

Semerçi, Anıl Boz; Çimen, Mustafa

**Article**

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# Environmental incentives of entrepreneurship: Fuzzy clustering approach to OECD countries

Anil Boz Semerci\* and Mustafa Çimen

\*Correspondence:  
fauthor@example.com  
Faculty of Economics and  
Administrative Sciences  
Department of Business  
Administration, Hacettepe  
University, Ankara, Turkey

## Abstract

The rate of nascent entrepreneurship is crucial for economies of countries in order to identify economic well-being and promote dynamics for new business start-ups. Supportive governmental programs, proper entrepreneurship education and predisposition of cultural and social norms are encouraging factors that assist new businesses and develop entrepreneurial and innovative structures in economies. This research classifies countries and examines the clusters according to their governmental supportive programs, educational incentives, cultural and social norms on entrepreneurship and the rate of new entries into self-employment in the country. For the analyses, fuzzy clustering method is applied on the entrepreneurship key indicators data, obtained from the Global Entrepreneurship Monitor (GEM) study. Although our analyses do not allow the identification of causal relationships, they provide useful comparisons among the countries and suggest incentive mechanisms for policy makers according to their clusters. Given the importance of entrepreneurship and new business ventures, the findings of this study form an important base for further empirical studies, in addition to its practical value on public, educational and social point of views in entrepreneurship.

**Keywords:** Entrepreneurship, Nascent entrepreneur, Governmental programs, Education, Culture and social norms

## Introduction

In recent years there has been a growing interest in the role of entrepreneurship for economies and societies. Audretsch and Thurik (2001) have explained this interest as the result of moving from managed economies to entrepreneurial economies. Big and static businesses and bureaucratic hegemony, which are dominant in managed economies, have been replaced with innovation, knowledge and dynamic structures of companies over the years. This replacement points to a transition to entrepreneurial economies (Acs and Stough 2008). Many researchers have brought out the most important advantage of moving from managed economies to entrepreneurial economies as contribution to economic growth (e.g., Acs and Szerb 2007; Wennekers et al. 2005). This interaction of entrepreneurship and economic growth can be seen in various ways such as employment creation, expanding opportunity pool, knowledge spillovers and fostering innovation (e.g., Agarwal et al. 2007; Block et al. 2013; Holcombe 2003; Rupasingha and Goetz

2013). Stephens and Partridge (2011) have revealed statistically significant relationship between entrepreneurship and growth in lagging regions. Furthermore, many empirical researches have indicated the positive effects of entrepreneurial activities on Gross Domestic Product rates (Aparicio et al. 2016; Audretsch and Keilbach 2008; Zacharakis et al. 2000). Michelacci (2003) has debated the relationship between research and development activities and economic growth. He has revealed the necessity and importance of existence of entrepreneurial activities. According to Michelacci (2003), increases only in resources allocated to research activities are not sufficient for economic growth. Growth occurs when entrepreneurs transform researches into economic activities and facilitate knowledge spillovers.

In the global context, although the transition from managed economies to entrepreneurial ones has spread out to many countries, the degree of transformation and adaptation has varied in each of the countries depending on the individualistic and environmental factors. Individualistic factors are composed of personality characteristics and highlight psychological profile of individuals that separates entrepreneurial individuals from others. On the other hand, environmental factors refer to industrial conditions, financial institutions, political ideas, regulations, educational actors and social norms aspects. Cuervo (2005) has classified environmental factors into two main groups. He has included micro and macro economic indicators in the economic environment, whereas governmental regulations, public policies, educational system and culture in the institutional environment. Veciana and Urbano (2008) have also confirmed the accuracy of considering governmental, educational and cultural indicators in entrepreneurship environments besides economical aspects. Although there are many studies that have examined environmental incentives of entrepreneurship, most of them have approached it from the economic point of view (Meek et al. 2010). In the studies related to environmental incentives, generally one or two environmental indicators were considered, rather than a holistic approach. For instance, Stevenson and Lundström (2007) have highlighted that governments help to develop entrepreneurial culture in societies by regulatory and administrative policies. They have emphasized environment as a crucial factor in entrepreneurship process and governmental policies as having a key role in shaping that environment. Mok (2005) has revealed that universities and their strategies play an important role in fostering entrepreneurship. He has also suggested that governmental regulations should provide conducive infrastructure for them. Neck and Greene (2011) have highlighted the importance of education on entrepreneurship and have indicated the necessity of different teaching approaches to entrepreneurial education. Hechavarria and Reynolds (2009) have searched the impact of culture on the type of entrepreneurial activities and have illustrated the strong role of cultural context in entrepreneurial behaviours of individuals.

