

# Entrepreneurial Activities, Innovation and Economic Growth: The Role of Cyclical Factors

## *Evidence from OECD Countries for the Period 2001-2009*

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### Abstract

This article examines the relationship between entrepreneurship and economic growth for 19 OECD countries from 2001 to 2009. We used two measures for entrepreneurship: the level of entrepreneurial activities and potential innovation. We estimated a growth function using techniques of panel data. The results show a significant and positive impact of the variables used to measure entrepreneurship on economic growth. The results also show that the impact of innovation becomes more potential significant and higher in the presence of a favorable institutional framework. These results have strong implications for economic policy. The government will further promote entrepreneurial activities, especially which generate innovation, by providing a favorable institutional framework.

**Keywords:** entrepreneurship, innovation, economic growth, panel data, OECD

### 1. Introduction

Entrepreneurship studies are conducted in several fields of research. Economic growth is one of the disciplines dealing with entrepreneurship. Already Cipolla (1981) argues that the economy before the 20th century provided the first signs that entrepreneurship is an engine of economic growth in the long run. However, early empirical studies on growth related to other variables rather than entrepreneurship. For example, Barro (1991), Barro and Lee (1993), Mankiw et al. (1992) examine the human capital. Edwards (1998) and Harrison (1996) concerned with the economic opening, King and Levine (1993) and Levine et al. (2000) on financial development and Sarel (1996) on inflation. Therefore, entrepreneurship cannot be a determinant of growth (Autio et al., 2005). However, in recent years, empirical studies testing the relationship between entrepreneurship and economic growth have increased (Carree & Thurik, 1998; Carree et al., 2002, 2004; Reiss & Weinert, 2002; Salgado-Banda, 2004; Audretsch, 2003, 2007). They face the problem of measuring entrepreneurship and the availability of data (Salgado-Banda, 2004). This work differs from the work identified in the literature in the sense that it tries to show that the impact of entrepreneurial activities on growth is amplified in the presence of a favorable institutional framework.

This study uses the latest data from GEM (Global Entrepreneurship Monitor) for estimating the impact of entrepreneurship on economic growth for 19 OECD (Organization for Economic Co-operation and Development) countries from 2001 to 2009 (the choice of these countries is essentially dictated by the availability of data over several years).

The second section presents a literature review of the relationship between entrepreneurship and economic growth. The methodology is explained in section three. The fourth section analyzes the results. The fifth concludes.

### 2. Entrepreneurship and Economic Growth: A Review of Theoretical and Empirical Literature

The theoretical literature on the relationship between entrepreneurship and economic growth requires that the channels through which the entrepreneurship may affect economic growth are different: the creation of employment (Salgado-Banda, 2004; Acs et al., 2005), the increasing of competitiveness (Eliasson, 1996; Kirzner, 1973), innovation and technological progress (Schumpeter, 1934; Mairesse & Mohnen, 2001) and

improved productivity (Aghion & Howitt, 1998; Lever & Nieuwenhuijsen, 1999). The transmission channels revealed in the literature are presented in Figure 1.

