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THE INNOVATION-DRIVEN ECONOMIES AND ENTREPRENEURIAL ACTIVITY THROUGH A CLUSTER ANALYSIS

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ABSTRACT

A main aspect of Entrepreneurial activity is the extent to which people in a population are creating new business activity, both in absolute terms and relative to other economic activities, such as business closure. Within the realm of new business activity, different types of entrepreneurial activity can be distinguished. For example, business creation may vary by industry sector, by the size of the founding team, and by whether the new venture is legally independent of other businesses, and in terms of founder demographics, such as gender, age, or education (Global Entrepreneurship Monitor, 2009). Therefore this article selects the 20 countries; classified as Innovation-Driven Economies, from 2009 Global Entrepreneurship Monitor data. By using the Entrepreneurial Activity key indicators and applying the cluster hierarchical analysis technique, two clusters were found to measure differences and preliminary results show a clear measure differences in the level of entrepreneurial activity among countries. And according this is possible to identify policies that may enhance the national level of entrepreneurial activity in those countries.

Keywords: Innovation-Driven Economies, Entrepreneurial Activity, Cluster Analysis.

Field of Research: Entrepreneurship.

Codes JEL: M13

1. INTRODUCTION

Over the last two decades the role played by enterprises in economic development has become more and more clear to economists and policymakers (Acemoglu, Johnson & Robinson, 2001). To understanding why countries are rich and poor the researches focus on the measurement of enterprises and is very important that their studies also focus on the measurement of entrepreneurial activity.

Acemoglu and Johnson (2005) indicate that enterprises are strengthened and more and more entrepreneurial activity is displaced towards productive entrepreneurship strengthening economic development. This entrepreneurial activity explodes through the innovation-driven stage and culminates in a high level of innovation with entrepreneurship leveling out as institutions are fully developed (Fukuyama, 1989).

Additionally it is imperative to know how countries' economies compete, because they have different economies and industry can become more innovative based on increasing productivity (Wennekers, Stel, Thurik & Reynolds, 2005; Acs & Amorós, 2008). For that countries need to adopt an economic strategy that increases innovation because it is crucial to make a country more competitive in the global economy (Carree, van Stel, Thurik & Wennekers, 2007).

According to this, the purpose of this paper is to help understanding how countries classified as Innovation-Driven Economies, will agglomerate by using the Entrepreneurial Activity key indicators and applying the cluster hierarchical analysis technique.

In the following section we look at the Innovation-Driven Economies and Entrepreneurial Activity. After this section we define the variables used in this research to describe the Entrepreneurial Activity, the methodology will be explained in this section and the results discussed. The final section will present the conclusions.

2. INNOVATION-DRIVEN ECONOMIES AND ENTREPRENEURIAL ACTIVITY

Rostow (1960) suggested that countries go through five stages of economic growth: (1) the traditional society (2) the preconditions for take-off (3) the take-off (4) the drive to maturity and (5) the age of high mass-consumption. While these stages are a simplified way of looking at the development of modern economies, they identify critical events and are focused on the age of high mass-consumption. On the other hand Porter (2002) has provided a modern interpretation of this approach by identifying three stages of development: (1) a factor-driven stage, is marked by high rates of agricultural self-employment and countries in this stage compete through low cost efficiencies in the production of commodities or low value-added products; (2) an efficiency-driven stage, is distinct by decreasing rates of self-employment and countries must have efficient productive practices in large markets, which allow companies to exploit economies of scale; and (3) an innovation-driven stage, where it is biased towards high value added industries in which entrepreneurial activity is important.

Doing a link to previously presented, the Global Entrepreneurship Monitor (GEM) define as economic development of countries, classifying each participating country as "Entrepreneurship in Factor-

Driven Economies", "Entrepreneurship in Efficiency-Driven Economies" or "Entrepreneurship in Innovation-Driven Economies".

Because the present study will focus on "Entrepreneurship in Innovation-Driven Economies", only a brief explanation of this will be presented. The Entrepreneurship in Innovation Driven Economies (GEM, 2009:9), as an "economy matures and its wealth increases, one may expect the emphasis on industrial activity to gradually shift toward an expanding service sector that caters to the needs of an increasingly affluent population and supplies the services normally expected of a high-income society. The industrial sector evolves and experiences improvements in variety and sophistication. Such a development would be typically associated with increasing research & development and knowledge intensity, as knowledge-generating institutions in the economy gain momentum. This development opens the way for the development of innovative, opportunity-seeking entrepreneurial activity that is not afraid to challenge established holders in the economy. Often, small and innovative entrepreneurial firms enjoy an innovation productivity advantage over large holders, enabling them to operate as 'agents of creative destruction'. To the coverage that the economic and financial institutions created during the scale-intensive phase of the economy are able to accommodate and support opportunity-seeking entrepreneurial activity, innovative entrepreneurial firms may emerge as significant drivers of economic growth and wealth creation."

