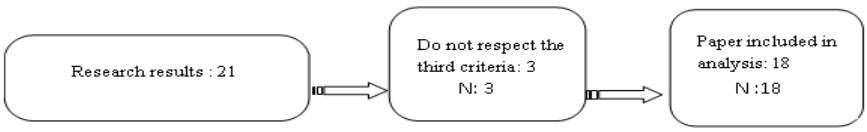


**Figure 1**

**Table 1: Primary Studies Included in Analysis**

| Author | Year | Journal/Review |
|---|---|---|
| Audretsch and Keilbach | - | Working paper |
| Audtretsch and keilbach | 2002 | Working Paper |
| Van Stel, Carree and Thurik | 2004 | Small Business Economics |
| Audretsch, Keilbach | 2004 | Working Paper |
| Wong, Ho and Autio | 2005 | Small Business Economics |
| Mueller | 2005 | Working Paper |
| Mueller | 2006 | Policy Research |
| Salgado- Banda | 2005 | Working Paper |
| Stam, Suddle, Hessels and Van Stel | 2007 | Working Paper |
| Verheul and Van Stel | 2007 | Working Paper |
| Primo, Scott Green | 2008 | Working Paper |
| Audretsch, Bönte and Keilbach | 2008 | Working Paper |
| Stam, Hartog, Van Stel and Thurik | 2009 | Working Paper |
| Stam and Van Stel | 2009 | Working Paper |
| Mojica, Gebremedhin and Schaeffer | 2009 | Working Paper |
| Musai, Gharshasbi Abhari | 2011 | American Journal of Scientific Research |
| Bosma | 2011 | Working Paper |
| Rozas, Gomez and Vieira | 2011 | Working Paper |

Many researchers have treated the relationship between entrepreneurship capital and economic growth in different countries of the world.

The majority has studied the case of countries participating in the Global Entrepreneurship Monitor (Stam. Suddle. Hassels and Van stel 2007, Hartog, van Stel and Thurik, 2009, Van Stel, Carree and Thurik, 2004, Wong, Ho and Autio, 2005; Stam, Hartog, Van Stel and Thurik, 2009; Stam and Van Stel, 2009; Verheul and Van, Stel, 2007).

Six studies have examined the case of Germany (Audtretsch, Bönte and keilbach, 2008 ; Autretsch and Keilbach, 2004; Audtretsch and Keilbach, 2002; Audtretsch and Keilbach; Mueller, 2005; Mueller, 2006).

While two studies for Spain and Portugal countries (Rozas, Gomez and Vieira, Maribel, Mojica. Grebremedhin, Schaeffer, 2009). One study for USA (Primo and Scott Green, 2008), a study for different countries (Musai, Ghashasbi and Abhari, 2011). One study for Europe (Bosma Niels, 2011) and a study for OECD countries (Salgado- Banda 2005).

The number of observation is between 22 and 850 with an average of 270.

**Studies Analysis**

For each selected study, we have presented the variables used and their measures. In the study of Stam, Suddle, Hassels and Van Stel (2007), the authors measured the economic growth by annual growth rate of GEM countries, explained by entrepreneurial variable. Entrepreneurship is measured by the prevalence of entrepreneurial activity, the percentage of adult population who creates a business or who are business owners (less than 42 months) in each country, as well as the lagged growth rate of GDP and the global competitiveness Index and Gross National Income per capita.

Bosma, Niels, 2011, has used the level of regional productivity as a measure of economic performance of European countries. While the explanatory variables used were; entrepreneurship measured by nascent entrepreneurs on the one hand and on the other by ‘entrepreneur High’ which represents people who have started their business and have expected to have 10 or more employees in the next five years. Invention is measured by the number of patents.

Audretsch, David B. Bönte, Werner and Keilbach (2008) measured economic performance by two indicators: labor productivity and capital productivity. They employed as explanatory variables entrepreneurship measured by three indicators; entrepreneurship capital represented by the number of start-ups created, the entrepreneur ‘High Tech’ represents start- ups activities in high tech industries with Research and Development intensity above 2.5. The ICT represents the innovation activities in the ICT industries whose products are related to information technology.

They also noted the important role of innovation in stimulation of economic growth by introducing the technical knowledge and innovation.