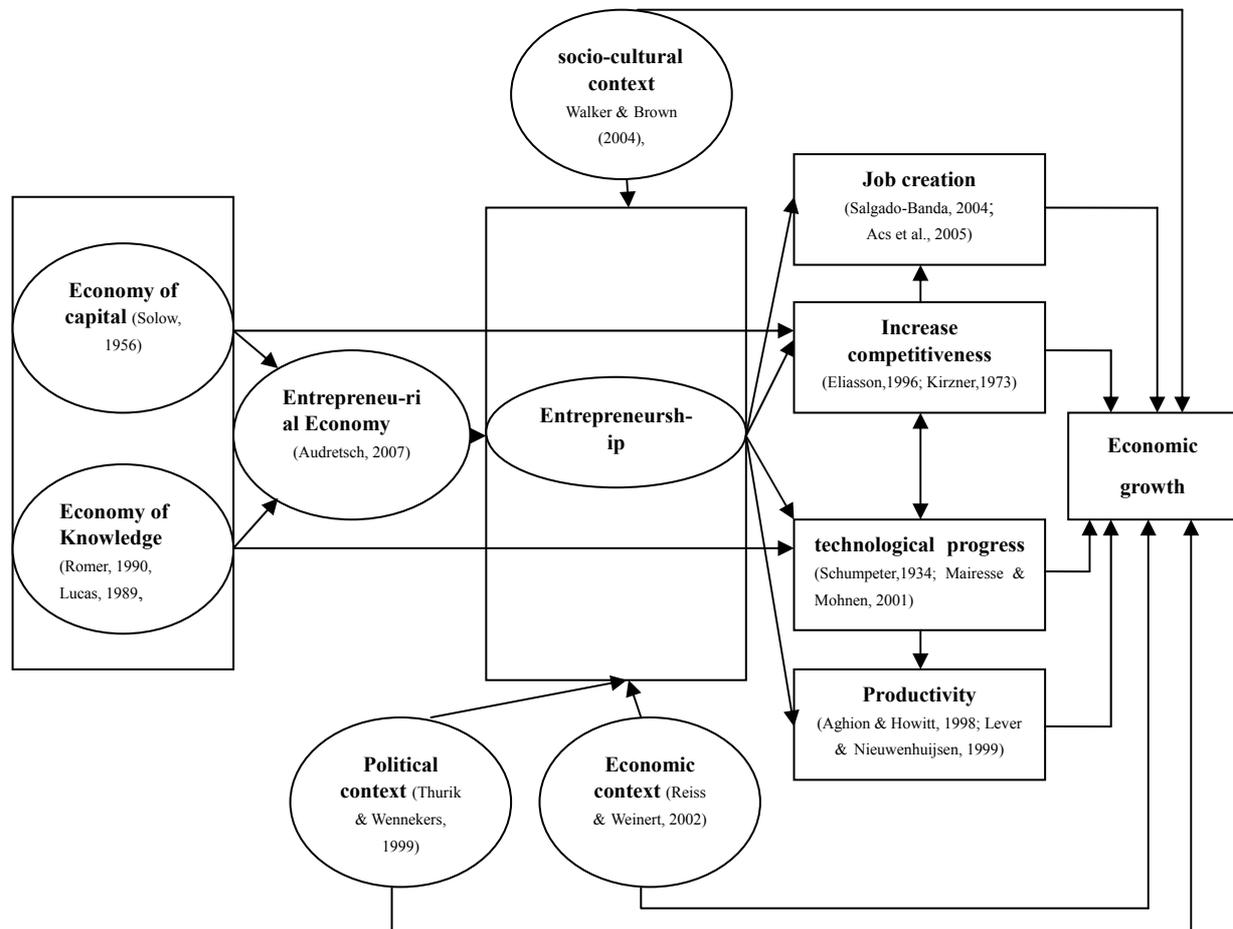


Figure 1. Entrepreneurship and Economic Growth: the transmission channels

Source: author's realization, 2012.

The works of Audretsch (1995), Klepper (1996) and Jovanovic (2001) provide the first ingredients of the emergence of new theories of evolution of the industrial economy. According to these new theories, entrepreneurship stimulates and generates economic growth (Audretsch, 2003).

Bewley (1989) studies the role of aversion to uncertainty in the identification of entrepreneurship. King & Levine (1993) analyze the implications of financial systems in a Schumpeterian perspective.

Schmitz (1989) develops a theoretical model of endogenous growth. It uses the proportion of entrepreneurs in the workforce as a production factor separately. In this model, the creation of new businesses is considered as an endogenous factor to growth. This theoretical model concludes that increasing the proportion of entrepreneurs generates additional production and increases economic growth.