A main aspect of Entrepreneurial activity is the extent to which people are creating new business activity, both in absolute terms and relative to other economic activities, such as business closure and contained by the realm of new business activity, different types of entrepreneurial activity can be distinguished. For instance, business creation may differ by industry sector, by the size of the founding team, and by whether the new venture is legally independent of other businesses, and in terms of founder demographics, such as gender, age, or education (GEM, 2009). It is very important to remember that entrepreneurial activity should be seen as a process and not a moment. The analysis of multiple components of entrepreneurial activity also allows processes to explore differences between entrepreneurs in the three major phases of economic development of countries. For example, it is expected that business activity is high and new emerging economies driven by factors of production, mainly because most of this activity is motivated by economic necessity. Additionally, in innovation economies it is expected that the proportion of those motivated by the entrepreneurship opportunities is higher than in Factor Driven and Efficiency-Driven economies.

3. METHODOLOGY, METHODS AND RESULTS

3.1. Description of the entrepreneurial activity variables

The data presented in this section were obtained from a standard questionnaire applied to all countries participating in GEM, in 2009, to a sample of individuals in adult age (18-64 years).

It was the purpose of this research to see the involvement in entrepreneurial activity in the phases of the entrepreneurial process Innovation-Driven Economies of the countries covered by the GEM, in 2009. The countries under study are the following: Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Israel, Italy, Japan, Republic of Korea, Netherlands, Norway, Slovenia,

Spain, Switzerland, United Kingdom, United Arab Emirates and United States of America. The purpose of this research is agglomerating countries that have similar features; the variables that helped for that classification were (GEM, 2009):

- Total early-stage Entrepreneurial Activity (TEA): Percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business;
- Established Business Ownership Rate: Percentage of 18-64 population who are currently owner-manager of an established business, i.e., owning and managing a running business that has paid salaries, wages, or any other payments to the owners for more than 42 months;

iv) Nascent Entrepreneurship Rate: 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;

vi) New Business Ownership Rate: 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.

Table 1 summarizes the information for each variable under study.

Table 1. Entrepreneurial Activity for Innovation-Driven Economies Countries in 2009.

Country	Total early-stage Entrepreneurial Activity (TEA)	New Business Ownership Rate	Established Business Ownership Rate	Nascent Entrepreneurship Rate
Belgium	3,5	1,6	2,5	2,0
Denmark	3,6	2,0	4,7	1,6
Finland	5,2	2,3	8,5	2,9
France	4,3	1,4	3,2	3,1
Germany	4,1	2,1	5,1	2,2
Greece	8,8	4,7	15,1	4,5
Hong Kong	3,6	2,2	2,9	1,6
Iceland	11,4	4,2	8,9	7,6
Israel	6,1	2,7	4,3	3,4
Italy	3,7	1,9	5,8	1,8
Japan	3,3	1,3	7,8	1,9
Korea (South)	7,0	4,4	11,8	2,7
Netherlands	7,2	4,1	8,1	3,1
Norway	8,5	3,9	8,3	5,0
Slovenia	5,4	2,1	5,6	3,2
Spain	5,1	2,8	6,4	2,3
Switzerland	7,7	3,5	8,4	4,3

United Arab Emirates	13,3	7,4	5,7	6,5
United Kingdom	5,7	3,2	6,1	2,7
United States of America	8,0	3,2	5,9	4,9

Source: Global Entrepreneurship Monitor (2009) database.

One of the principal measures is the early-stage entrepreneurial activity, or TEA, because they give us the information about percentage of people, with age between 18-64 years old, who are either a nascent entrepreneur or owner-manager of a new business.

Making a reading to the values presented in the table above and Fig. 1 it can be observed that the United Arab Emirates and Iceland have the highest rates of TEA, followed by Iceland. The United States only just making the top quartile (Table 2), along with Greece and Norway. Japan, Belgium, Denmark, Hong Kong, and Italy were in the lowest quartile (Table 2).