In their studies, Audretsch, David and Keilbach (2002,2004) used the gross domestic product as indicator of economic growth in 2004. In 2002, as well, they used the ‘gross value added’ and ‘labor productivity’ of the region. The independent variables used were the same, ie, the traditional production factors, entrepreneurship represented by the ‘entrepreneurship Capital’, entrepreneur ‘High Tech’, ‘ICT’and the regional intensity level in research and development.

In the study of David M. Primo and William Scott Green 2008, economic performance is measured using two indicators; the first one is economic growth which refers to the variation percentage in real per capita income from

one year to another, the second is the unemployment represented by the percentage of the active population currently unemployed. They supposed that entrepreneurship measured both by the self employment level and by the proxy of innovator entrepreneur 'venture capital', is a major determinant of economic performance. They also used as control variables; gross national income per capita and GDP growth rate of previous year.

Referring to the study of Van Stel. Carree Martin and Thurik Roy, 2004, economic growth measured in terms of growth rate of GDP was regressed by 'Total Early stage entrepreneurial activity', by the global competitiveness index and by the lagged economic growth.

Wong Poh Kam. Ho Yuen Ping and Autio Erkko, 2005, in their study, used as a dependent variable 'economic growth', explained by the 'Total Early stage entrepreneurial activity', growth rate of capital per worker and ratio of patents and GDP for 37 GEM countries.

Mueller Pamella in his study of 2005- 2006 measured respectively economic growth by regional GDP per capita and economic performance by the value added of all industries. The independent variables used in both studies are the same; physical capital, labor, regional research and development intensity level, while entrepreneurship was measured by the creation of new enterprises (start- ups).

In the study of Stam Erik, Hartog Chantal, Van Stel André and Thurik Roy, 2009, the dependent variable is measured by annual growth rate of real GDP, while the independent variables used are: the total Early Stage of Entrepreneurial Activity, ambitious entrepreneurs who expect to employ at least five employees in five years, high growth rate companies, global competitiveness index and lagged growth value.

Stam Erik, van Stel André et Thurik 2009 treated the relationship between entrepreneurship and economic performance using as a dependent variable average of annual growth rate. Independent variables such as entrepreneurshp in rich countries, in transition and poor countries, Global competitiveness index, gross national income per capita and lagged economic growth.

Likewise, Verheul Ingrid and Van Stel André, 2007 explained economic growth by the same variables used by Stam et Van Stel, unless they used the total of early stage entrepreneurial activity as a proxy of entrepreneurship.

Salgado hector (2005), used two proxies to measure entrepreneurship. The first one is self- employment and the second is technical knowledge. Thus economic performance was measured by real GDP growth rate.

While Rozas Emilia, Gomez and Vieira (2011) estimated this relationship using some independent variables such as entrepreneurship capital measured by the number of enterprises created in each region relative to the total of enterprises created for nine years. Physical capital, labor and innovation.

Maysam Musai, Gashabi Fakhr and Abhari (2011), considered that GDP of each country is an indicator of economic growth. They proposed as explanatory variables an index for entrepreneurship and innovation, physical capital and labor.

Finally, Mojica Mariebel, Gebremedhin and Schaeffer (2009) measured economic growth by three indicators; population growth, employment and national income per capita, while entrepreneurship capital is measured by the number of new businesses and the number of nonfarm owners.

**Coding of Studies**

In order to analyze the relationship between entrepreneurship and economic performance, empirical literature has used many variables, entrepreneurship, innovation, physical capital, labor, etc.

In this paper, we coded each study by these variables; entrepreneurship capital, entrepreneur 'high tech', entrepreneur 'low tech', 'ICT', 'TEA', 'other entrepreneurship measures' and country.

## RESULTS AND DISCUSSIONS

The discussion of results obtained by meta- analysis begins with the calculation of the effect size, the search of existence or non- existence of the heterogeneity of the effect size and its causes. To do this, we will use comprehensive meta-analysis (CMA) version 2.

**Effect Size Calculation**

The calculation of effect size is a key step in the meta-analysis. This measure is used to estimate the importance of the relationship between two variables. The effect size is the degree of presence of a phenomenon in a population Cohen (1977).

There are different measures such as: measures based on the difference between means and measures based on correlation.

To determine the scope of the relationship between economic performance and entrepreneurship capital, we chose the measure of correlation.