Holmes & Schmitz (1990) develop a model of entrepreneurship based on the work of Schultz (1961). The model shows that entrepreneurship can have a positive impact on economic development. Holtz-Eakin and Schwartz (1995), and Quadri (2000) discuss the impact of financial constraints on entrepreneurship. Eliasson (1995) shows, by studying the dynamic evolution of Swedish industry, that competition affect economic progress not only in the short term but also in long term.

Thurik (1996) shows that the excessive growth of small business has a positive impact on the change of GDP for a sample of 16 European countries. Nickell (1996) and Lever & Nieuwenhuijsen (1999) show that competitiveness has a positive impact on the growth of total factor productivity.

Carree and Thurik (1998) stress that the share of small businesses in the European industrial sector has a positive impact on the growth of industrial production.

Thurik and Wennekers (1999) have established a relationship between changes in entrepreneurship and the disappearance / appearance of certain political regimes. The collapse of centrally planned economies can be explained by the share of very significant public employment in total employment plus the dominance of monopolistic structures. The transition process in countries of Eastern Europe has been accompanied by a high rate of self-employment, a large-scale privatization and a multiplication of small business.

Reiss and Weinert (2002) analyze the role of redistribution policies in promoting entrepreneurship and economic growth.

Audretsch (2003, 2007) shows that the passage of the knowledge economy to the innovation economy is realized through the promotion of entrepreneurial activities. Indeed, a rational economic agent has an interest in leaving a company already in place to start another in order to recoup the value of his knowledge. In this sense, entrepreneurship is the mechanism by which ideas are implemented.

Salgado-Banda (2004) proposes a new variable to measure entrepreneurship. The paper studies the impact of self-employment on economic growth. The study considers 22 OECD countries and finds that self-employment appears to be negatively correlated with economic growth. The findings are backed by a battery of econometric specifications and techniques.

Autio et al. (2005) use an augmented Cobb–Douglas production to explore firm formation and technological innovation as separate determinants of growth. They use cross-sectional data on 37 countries. The results suggest that only high growth potential entrepreneurship is found to have a significant impact on economic growth.

Stam and van Stel (2009) use two measures of entrepreneurship: the rate of entrepreneurship based on the “necessity” and the rate based on the “opportunity”. The results show that the impact of these measures depends on the level of the development of countries.

### 3. Methodology

In this section we try to check the empirical relationship between the entrepreneurship and economic growth using panel data techniques of 19 OECD countries during the period 2001-2009. So we differ from most other studies that rely on cross-sectional data.

#### 3.1 Econometric Model

We use a linear Cobb–Douglas production function where entrepreneurship is taken as a separate factor of production. The general form of the model is given as follows:

$$Y_{it} = \alpha X_{it} + \beta Z_{it} + \gamma Ent_{it} + v_{it} \quad (1)$$

$$v_{it} = u_{it} + v_t + \varepsilon_{it} \quad (2)$$

With  $Y_{it}$  logarithm of real GDP per capita for country  $i$  at time  $t$ ,  $X_{it}$  vectors of variables in the base model (economic context),  $Z_{it}$  vector of control variables (institutional context),  $Ent_{it}$  set of indicators that measure the entrepreneurship and  $v_{it}$  general error term including individual-specific unobservable effects  $u_{it}$  (social, cultural and political context), a specific time factor  $v_t$  and the error term  $\varepsilon_{it}$  how is independent and identically distributed.