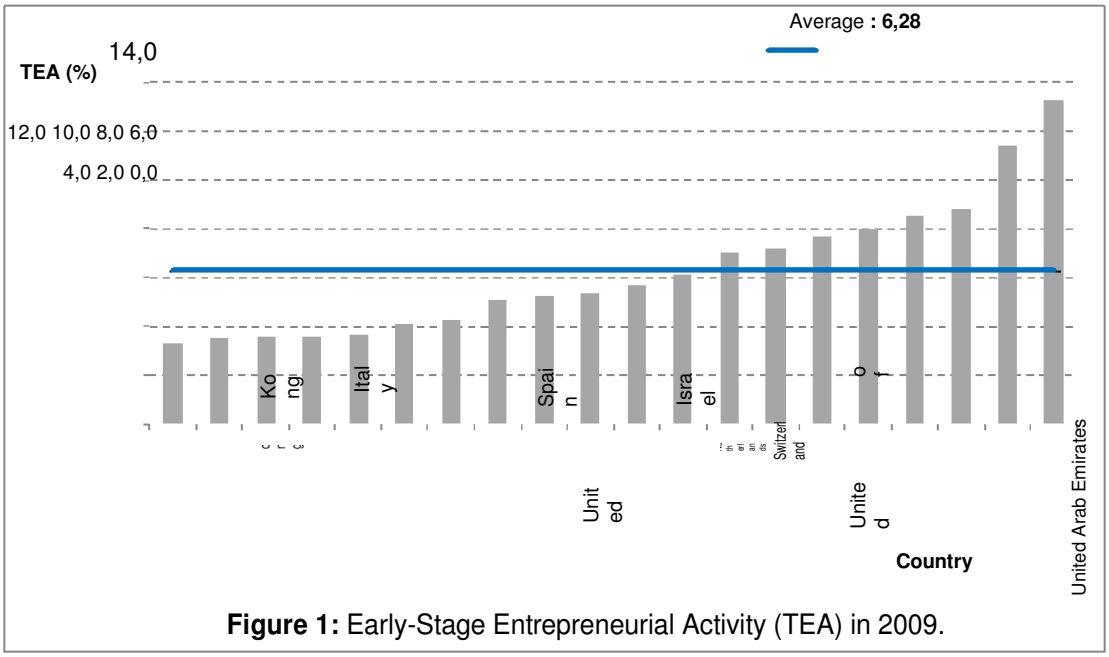

Figure 1: Early-Stage Entrepreneurial Activity (TEA) in 2009.

In 2009, is possible to see that Japan recorded a TEA of 3.3%, which means that there are 3 early-stage entrepreneurs (individuals involved in start-ups or new business management), per 100 individuals in adult age, lowest value of the Innovation-Driven Economies Countries, being well below the average TEA rate associated with the countries under study. On the other hand United Arab Emirates registered a TEA of 13.3%, i.e. there are 13 early-stage entrepreneurs per 100 individual in adult age. A similar behaviour we can see for the New Business Ownership rate and Nascent Entrepreneurship Rate (Tables 1 and 2, Fig. 2).

An analysis to the previous figure, Rate Early-Stage Entrepreneurial Activity, allows us to conclude that there is an inverse correlation between the level of developed and sophistication economies and the value of TEA.

We can see a similar behaviour for the New Business Ownership rate and Nascent Entrepreneurship Rate where it is possible to observe high values for countries such as United Arab Emirates, Greece, Iceland and Norway (Tables 1 and 2, Fig. 2), and low rates for Italy, Hong Kong, Denmark, Belgium and Japan. The average rate of the Nascent Entrepreneurship is higher than the average rate of New Business Ownership (Table 2).

Table 2. Statistics Descriptive for Entrepreneurial Activity Variables.

		Total early-stage Entrepreneurial Activity (TEA)	New Business Ownership Rate	Established Business Ownership Rate	Nascent Entrepreneurship Rate
Mean		**6,28**	**3,05**	**6,76**	**3,37**
Standard Deviation		**2,74**	**1,46**	**3,03**	**1,64**
Percentiles	**25**	3,80	2,03	4,80	2,05
	50	5,55	2,75	6,00	3,00
	75	7,93	4,05	8,38	4,45

According to Fig. 2 is possible to observe for the variable Established Business Ownership a different behaviour when compared with the remaining variables. The percentage of 18-64 population who are currently owner-manager of an established business, is higher for Greece (15,1 %), Korea (South) (11,8 %), Iceland (8,9%), Finland (8,5%). These countries have so many people involved as established business owners in comparison to not just other innovation-driven economies but also to own TEA points at limited degree of dynamism. Several countries with lower than average TEA show comparatively high established business ownership.