However, previous researches have shown the impacts of governmental, educational or cultural structures of countries on entrepreneurship. Veciana and Urbano (2008) have demonstrated the need to conduct more empirical researches, with a holistic approach, on these incentives of entrepreneurship. Derived from this literature review and suggestions, this research is conducted in order to measure the level of governmental, educational and cultural incentives for entrepreneurship and new entrepreneurial activity across countries and to make credible international comparisons.

Accordingly, we empirically examined the clustering schema of countries by considering the environmental incentives of entrepreneurship and nascent entrepreneurship rates. In order to represent each of the environmental incentives, we have used the data collected on governmental programs, basic and post-school education, cultural-social norms for each of the investigated countries. More specifically, we aim to answer the research question of “Do the policies and educational and cultural conditions of countries, regarding each of the environmental motives and nascent entrepreneurship rate shape similar clusters?”.

This research contributes to the literature in several ways. First, to the best of our knowledge, this study is the first to investigate and compare multiple countries’ performances with respect to the aforementioned three environmental incentives of entrepreneurship together. Second, this research analyses general profiles of countries’ new entrepreneurship activities for the period of 2009-2013. Clustering countries and ordering these clusters with respect to their nascent entrepreneurship rates harmonize data across countries and provide international comparisons that are beneficial in a global context. Last but not the least, the findings of this research are important as they reveal successes and failures of countries with respect to environmental incentives of entrepreneurship, which provide practical recommendations for policy makers.

### **Literature review**

The environmental incentives of entrepreneurship are crucial in understanding and managing individuals’ entrepreneurial intentions and actions. Environmental conditions refer to the market characteristics that ventures confront. The environment that entrepreneurs operate in can help or hinder the success and sustainability of their businesses. The incentives can be defined as the core for the formation of entrepreneurship and the adaptation of companies to changes. Gartner (1985) has listed several variables in affecting new venture creation. Governmental policies, individuals’ educational background and attitudes of the population were in his list as surrounding variables of entrepreneurs. Leibenstein (1968) has also discussed governmental, educational and cultural aspects of entrepreneurship as the promoting exogenous factors. Reynolds et al. (2005) have presented these variables as the affecting factors of entrepreneurial framework conditions. Herrington et al. (2010) have mentioned that these three incentives are among the “main inhibitors of entrepreneurial activities”. Levie and Autio (2008) have also highlighted their encouraging impacts on opportunity perception and entrepreneurial activities of individuals. Grounding on these studies, in this paper, governmental, educational and cultural variables were chosen to make comparisons between countries. In the sub-section below, the related previous research on each of these factors are discussed.

**The framework of public policies for entrepreneurship:** One of the environmental incentives of entrepreneurship investigated in this study is about public policies for entrepreneurship. The importance of public policies for encouraging entrepreneurial activities has been recognized by many researchers for over ten years. Public policy is defined by Hillman and Keim (1995:199) as “any action or inaction of governments that expresses the intent of government actors”. Hart (2003:8) has defined the same term as “intentional power use of governments to effect societal outcome, such as

entrepreneurship” and Minniti (2008:779) has depicted as “power that shapes institutional environment in which entrepreneurial decisions are made.” It is clear that public policies are important for all actors of entrepreneurship since they establish the rules of the economies, more specifically rules of markets in which entrepreneurs will operate and sustain their organizations (Michael and Pearce 2009). Although policies for entrepreneurship and for small and medium sized enterprises (SME) are commonly used interchangeably, they are different in many aspects (Lundstrom and Stevenson 2006). While SME policies are associated directly with existing SMEs, self-employment rates and quantitative aspects of macroeconomic indicators, entrepreneurship policies are related to more comprehensive systems and qualitative factors.