#### 3.2 Data

##### 3.2.1 Variables for Entrepreneurship

The concept of entrepreneurship is multidimensional. The difficulty of measuring entrepreneurship complicates the measurement of its impact on economic performance (Carree et al., 2002). In this study, we will test two separate measures for entrepreneurship:

1) A measure of the degree of entrepreneurial activity itself represented by three variables:

a) Rate of nascent entrepreneurship (log (sub)): Percentage of 18-64 population who are currently a nascent entrepreneur, i.e., actively involved in setting up a business they will own or co-own; this business has not paid salaries, wages, or any other payments to the owners for more than three months.

b) Percentage of ownership of a new enterprise log (bab): Percentage of 18-64 population who are currently a owner-manager of a new business, i.e., owning and managing a running business that has paid salaries, wages, or any other payments to the owners for more than three months, but not more than 42 months.

c) Total Entrepreneurial Activity at an early stage (log (tea): Percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business (as defined above)

2) An alternative measure that takes into consideration the degree of innovation itself approximated by the number of patent applications filed by residents.

Data on variables measuring entrepreneurs activities are from GEM (2001-2009) those relating to the potential of innovation come from WDI (World Development Indicators, 2010). All data are transformed into natural logarithm.

### 3.2.2 Control Variables

In addition to the basic model variables (the rate of investment in physical capital,  $kit$ ), other variables can influence economic growth. In this paper, we use the logarithm of the share of government consumption in real GDP per capita ( $\log(kg)$ ), the logarithm of the population ( $\log(pop)$ ), logarithm of the level of consumer prices ( $\log(pc)$ ), logarithm of economic openness measured by the rate of exports plus imports to GDP ( $\log(openk)$ ). All data are from PWT (Penn World Table) 7.0. The following table presents descriptive statistics for all variables for 19 OECD countries observed over the period 2001-2009.

Table 1. Descriptive statistics of variables in the model

Variables	Number of observations	Mean	Standard deviation	Min	Max
y	171	31298.11	8374.746	9693.448	51102.36
ki	171	23.23418	4.452244	14.40346	42.33028
sub	158	3.777215	1.993202	.4	10.9
bab	158	2.755063	1.368599	.1	7.1
tea	158	6.306329	2.977617	1.5	16.9
pat	162	36516.55	90190.4	45	382815
kg	171	9.467868	2.472247	4.472553	18.28216
pop	171	43476.29	68553.32	284.812	307007
pc	171	103.256	24.96005	39.57963	161.8248
openk	171	83.16228	39.53035	22.16101	177.9315

Source: author's realization, 2012.

### 3.3 Method of Estimation

The equation (1) above can have different specifications depending on the assumptions made on the constant and the error term. In this context, several factors are able to impact the dependent variable and yet few of them are not considered in the regressions. They are taken into account during the analysis of residues. In the analysis of panel data, three factors are taken into account in the analysis of residues: factors affecting the dependent variable in a different way depending on the date and / or country, those having the same influence on all countries but the impact depends on the date (time effect) and those that reflect structural differences between countries (individual effect). Individual effects are either fixed or random.

The first tests to be performed thus concerns the control of the existence of specific individual effects. After checking for the existence of individual effect we have to choose between a fixed effects model and a random effects model. The Hausman test (1978) is performed to choose the appropriate specification.

## 4. Empirical Results

The following tables give the results of estimating the Cobb-Douglas function obtained using different specifications: fixed effects (FE) and random effects (RE). Bottom of each table shows the R-sq. The Hausman test allows us to choose between the two models FE and RE. We only present the coefficients of the appropriate model. The Hausman test concluded to adopt a fixed effects model for all regressions except those in columns (1) and (2) of Table 1 and column (1) of Table 2 which report the results of random effects model.

Columns (1), (2) and (3) of Table 1 show that the three variables measuring entrepreneurial activity namely the nascent entrepreneurship rate, the rate of ownership of a new company and the total entrepreneurial participation rate at an early stage have a positive impact on economic growth although not significant for the variable measuring nascent entrepreneurship. The non-significance of the nascent entrepreneurship can be explained by the fact that this type of entrepreneurship generates less employment and less production and therefore less economic growth.