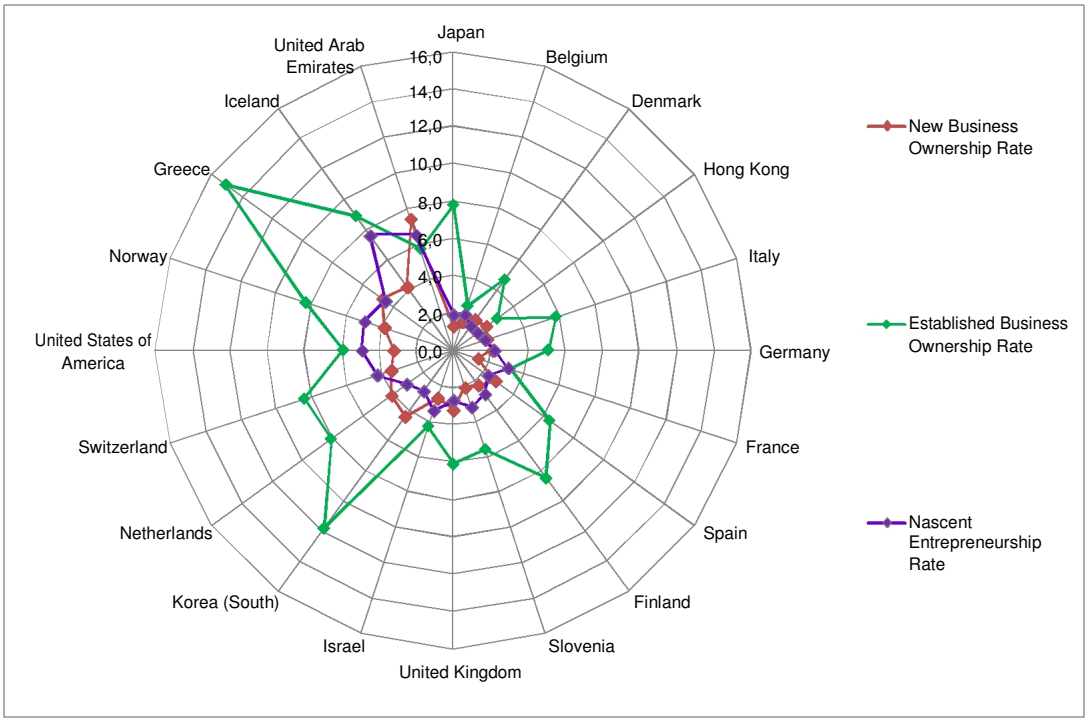

Figure 2: Entrepreneurial Activity for Innovation-Driven Economies Countries in 2009.

In line with the values of Table 3 is possible to verify the positive and highly correlation, statistically significant, between the variables: Total early-stage Entrepreneurial Activity and New Business Ownership Rate (0,918; p-value<0,001); Total early-stage Entrepreneurial Activity Nascent Entrepreneurship Rate (0,938; p-value<0,001); New Business Ownership Rate and Nascent Entrepreneurship Rate (0,727; p-value<0,001). On the other hand Established Business Ownership Rate and Nascent Entrepreneurship Rate has a poor correlation and is not statistically significant (0,354, p-value=0,126).

Table 3. Correlations between Entrepreneurial Activity Variables (n=20).

		Total early-stage Entrepreneurial Activity (TEA)	New Business Ownership Rate	Established Business Ownership Rate	Nascent Entrepreneurship Rate
Total early-stage Entrepreneurial Activity (TEA)	Pearson Correlation	1			
	Sig. (2-tailed)				
New Business Ownership Rate	Pearson Correlation	0.918**	1		
	Sig. (2-tailed)	0.00			
Established Business Ownership Rate	Pearson Correlation	0.455	0.486	1	
	Sig. (2-tailed)	0.044	0.030		
Nascent Entrepreneurship Rate	Pearson Correlation	0.938**	0.727**	0.354	1
	Sig. (2-tailed)	0.000	0.000	0.126	

Note: **. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed).