According to the selected studies, we give off the T-statistic of each relationship, and we use Lipsey and Wilson (2001) formulation to convert it into 'r' correlation.

$$ES_r = \frac{t}{\sqrt{t2+df}}$$

The effect size based on correlation is taken as the value of the correlation itself based on Fisher's variance- stabilizing transformation.

$$ES_z = \frac{1}{2}\left[In\,\frac{1+r}{1-r}\right]$$

**Choice of Effect Model**

The calculation of summary effect is based on two models: fixed effect model and random effect model. The major difference between these two models is related to the distribution of the effect size from which the studies were selected. In the fixed effect, the studies share the same effect size and the summary effect is the estimation of this common effect. But, in the random effect model, the effect size varies across studies and the summary effect is the estimation of the mean of effect size distribution.

We try to check the presence or absence of heterogeneity between effect sizes and evaluate its amount.

**Evaluation of Heterogeneity among Effect Size**

Evaluation of heterogeneity between effect sizes aims to examine the null hypothesis that all studies are

evaluating the same effect. Various methods of evaluation heterogeneity were developed; the Forest Plot, the Galbraith plot, the l'Abbé Plot, the Cochran- Q test and the I squared test. The Cochran's test is a classical test which computed as follow;

$$Q= \sum_{i=1}^{k} w_i (r_i)^2 - \frac{\left(\sum_{i=1}^{k} w_i r_i\right)^2}{\sum_{i=1}^{k} w_i}$$

If the number of studies introduced in the meta- analysis is reduced, Gavaghan and al (2000) reported that Cochran's Q statistic has a low power as a test of heterogeneity, while Higgins and al (2003) argue that the Cochran's test has a much power as a test of heterogeneity if the number of included studies is important.

The Q test allows to identify the presence or absence of heterogeneity. However, taking into account the weaknesses of the test, Higgins and Thompson(2002) proposed the I Squared Index to quantify the amount of heterogeneity in meta analysis.

$$\mathbf{I^2 = \left[\frac{Q-df}{Q}\right] * 100\%, I^2 \in [0\%, 100\%]}$$

Q is the statistical heterogeneity

Df is the degree of freedom

Higgins and al (2003) have proposed a classification of $I^2$ values

**Table 2: Interpretations of the Values of I-Squared**

| $I^2$ Values | Interpretations |
|---|---|
| [0%, 25%] | There is heterogeneity |
| [25%, 50%] | There is a low heterogeneity |
| [50%, 75%] | There is a moderate heterogeneity |
| [75%, 100%] | There is a high heterogeneity |

In order to treat the relationship between entrepreneurship capital and economic performance, we used the Q and $I^2$ test.

**Table 3: Heterogeneity Evaluation**

| Variables | Q Statistic | Df(Q) | P-Value | $I^2$ |
|---|---|---|---|---|
| Entrepreneurship Capital | 13003,291 | 66 | 0.000 | 99.492 |
| innovation | 11040,510 | 66 | 0,000 | 99,402 |
| Physical Capital | 10690,824 | 66 | 0,000 | 99,383 |
| Labor | 688,363 | 66 | 0.000 | 90,412 |

According to table 3, the Q- Statistic is between 688, 363 and 13003,291 for each relationship. Moreover, the Q statistic is highly significant (p- value= 0.000) for all variables which proves the existence of a problem of heterogeneity. By examining the I squared index, we found that it confirms our result and it exists a considerable heterogeneity among variables introduced in Meta analysis. The I squared is from 90.412 (labor) to 99.492 (entrepreneurship capital). This means that 99.492% of variability between effect sizes is not caused by sampling error but due to heterogeneity between studies that treats the relationship between entrepreneurship capital and economic performance.

Based on 67 studies of the relationship between entrepreneurship and economic performance, we found a problem of heterogeneity, we adopt in this case the random effect models.

**Table 4: Random Effect Model**

| Confidence Interval | | | | | |
|---|---|---|---|---|---|
| **Variables** | **Effect Size** | **Lower Limit** | **Upper Limit** | **Z-Value** | **P-Value** |
| Entrepreneurship Capital | 0,565 | 0,399 | 0,695 | 5,756 | 0,000 |
| innovation | 0,242 | 0,046 | 0,420 | 2,405 | 0,016 |
| Physical Capital | 0,336 | 0,151 | 0,499 | 3,467 | 0,001 |
| Labor | 0,117 | 0,064 | 0,169 | 4,345 | 0,000 |

Cohen (1977, 1988) established a classification of effect sizes; if (ES<0.20), the effect size is small, medium if (ES= 0.50) and higher if (ES>0.80). Table 4 shows that all effect size estimates of selected variables are small and medium (between 0.10 and 0.56). Concerning the statistical significance, we noted that the variable innovation is significant at 5%, while all other variables are significant at 1%. The effect size of entrepreneurship capital is 0.565 with a confidence interval of 95% from 0.339 to 0.695. The p- value of the overall effect size is significant at 1%. We can conclude that there is a positive and significant relationship between entrepreneurship capital, physical capital, innovation, labor and economic performance in the selected studies.