The R-sq is very low (not exceeding 0.23 for all three variables). It suggests that entrepreneurship as measured cannot be considered as a separate factor of production in the base model. The coefficient associated with the rate of entrepreneurial activity at an early stage is greater than that associated with the nascent entrepreneurship

rate and the rate of ownership of a new company. These results confirm that of Stam and van Stel (2009). They use microeconomics data with more aggregate data and find that entrepreneurship has no growth effect in low income countries. In high income and transition countries the opposite prevails, particularly with regard to opportunity based entrepreneurship.

Table 2. Entrepreneurship approximated by the index of entrepreneurial activity

Dependent variable: real GDP per capita

Regression	1	2	3	4	5	6
Constant	9.533***	9.508***	9.459***	-.570	.079	-.276
Log (ki)	.240***	.249***	.25***	.017	.018	.020
Log (sub)	.017	-	-	.027**	-	-
Log (bab)	-	.022*	-	-	.022**	-
Log (tea)	-	-	.04**	-	-	.041**
Log (kg)	-	-	-	-.703***	-.746***	-.717***
Log (pop)	-	-	-	1.19***	1.142***	1.167***
Log(pc)	-	-	-	.170***	.169***	.166***
N.d'observation	158	158	158	158	158	158
R-sq	0.19	0.2	0.22	0.68	0.69	0.69
F-test : existence of specific individual effects	accepted	accepted	accepted	accepted	accepted	accepted

Note: \* Coefficient significant at 10%, \*\* coefficient significant at 5%, \*\*\* coefficient significant at 1%.

Columns (4), (5) and (6) show the regression results after introducing the control variables. They suggest that all variables used as a proxy for entrepreneurship have a significant positive impact on economic growth. Indeed, entrepreneurial activities contribute to create jobs and therefore the creation of wealth. This finding was demonstrated by the work done in some countries (the United States by Birch (1979, 1987), in Sweden by Davidsson et al. (1995) and Canada by Baldwin and Picot (1995)) which leads to economic growth. The variable whose amplitude is highest is the rate of total entrepreneurial activity at an early stage.

The control variables used have the expected sign and are highly significant. For example, government spending on consumption has a negative sign in the sense that a higher size of the state stifles economic activity. In developed countries, population growth is an engine of economic growth. Therefore, the sign obtained for log (pop) is identical to theoretical predictions.

The model's explanatory power is acceptable (R-sq = 0.69) which indicates a good specification.

Table 3. Entrepreneurship measured by the number of patents filed by residents

Dependent variable: real GDP per capita

Regressions	1	2
Constant	9.158***	-1.125
Log (ki)	.272***	.136***
Log (pat)	.043*	.051**
Log (kg)	-	-.391***
Log (pop)	-	1.014***
Log (openk)	-	.403***
Number of observations	162	162
R-sq (overall)	0.22	0.76
F-test : existence of specific individual effects	accepted	accepted

Note: \* Coefficient significant at 10%, \*\* coefficient significant at 5%, \*\*\*coefficient significant at 1%.

After approximating entrepreneurship by variables measuring the entrepreneurial activity, we used an alternative measure: The degree of innovation. The measure used is the number of patent applications filed by residents. Table 3 presents results for the base model (column 1) and the augmented model (column 2).

The results in Table 2 show that the degree of innovation has a positive and significant impact on growth both in the basic model and in the augmented model with control variables. With a very high R-sq = 0.76 in the augmented model. Autio et al. (2005) found similar results for cross-sectional data.

The coefficient on the variable log (pat) in the augmented model is higher and more significant than in the basic

model. This means that the potential for innovation can generate additional production in the presence of a more favorable institutional framework.

## 5. Conclusion and Implications

In this paper, we have demonstrated the positive impact of entrepreneurship on economic growth is a theoretically or empirically. We also showed that the indicators used to measure entrepreneurship take magnitudes more and become more significant in the presence of a favorable institutional framework. These results should prompt governments to give more importance to the promotion of entrepreneurial activities. Intervention points will worn on the following:

- Raise awareness of the entrepreneurship culture since school education (implicitly during the primary and college, and specifically from the secondary);
- Insert modules in all sectors of higher education to stimulate entrepreneurship while focusing on innovative projects with high added value;
- Reducing the administrative procedures sufficient when creating new businesses.