3.2. Finding & Discussion

In this section we investigate those country groups that possess similar entrepreneurial features. Cluster analysis provides the proper tool for doing it.

After following all the steps to apply the Cluster Analysis a hierarchical method was applied. The most frequent hierarchical method for this our quantitative variables is the method of Ward. The main objective of this method is based on minimized an objective function, defined as the sum of squares of deviations of the individual observations compared with the average of the group are classified, with the aim is to create groups having maximum internal cohesion and maximum separate external (Green, 2003; Marôco, 2003). As a dissimilarity measure between subjects the Euclidean Distance Squared was selected. In order to graphically view the classification of countries into clusters a dendrogram was produced (Figure 3). The graphical visualization of Figure 3 allows us to anticipate the optimal number hypothetical clusters of countries as well as their composition. The distance between about 10 and 25 are straightforwardly notable two groups.

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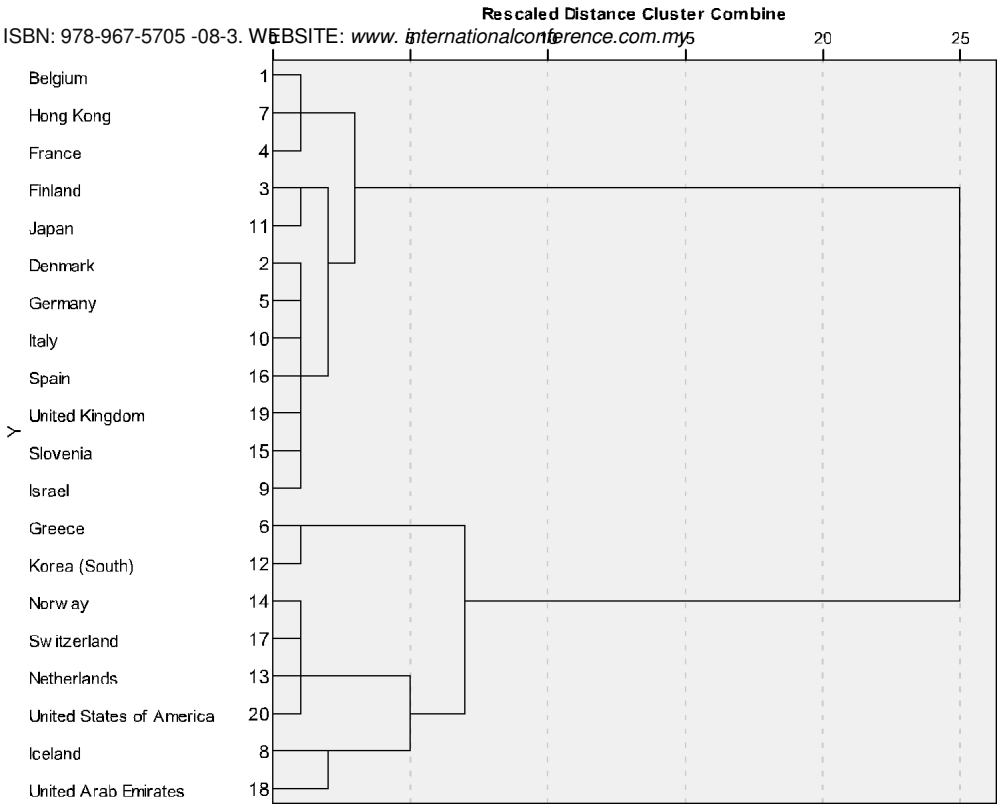

Figure 3: Dendrogram using Ward Linkage.

However, in order to identify the optimum number of clusters we used the test r-squared (R-Sq). With the support of one-way ANOVA and the graph with relative distance between clusters and r-square test (Figure 4), we can retain two clusters.