Entrepreneurship policies consist of regulations to compose well-structured economies. These regulations aim not only to increase the number of firms or self-employed individuals but also to provide an encouraging environment for productive entrepreneurial activities (Henrekson and Stenkula 2009). Entrepreneurship policies also focus on entrepreneurial processes with individual perspectives such as required motivation, skills, knowledge and preferences. While the scope of SME policies is generally about firm-based financial variables, entrepreneurship policies combine various tools. This is because that entrepreneurship policies refer the preliminary and preparative policies whereas SME policies refer post-phase interventions in entrepreneurial process (Lundstrom and Stevenson 2006).

Entrepreneurship policies are discussed in several ways in the literature. While some researchers highlight the direct or indirect effects of public policies, some others emphasize the level of policies as national, regional or local. The levels of policies have also been considered as important predictors of entrepreneurial activities. Tax policies, protection of intellectual capital or easing formation and growth of new firms can be planned and applied as national or regional level policies. Although there is not any consensus on whether national or regional policies have better impacts on entrepreneurship, many researchers have agreed on the positive effects of harmonic and responsive policies on the global, national, regional and industrial level (Acs and Stough 2008; Hospers et al. 2009). Henrekson and Stenkula (2009) have stressed the importance of the direct impact of public policies on starting and expanding a business. They have also explained the long-term (indirect) effects of public policies on social norms and culture towards entrepreneurship. The success of these long-term effects depends not only on the governmental policies themselves, but also on their coherence and supportiveness for the educational environment (Mok 2005).

**The framework of education for entrepreneurship:** Another environmental incentive of entrepreneurship investigated in this study is entrepreneurial education. The entrepreneurial education is the mix of different types of educational methods that provide students mindset shift towards entrepreneurship. The recognition of the social and economic importance of entrepreneurship globally has led countries to pay more attention to the development of entrepreneurship. Entrepreneurship education and training programs are considered as one of the effective tools in order to increase the number and quality of enterprises (Elert et al. 2015).

The impact of education on entrepreneurship is generally discussed with two aspects. The first one is the impact of education on entrepreneurial performance. Education is

seen as a contributor to the development of entrepreneurial skills, abilities and attitudes, which, in turn, enhances individuals' intentions to be an entrepreneur. Furthermore, education can make a difference after becoming an entrepreneur. Kolstad and Wiig (2015) have found that there is a significant and substantial impact of an added year of primary education on entrepreneurial profitability. Hernández-Maestro and González-Benito Ó (2013) have demonstrated the significant impact of entrepreneurs' education level on enterprise performance. Van der Sluis et al. (2008) have also indicated in their meta-analytic research that education has a positive effect on entrepreneurial performance. On the other hand, Elert et al. (2015) in their long-term study in Sweden have found that entrepreneurship education is related to entrepreneurial income but has no effect on firm survival.

The second aspect of the discussions on the effect of education on entrepreneurship is the entrepreneurial intention as an occupational choice. Despite the fact that many researchers have indicated the positive effects of education on entrepreneurial intention, the findings of recent studies on education reveal some moderations and controversial relations. For example, Oosterbeek et al. (2010) in their study on college students in Netherlands have indicated the effect of entrepreneurship program on self-assessed entrepreneurial skills and motivation as insignificant. They have even found that the effect of entrepreneurship program is negative on entrepreneurial intentions to start a new business. Van der Sluis et al. (2008) have also reported an insignificant impact of education on selection into entrepreneurship. On the other hand, Masakure (2015) has indicated a positive effect of university education on Canadians' entrepreneurship choice in his empirical research. Rauch and Hulsink (2015) have also compared the effects of entrepreneurship and supply-chain management programs. Their findings have revealed that students participating in entrepreneurship programs have more positive attitudes. They have also perceived behavioural control towards entrepreneurship. As a result, these students have higher entrepreneurial intentions. In several other studies, this relationship between education and entrepreneurship has been discussed within the effects of some moderator variables. Westhead and Solesvik (2015) have examined the positive role of entrepreneurship education on intentions and also considered the gendered ascriptions and its moderating effect. In addition to gender, type of courses, field of study, self-efficacy or past entrepreneurial experience have been evaluated as moderator variables in several studies (Fayolle et al. 2006; Piperopoulos and Dimov 2015; Teixeira and Forte 2016). Particularly, an important moderator variable between education and entrepreneurship stated is the culture. Lee et al. (2005) have shown that differences in cultures affect the benefits gained by countries from entrepreneurial education. Roman and Maxim (2015) have also stated the interaction between education, culture and entrepreneurship.