To conclude, the main limitation of this work concerns the sample size which focuses on OECD countries. The lack of data does not allow to test the impact of entrepreneurial activity on economic growth for a wide sample of countries especially in the developing world. However, a classification of countries according to the different aspects of entrepreneurship taking into account their level of development could provide interesting results. This point will be addressed in future research work.

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Appendix

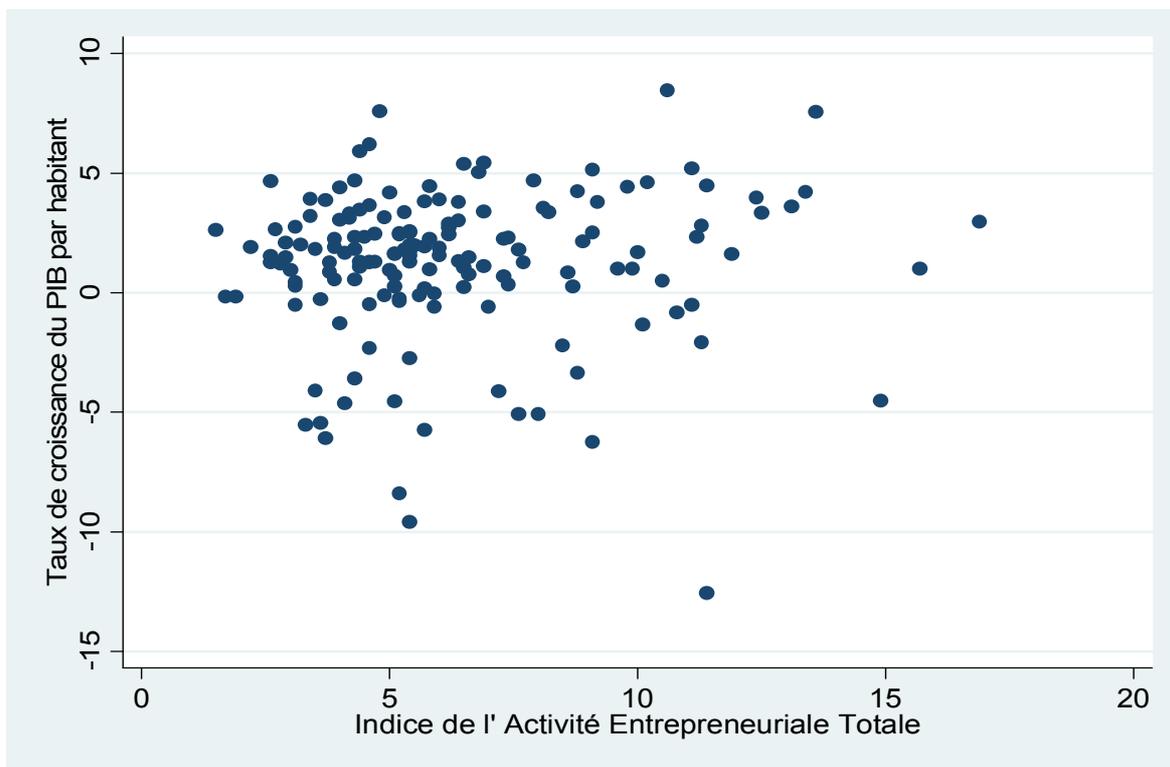


Figure 2. Correlation between the growth rate of GDP per capita and the index of total entrepreneurial activity