Indeed, this relationship is based on a set of published and unpublished studies. According to Rosenthal et Rosnow (1991), it is necessary to verify the presence or absence of the publication bias, also called « File Drawer effect », it is manifested when the share of studies with positive and significant results selected for publication are above studies with negative results.

**Verifying the Publication Bias**

All synthesis approaches, narrative literature, systematic literature and Meta analysis suffer from publication bias. Dickersin (2005) demonstrated that studies which has a significant results are more susceptible to find their place in the published literature that studies with non significant results. There are many methods to estimate publication bias such as; Funnel Plot, Classic Fail- safe N, Orwin Fail- safe, Egger's regression and Fill and Trim method. The Funnel plot method is composed of abscissa axis (X) for effect size and an ordered axis (Y) for sample size and variance. But the use of the standard deviation on the ordered axis allows to identify asymmetry because it allows to disperse the points on the bottom of the scale whereas there are studies that have small sample sizes. In this study, we developed four Funnel Plots shown below:

In each figure, the standard deviations are placed on the Y-axis and are represented in terms of their effect size, while in X-axis, the circles denote individual studies. The pyramid represents 95% of confidence interval.

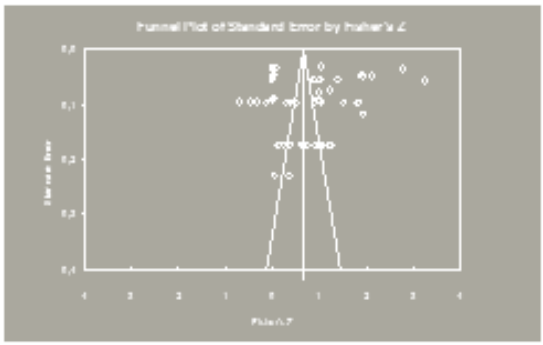

**Figure 2: Funnel Plot of the Relationship between Entrepreneurship Capital and Economic Growth**

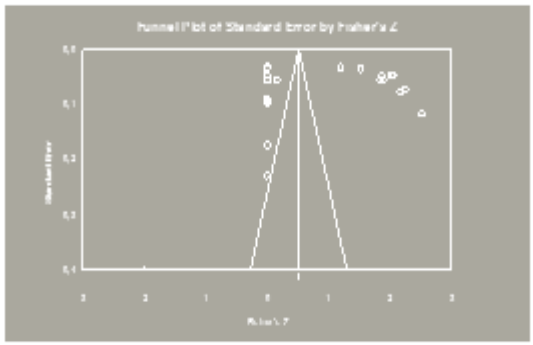

**Figure 3: Funnel Plot of the Relationship between Physical Capital and Economic Growth**

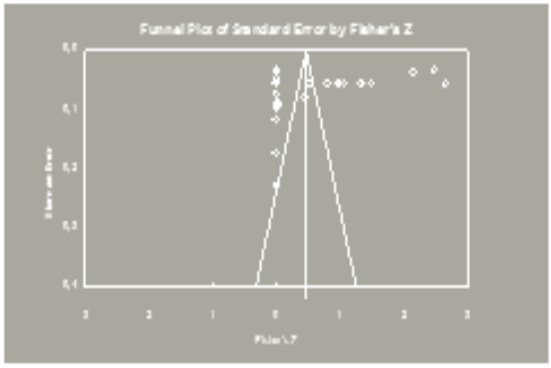

**Figure 4: Funnel Plot of the Relationship between Innovation and Economic Growth**

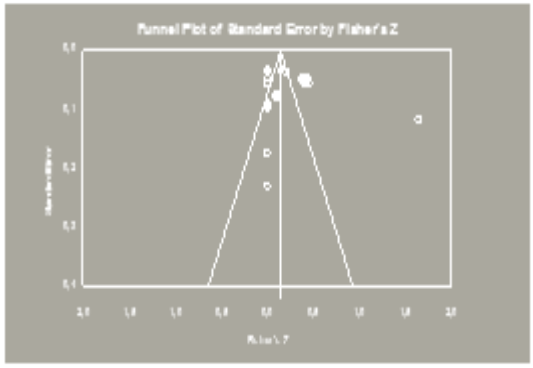

**Figure 5: Funnel Plot of the Relationship between Labor and Economic Growth**

This is a graphical method for detecting publication bias, according to the four Funnel Plot, we can see that it exists symmetry in the first and fourth figure, so there is no bias, while, we can see an asymmetry in the two other figures. In this case, there is a publication bias.

**Table 5: Egger's Regression Test**

| Variables | Constant | T | P-Value | df | Publication Bias |
|---|---|---|---|---|---|
| Entrepreneurship Capital | -0.078 | 0.02 | 0.49 | 65 | no |
| Innovation | -6.148 | 1.84 | 0.03 | 65 | yes |
| Physical Capital | -3.44 | 1.03 | 0.10 | 65s | yes |
| Labor | -0.66 | 0.77 | 0.2 | 65 | no |

Egger's regression results confirm the results of Funnel Plots that it exists a Bias publication in the relation between economic performance, innovation and physical capital.