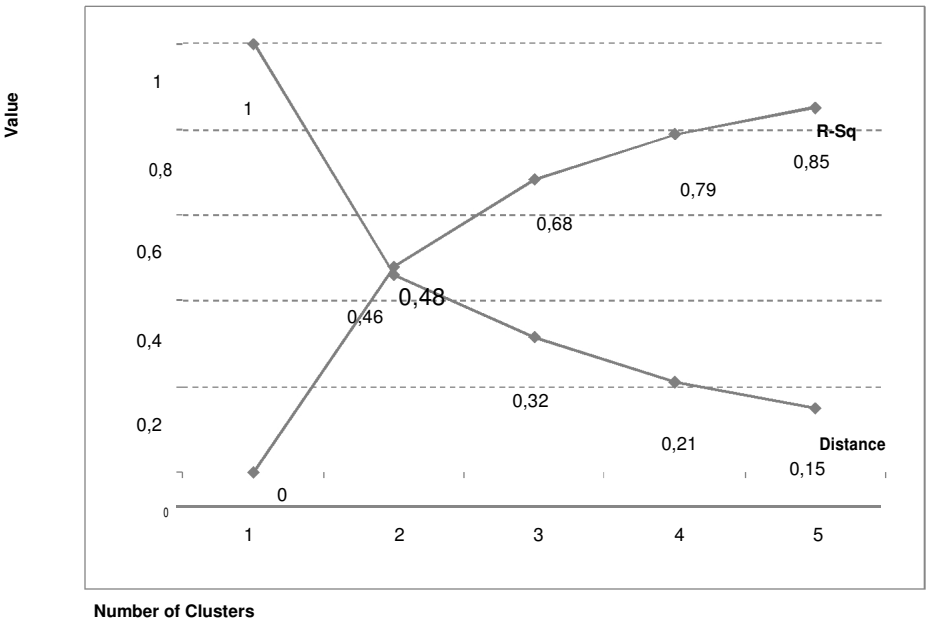
Value
1
0,8
0,6
0,4
0,2
0
1
2
3
4
5
R-Sq
Distance
1
0,85
0,79
0,68
0,48
0,46
0,32
0,21
0,15
0
Number of Clusters

Figure 3: Optimal Number of Clusters.

In Table 4 is possible to note the country groups that possess similar entrepreneurial features. The first cluster comprises 12 countries and cluster 2 includes 8 countries.

Table 4: Agglomeration of countries.

Cluster 1	Cluster 2
Belgium	Greece
Denmark	Iceland
Finland	Korea (South)
France	Netherlands
Germany	Norway
Hong Kong	Switzerland
Israel	United Arab Emirates
Italy	United States of America
Japan	
Slovenia	
Spain	
United Kingdom	

The results achieved for the clustering of countries, based on cluster hierarchical analysis technique, is quite interesting to note that for the 1st cluster is feasible to detect the groups of countries that have lower values for each variable previously analyzed, and we called Low/Medium Entrepreneurial Activity. On the other hand, the 2nd cluster groups together the countries with the highest values, for all variables under study, and we decided to call it High/Medium Entrepreneurial Activity. It would be interesting to analyze which of all variables separate these groups and this is proposed as a line of future research using other statistical techniques.

4. CONCLUSION AND FUTURE RECOMMENDATION

Entrepreneurial activity is a multifaceted phenomenon that describes the contribution of a population in the process of creating new firms, managing recently created and established firms, and closing unnecessary or inefficient businesses.

Once our work focused on Innovation-Driven Economies, and paid special attention to the present financial and economic world situation, the link between entrepreneurship and innovation gained particular importance in that business initiatives related to innovation are revealed more and more relevant for economic growth.

According to the main objective of this paper, to find groups of countries classified as Innovation-Driven Economies that have the same features and applied the cluster hierarchical analysis

technique, two clusters were found to measure differences and the results show clear measure differences in the level of entrepreneurial activity amongst countries. The results achieved for the clustering of countries for the 1st cluster is feasible to detect the groups of countries that have lower values Total early-stage Entrepreneurial Activity, Established Business Ownership Rate, Nascent Entrepreneurship Rate and New Business Ownership Rate. According to this behaviour we decided to call Low/Medium Entrepreneurial Activity. For the other cluster we have joined the countries that had high values Total early-stage Entrepreneurial Activity, Established Business Ownership Rate, Nascent Entrepreneurship Rate and New Business Ownership Rate and we decided to call it High/Medium Entrepreneurial Activity. In any case the allocation of these names and their analysis has to be weighted because a more refined analysis is needed and it is proposed as a future line of research, using a discriminatory analysis in order to ascertain whether the groups are well classified.

The important added value of this research is that it provides some approach at measuring entrepreneurial activity and according to this it is possible to identify policies that may enhance the national level of entrepreneurial activity in countries under study. We also believe that our study raises several intriguing issues regarding the interaction between entrepreneurial activity variables and economic growth. Unquestionably much more work is needed, particularly in the area of casual modeling of critical relationships.

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