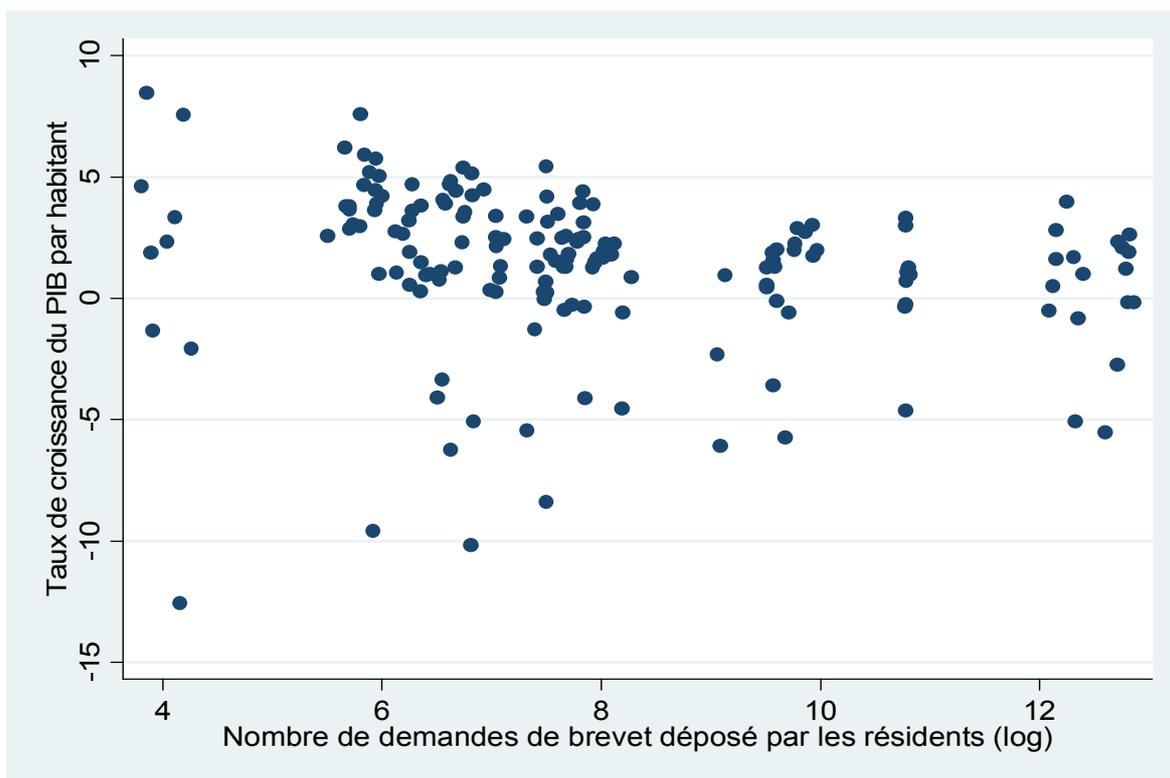


Figure 3. Correlation between the growth rate of GDP per capita and the number of patents filed by residents

Table 4. Average of the variables used to approximate entrepreneurship (2001-2009)

Countries of the studie	sub	bab	tea	pat
Belgium	2.28	1.12	3.28	546
Chile	8.23	5.64	13.47	367
Denmark	2.61	2.64	5.09	1688
Finland	3.01	2.16	5.04	1954
France	3.35	1.11	4.33	14153
Germany	3.03	2.04	4.73	48354
Greece	4.56	2.91	7.34	492
Hungary	3.97	3.06	6.89	757
Iceland	7.35	4.44	11.36	57
Ireland	5.00	4.06	8.66	877
Italy	2.79	1.92	4.53	8886
Japan	1.53	1.32	2.89	349840
Netherlands	2.60	2.49	5.03	2241
Norway	4.44	3.81	7.86	1155
Slovenia	3.05	1.60	4.60	321
Spain	2.97	3.20	6.04	3069
Sweden	1.89	2.20	3.87	2890
United Kingdom	3.10	2.94	5.83	18539
United States of America	7.12	4.23	10.62	207526