**Meta- Regression Analysis**

In this paper, the meta-analysis results identified a significant heterogeneity between results of primary studies. The purpose of this subsection is to explore the causes of this heterogeneity. Every study is represented by a circle that represents the real coordinates, the effect sizes is observed by entrepreneurship capital, entrepreneur 'High Tech', entrepreneur 'Low Tech', ICT, TEA, other entrepreneurial measures and country variable. The size of the circle is proportional to the weight of each study analyzed based on the total variance. The analysis is based on the random effects model.

According to meta-analysis results, we can conclude that empirical studies which measured entrepreneurship through entrepreneurship capital, entrepreneur 'High Tech', entrepreneur ICT have identified a positive relationship between entrepreneurship and economic growth and a negative relationship when entrepreneurship was measured through entrepreneur 'Low Tech', other entrepreneurship measures and TEA. (See APPENDIX)

From the results of Meta analysis, we can conclude that the sign of the relationship between entrepreneurship and economic growth depends necessarily on measures choice of entrepreneurship variable and considered country (developed and developing countries).

## CONCLUSIONS

In this paper, we provide a rigorous overview of previous studies that link entrepreneurship to economic growth. For this reason, we have applied the Meta analysis technique. Our purpose is to synthesize the results of previous studies dealing with this relationship and to evaluate the effect of moderating variables such as the country studied. This analysis is based on 18 articles and the effect size is measured by the correlation coefficient. From the Q statistic test and the I squared index, we have found the existence of a significant heterogeneity between effect sizes estimations. So we have adopted the random effect model.

We have introduced all published and unpublished studies in our study and we tried to explain the heterogeneity between effect size estimations. We found that there is no unanimous measure of entrepreneurship capital, according to the results of meta- regression analysis, the choice of the measure of entrepreneurship capital can influence the sign of the relationship between economic growth and entrepreneurship. The sign of the relationship between each of these variables with economic growth; entrepreneurship capital, High Tech entrepreneur, ICT, countries (developed and developing) is positive and negative with these variables; TEA, Low tech entrepreneur and other measures of entrepreneurship. Therefore the impact of entrepreneurship capital on economic growth remains a matter of debatable research.

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## APPENDICES

**Table 6: Used Variables and Their Measures**

| Variables | Measures |
|---|---|
| • **Study of Erik Stam. Kashifa Suddle. S Jolanda A Hassels. André Van Stel 2007** | |
| **Dependant Variable** | |
| Economic growth | Economic growth measured in terms of annual growth rate |
| **Independant Variables** | |