**The framework of culture for entrepreneurship:** Entrepreneurial culture and related social norms form another environmental incentive of entrepreneurship that is investigated in this study. Culture is the set of shared and learned preferences, values and beliefs (Hofstede 1980). These preferences, values and beliefs are transmitted from generation to generation by many ways (such as symbols, language or visual components) and shape the individuals' thinking, feeling and behavior. Entrepreneurial culture refers any social values, norms or practices that determine individuals propensity to entrepreneurship. Many

researchers have explored the effect of culture on individuals' risk taking, uncertainty tolerance or innovativeness level, which are all related to entrepreneurship as a career option (Doepke and Zilibotti 2013; Eroglu and Piçak 2011; Hayton et al. 2002). In other words, culture performs a fundamental role in forming a conducive environment to encourage entrepreneurial activities.

Berger (1991) have suggested that the economic regulations are important steps in entrepreneurial development. However, he also reported that culture gives rise to entrepreneurship from the bottom of societies and 'serves as a conductor'. Culture that stimulates entrepreneurship is necessary even in the presence of economically favourable environment (Lee and Peterson 2001). Hechavarria and Reynolds (2009) have indicated that cultural values play a strong role in identifying entrepreneurial actions. They refer half of all explained variance on type of entrepreneurial activities. Liñán et al. (2013) in their research on 56 countries have also revealed that higher entrepreneurship rates are seen in countries where egalitarianism is dominant as cultural values.

Although the interactions of public policies, education and culture with entrepreneurship have long been studied, they still need further exploration to construct a better understanding across countries (Freytag and Thurik 2010; Hayton et al. 2002). In this vein, this study aims to investigate the profiles of countries and their clusters with respect to the aforementioned environmental incentives of entrepreneurship. Since the incentives are dynamic and changing variables, the corresponding context of entrepreneurship for countries is to be tested for narrow time intervals.

To summarize, our brief literature review demonstrates that the existing literature has revealed the environmental indices of entrepreneurship and examined their impacts on entrepreneurial decisions of individuals. However, each of the previous studies mostly focuses on a fraction of the three aforementioned environmental factors, rather than investigating their affects together. Moreover, although there is a conceptual framework in literature, there is a gap in empirical researches which investigates the aggregate performances of countries regarding the rate of new entrepreneurship activities. Finally, a comparative study, which evaluates countries' relative position with respect to the environmental indicators of entrepreneurship, in addition to the entrepreneurship rate itself, does not exist in the literature to the best of the authors' knowledge. In the light of the literature review, the purpose of our study is to make a comparative analysis among 15 countries by considering all three of the aforementioned environmental variables. We cluster countries with respect to these indicators, order the clusters and indicate relative positions of countries according to their clusters' positions for entrepreneurial environment and new entrepreneurs' rates. In addition to their academic contributions, these numerical analyses also provide comprehensive empirical ground for practical recommendations.

## **Methodology**

This section is dedicated to the explanations of the methodology used for the analyses. To this end, we first describe the data used, then present a brief introduction to the Fuzzy C-Means Clustering algorithm.

### Data

As mentioned in “Literature review” section, in this study we will investigate the performances of countries with respect to their nascent entrepreneurship rate, and three environmental incentives of entrepreneurship: governmental support, entrepreneurial education and cultural-social norms. In our analyses, we use the data obtained from the Global Entrepreneurship Monitor study. For the governmental support performances of countries, we use the data under the title “Governmental Support and Policies”, which measures to what extent the individuals have agreed with the statement that “in their country, public policies support entrepreneurship”. The entrepreneurial education incentive is measured by two variables, “Basic-School Entrepreneurial Education and Training” and “Post-School Entrepreneurial Education and Training”, which reflect the participants’ answers to the question of whether “training in creating or managing SMEs is incorporated within the education system at primary and secondary levels (higher levels for Post-School Entrepreneurial Education and Training)”. The analyses for socio-cultural norms are carried by using the data titled “Cultural and Social Norms” in the study. The data demonstrates the responses to the question whether “social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth”. Finally, we also measured the “Nascent Entrepreneurship Rate” as the percentage of 18-64 population who are currently involved in setting up a business they will own or co-own.

The data for the analyses is obtained from the Global Entrepreneurship Monitor (GEM) study. However, the number of countries for which the GEM study presents the data related to the investigated variables is limited for the years before 2009 and after 2013. Therefore, the data for each variable is taken for 5-years (2009-2013). Even for this time interval, the data for all of the OECD countries could not be obtained. So, the countries that had more than one missing data within this range of years for any of our variables were eliminated. For each of the remaining 15 countries up to one missing data per variable is filled in by the average value of the year before and year after.

### Fuzzy clustering

Clustering algorithms, such as hierarchical, distribution-based or density-based clustering, are widely used in the literature for categorizing objects in terms of predefined measures. Clustering analyses are particularly useful for determining similar objects, where group-based analyses are needed for more in-depth analyses, or similar actions are to be taken in similar states.

Classical clustering algorithms work under the assumption that values of all of the variables are certain and known. However, in many cases (including our study), the data is collected using “linguistic variables”. Linguistic variables aim to reflect individuals’ perception on the variable. Since perception is a subjective concept, quantitative values of the variables often do not reflect the exact value of participants’ perception (Hawkins and Mothersbaugh 2010). Moreover, classical clustering techniques assign each object to a single category. However, an object may contain features of more than one categories, even though one of these categories more heavily shapes the features of the object.

Zadeh (1965) suggests the use of “fuzzy numbers” and “fuzzy clusters” in order to overcome the difficulty of accounting for the uncertainty caused by linguistic variables. “Fuzzy



*Logic provide a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise information*" (Agarwal and Jain 2013).

Fuzzy clustering replaces "membership's of objects to clusters with "membership degree's. In other words, in terms of algorithmic design, classical clustering algorithms use membership variables taking values of  $\{0,1\}$ , where fuzzy clustering uses continuous membership degree variables ( $\mu_{i,k}$ ) with a range of  $[0, 1]$  where  $\sum_i \mu_{i,k} = 1$ . An object, therefore, can have positive membership degrees for more than one cluster, revealing the degree of concordance between features of the object and the cluster.

Although several fuzzy clustering algorithms have been proposed in literature, we use the well-cited "Fuzzy C-Means Clustering Algorithm" in this paper for its simplicity and generality. The algorithm consists of three main steps. First one is to compute cluster prototypes,  $v_i$  for each cluster  $i$ . Cluster prototypes refer to the average values of features of member objects (real data,  $z_k$ ), weighted by membership degree of the object. Then, a distance matrix is calculated, which shows the numerical distance between features of each object and the computed prototypes of each cluster. Finally, the partition matrix (i.e., membership degrees) is calculated based on the distances. These three steps are repeated for a pre-defined number of times, or until stopping criteria is met. Algorithm 1 illustrates the computation process. For more information on the Fuzzy C-Means Clustering Algorithm, please refer to Babuška (1998: Chapter 3). The following section presents the results of our analyses.