**Table 6: Contd.,**

| | |
|---|---|
| TEA (Total early stage entrepreneurial activity) | Mesuread by TEA (medium and high rate) ; the proportion of the adult population which created a new business or are a business owners(less than 42 months ) |
| GCI | Global Competitiveness Index, Taken from Word Competitiveness report 2001- 2002. |
| GNIC | Gross National Income per Capita |
| Lagged GDP Growth | |
| • **Study of Niels Bosma 2011** | |
| **Dependante Variable** | |
| Economic Performance | Measured by regional productivity |
| **Independant Variable** | |
| Entrepreneurship | The nascent entrepreneurs or existing business owners for 42 months maximum. |
| High Entrepreneurship | People who started their business and expect to have 10 or more employees in the next five years |
| Invention | Measured by the number of patents |
| • **Study of David B. Audretsch a. Werner Bönte b. Max Keilbach 2008** | |
| **Dependant Variable** | |
| Economic performance | Measured by :<br>• Labor productivity<br>• Capital productivity |
| **Independant Variable** | |
| Entrepreneurship Capital | Start- ups numbers |
| High Tech entrepreneurship | start ups activity in High Tech industries (RD intensity is above 2.5) |
| ICT | Innovation Activities in TIC industries, which products linked to information technology. |
| Technical knowledge | Regional patents intensity |
| Innovation | Regional Research and Development intensity |
| • **Study of David B. Audretsch. Max Keilbach 2004** | |
| **Dependant Variable** | |
| Economic Performance | GDP |
| **Independant Variables** | |
| Entrepreneurship Capital | Start- ups numbers |
| High Tech Entrepreneurship | start ups activity in High Tech industries (RD intensity is above 2.5) |
| ICT | Innovation Activities in TIC industries, which products linked to information technology. |
| Physical Capital | The weighted sum of previous investment |
| Labor Force | Employees number |
| • **Study of David M. Primo. William Scott Green 2008** | |
| **Dependent Variable** | |
| Economic Performance | Measured by two variables:<br>• **Economic Growth:** The percentage evolution of real per capita income from one year to another.<br>• **Unemployment:** proportion of active population without job. |
| **Independent Variables** | |
| Entrepreneurhip | Measured by:<br>• **Self Employment:** total of owners employment divided by the total of employees number.<br>• Venture Capital, proxy of innovator entrepreneurship |
| GNIC Gross National Income per Capita | Gross national income per capita |
| Population growth | Taking from demographic data. |

**Table 6: Contd.,**

| | |
|---|---|
| • **Study of David B. Audretsch. Max Keilbach (2002)** | |
| **Dependant Variable** | |
| Economic growth | Measured by two ways :<br>• **Production:** Gross value added of the region<br>• Labor productivity |
| **Independant Variables** | |
| Entrepreneurship Capital | Measured by new start ups rate |
| Labor force | Number of workers in the region |
| Physical capital | Calculated on terms of the weighted sum of past investment |
| Knowledge Capital | Number of employees engaged in research activity and development in the public and private sector |
| Entrepreneur High Tech | Start ups activities in high-tech industries (R & D intensity is above 2.5) |
| ICT | Innovation activity in the ICT industries (technologies of information and communication) |
| • **Study of André Van Stel. Martin Carree. Roy Thurik 2004** | |
| **Dependant Variable** | |
| Economic growth | Measured by GDP growth rate |
| **Independant Variable** | |
| TEA (total early stage entrepreneurial activity) | The proportion of the adult population which created a new business or are a business owners(less than 42 months ) |
| GCI (Global Competitiveness Index) | Analysis of the degree that the economies have the structures, institutions and policies for economic growth in the medium term |
| Lagged GDP Growth | |
| • **Study of David B. Audretsch Max Keilbach** | |
| **Dependant Variable** | |
| Economic performance | Measured by GDP growth |
| **Indépendant Variables** | |
| Entrepreneurship Capital | New business rate created start up |
| High Tech Entrepreneur | start ups activity in High Tech industries (RD intensity is above 2.5) |
| ICT Entrepreneur | Innovation activity in the ICT industries (technologies of information and communication) |
| low Tech Entrepreneur | Intensity of research and development in industry is below 2.5 |
| Physical capital | Calculated on terms the weighted sum of past investments |
| Labor force | Number of workers in the region |
| RD intensity | The level of creation new knowledge in the region |
| • **Study of Poh Kam Wong. Yuen Ping Ho. Erkko Autio 2005** | |
| **Dependant Variable** | |
| Economic growth | Measured by GDP growth rate |
| **Indépendant Variables** | |
| TEA (total early stage entrepreneurial activity) | the proportion of the adult population which created a new business or are a business owners(less than 42 months ) |
| Capital | Measured by the growth rate of capital per worker |
| Innovation | Measured by the ratio of patents and GDP |
| • **Study of Pamela Mueller 2005** | |
| **Dependant Variable** | |
| Economic growth | Measured in terms of GDP per capita in the region |
| **Indépendant Variables** | |
| Labor | Number of workers without taking into account workers in research and development |
| Physical capital | Gross fixed capital formation |
| knowledge | Intensity of research and developement in region |