## Results

In this section, we first present the results of the clustering analyses on the aforementioned incentives of entrepreneurship in the literature. Then, the clustering results of the countries based on their nascent entrepreneurship rate data are presented. The clusters are ordered based on the average of the data values of member countries regarding the investigated factor.

The number of clusters is an important parameter of our analyses. If the number is low (e.g., one or two for our problem), large number of countries will be grouped together, which makes it difficult to provide managerial insights on the positions of the countries. A similar difficulty would occur when the number of clusters is too high (e.g., seven or more for our problem).

In that case, the number of countries in clusters would be mostly two or less, which again makes it difficult to provide insights on how similarly positioned countries perform across different datasets. Accordingly, as we have 15 countries (objects) in our data, the lower and upper limits for the number of clusters are defined to be 3 and 6 respectively, in order to be able to comment on the positions and performances of the countries within and across each data set. Then, for each number of clusters within this range, the clustering algorithm presented in Algorithm 1 is run using the "Nascent Entrepreneurship Rate" data and the number of clusters is chosen on the basis of Average Silhouette Values in order to provide sufficient freedom to the algorithm to group similar countries together. The resulting values for the number of clusters of 3, 4, 5 and 6 are found to be 0.19, 0.34, 0.56 and 0.47 respectively. Accordingly, in our analyses, we have set the number of clusters to 5. Then, Algorithm 1 is run using the data for each entrepreneurship incentive (i.e., governmental support and policies, basicschool entrepreneurial education, post-school entrepreneurial education, and cultural and social norms) and the data for nascent

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**Algorithm 1** Fuzzy C-Means Clustering Algorithm (source: Babuška 1998:57)

---

**repeat**

**STEP 1: Compute the cluster prototypes (means)**

$$\mathbf{v}_i^{(l)} = \frac{\sum_{k=1}^N (\mu_{ik}^{(l-1)})^m \mathbf{z}_k}{\sum_{k=1}^N (\mu_{ik}^{(l-1)})^m}.$$

**STEP 2: Compute the distances:**

$$D_{ikA} = (\mathbf{z}_k - \mathbf{v}_i^{(l)})^T \mathbf{A} (\mathbf{z}_k - \mathbf{v}_i^{(l)}), \quad 1 \leq i \leq c, \quad 1 \leq k \leq N.$$

**STEP 3: Update the partition matrix:**

**for**  $1 \leq k \leq N$  **do**

**if**  $D_{ikA} > 0$  for all  $i = 1, 2, \dots, c$  **then**

$$\mu_{ik}^{(l)} = \frac{1}{\sum_{j=1}^c (D_{ikA}/D_{jkA})^{2/(m-1)}},$$

**else**

$$\mu_{ik}^{(l)} = 0 \text{ if } D_{ikA} > 0, \text{ and } \mu_{ik}^{(l)} \in [0, 1].$$

**end if**

**end for**

**until** stopping criteria is met

---

**Note:** ( $l$ ) refers to the number of iterations for all variables,  $\mathbf{v}_i^{(l)}$  refers to the column vector of prototypes (central points) for cluster  $i$ ,  $\mu_{ik}^{(l)}$  refers to the membership degree of object  $k$  to cluster  $i$ ,  $\mathbf{z}_k$  is the column vector of observations (data) for object  $k$ ,  $\mathbf{A}$  is the so-called norm-inducing matrix, which, in our case, is the identity matrix and  $D_{ikA}$  is the theoretical distance of object  $k$  to cluster  $i$ .

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entrepreneurship rate, separately. In these analyses, an even initialization of membership degrees (i.e., membership degree of each object/country to each cluster is initialized as 0.2) is used in our analyses. The stopping criteria is arbitrarily chosen as the total absolute change in membership degrees being smaller than 0.01. A country is regarded as a “member” of a cluster, if its highest membership degree is for that cluster. The average values of clusters presented in our results are calculated by taking simple averages of the 5-years data for the analysed variable of the countries, which are regarded as the “members” of the cluster. If  $a_i$  is the average value for cluster  $i$ , then:

$$a_i = \frac{\sum_{k \in i} \mathbf{z}_k}{\#} \tag{1}$$

where  $k$  represents the countries,  $\mathbf{z}_k$  is the column vector of the observations (data) for country  $k$  and  $\#$  is the total number of data available for the countries that are member of  $i$  ( $k \in i$ ).

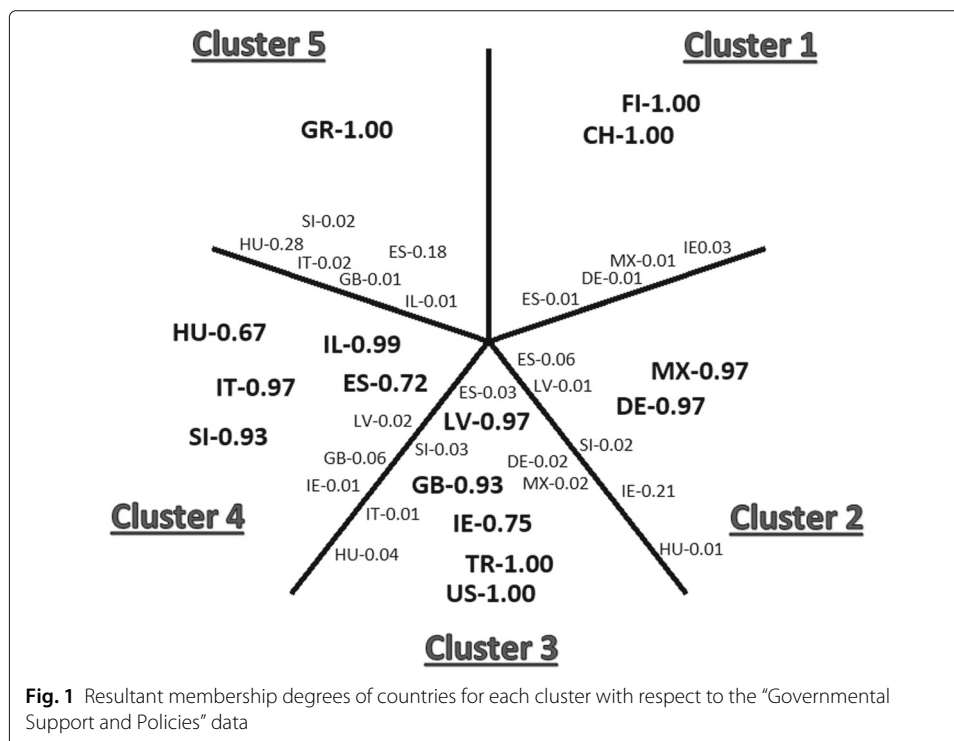
**Table 1** Resulting clusters of the analyses on the “Governmental Support and Policies” data

Clusters	Member countries	Average value
1	Switzerland (1.00), Finland (1.00)	3.24
2	Germany (0.97), Mexico (0.97)	2.88
3	Ireland (0.75), UK (0.93) Turkey (1.00), USA (1.00), Latvia (0.97)	2.70
4	Spain (0.72), Slovenia (0.93), Italy (0.97), Israel (0.99), Hungary (0.67)	2.23
5	Greece (1.00)	1.88

Notes: The numbers within parenthesis show the membership degree of the country to the cluster

The figures presented in this section interpret the resultant membership degrees of each country for each cluster. Note that, the values are rounded up to two decimal points, and the membership degrees with values of 0 is omitted in the figures. The places of countries/membership degrees within a cluster area is chosen arbitrarily (i.e., being close to the center or edges do not involve any information on the membership degree). The highest membership degree of a country is shown in bold, larger fonts. International country codes are used for representing each of the countries<sup>1</sup>.