**Table 6: Contd.,**

| | |
|---|---|
| Entrepreneurship | Entrepreneurial activities are measured by the number of businesses created in the region |
| • **Study of Erik Stam. Chantal Hartog. André Van Stel. Roy Thurik 2009** | |
| **Dependant Variable** | |
| Economic Growth | Measured by the annual growth rate of real GDP. |
| **Indépendant Variables** | |
| TEA | The proportion of the adult population which created a new business or are a business owners(less than 42 months ) |
| Share of ambitious entrepreneurs | Entrepreneurs are expecting to employ at least 6 employees within 5 years |
| GCI | Analysis of the degree that economies have structures, institutions and policies established for economic growth |
| High Growth firm rate | The companies that make 60% growth in 3 years:<br>• Growth in terms of turnover<br>• Growth in terms of jobs |
| Lagged GDP Growth | |
| • **Study of Erik Stam and André Van Stel 2009** | |
| **Dependant Variable** | |
| Economic Growth | Average annual growth rate of GDP |
| **Independant Variables** | |
| Entrepreneurship | Measured by the index of smaller companies in rich, in transition and poor countries. This is the rate of the adult population who are business, not exceeding 42 months owner. |
| GCI | Analysis of the degree that the economies have the structures, institutions and policies for economic growth in the medium term |
| GNIC | Gross national income per capita |
| Lagged GDP growth | |
| • **Study of Ingrid Verheul. André Van Stel 2007** | |
| **Dependant Variable** | |
| Economic Growth | National economic growth in terms of growth rate of real GDP |
| **Independant Variables** | |
| TEA | the proportion of the adult population which created a new business or are a business owners(less than 42 months ) |
| GCI | Analysis of the degree that the economies have the structures, institutions and policies for economic growth in the medium term |
| GNIC | Gross national income per capita |
| • **Study of Pamela Mueller 2006** | |
| **Dependant Variable** | |
| Economic performance | Measured by the value added of all industries. |
| **Independant Variables** | |
| Physical Capital | Gross fixed capital formation |
| Labor Force | Number of workers |
| Research and Development | The proportion of employees engaged in research and development |
| Regional entrepreneurial activity | The rate of new business start ups created |
| • **Study of Héctor Salgado-Banda 2005** | |
| **Dependant Variable** | |
| Economic Growth | Growth rate of real GDP per capita |
| **Independant Variables** | |

**Table 6: Contd.,**

| | |
|---|---|
| Entrepreneurship | • **Self Employment:** The relationship between self-employed and the number of workers.<br>• **Technical Knowledge:** The ratio between the number of patents and the number of employees |
| Lagged GDP growth | |
| • **Study of Emilia Vázquez-Rozas. E. Sofía Gómes. Elvira Vieira** | |
| **Dependant Variable** | |
| Regional economic growth | GDP growth per capita |
| **Independant Variables** | |
| Entrepreneurship Capital | The ratio of companies created in each region relative to the total number of enterprises created in nine years. |
| Labor Force | Total workers |
| Physical Capital | Stock of physical capital, the weighted sum of past investments |
| Innovation | Regional investment in research and development |
| • **Study of Maysam Musai. Saeid Garshasbi Fakhr. Marzieh Fatemi Abhari 2011** | |
| **Dependant Variable** | |
| Economic growth | Measured by gross domestic product |
| **Independant Variables** | |
| Entrepreneur and innovation | Index of entrepreneurship and innovation in each country calculated based on 10 variables; number of personal computers, internet security, spending on research and development, communication capacity via the Internet between countries, received royalties, value added in the industrial sector, information technologies and communication, registration of new companies and start-ups costs |
| Capital | Gross fixed capital formation |
| Labor Force | Number of workers |
| **Study of Maribel N. Mojica, Tesfa G. Gebremedhin, Peter V. Schaeffer 2009** | |
| **Dependant Variable** | |
| Economic growth | Three measures :<br>Population growth, Employment and national income per capita |
| **Independant Variables** | |
| Entrepreneurship | Number of new businesses and the number of non-farm owners. |