Table 1 and Fig. 1 show the fuzzy clustering results of the selected countries based on the entrepreneurship incentive, “Governmental Support and Policies”. Switzerland and Finland are observed to be in the cluster with highest average evaluation result for Governmental Support and Policies. The second cluster contains Ireland, UK, Turkey, USA and Latvia. The related previous researches have also supported our findings by proposing specific economic development policy changes which can result in creating a conducive atmosphere to entrepreneurial activity (Carland and Carland 2004; Manolova



**Fig. 1** Resultant membership degrees of countries for each cluster with respect to the “Governmental Support and Policies” data

**Table 2** Resulting clusters of the analyses on the “Basic-School Entrepreneurial Education and Training” data

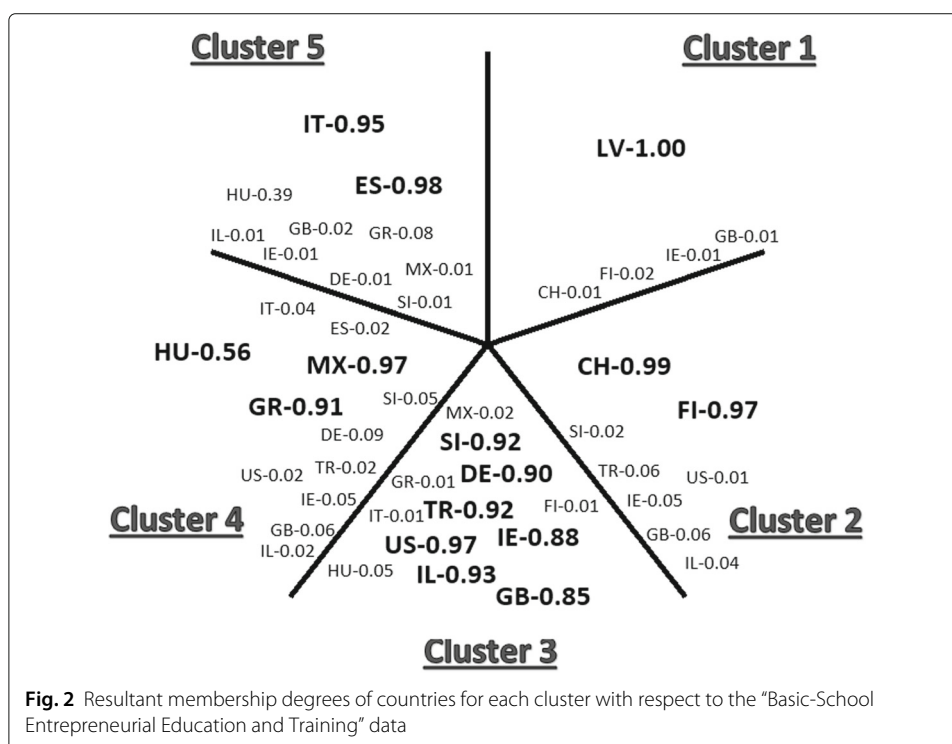
Clusters	Member countries	Average value
1	Latvia (1.00)	2.61
2	Finland (0.97), Switzerland (0.99)	2.42
3	Turkey (0.92), Israel (0.93), UK (0.85), Ireland (0.88), Slovenia (0.92), USA (0.97), Germany (0.90)	2.10
4	Mexico (0.97), Greece (0.91), Hungary (0.56)	1.81
5	Italy (0.95), Spain (0.98)	1.64

Notes: The numbers within parenthesis show the membership degree of the country to the cluster

et al. 2008). Greece is the single country in the last cluster, which implies that their evaluation for governmental support resulted in significantly lower values than any other country.

As indicated in related research (Sarri and Trihopoulou 2005) entrepreneurs think that institutional support and economic policies in Greece do not provide a supportive environment. High membership degrees of countries imply that the resulting clusters are representative of the profiles of countries.

Table 2 and Fig. 2 show the fuzzy clustering results of the selected countries based on the entrepreneurship incentive, “Basic-School Entrepreneurial Education and Training”. Latvia received the highest scores on this category, and is the single country in the top cluster. Italy and Spain together are in the last cluster. The resultant membership degrees are very high except that of Hungary, which has a membership degree of 0.56 for the fourth cluster and 0.39 for the fifth cluster, suggesting that the data of Basic-School Entrepreneurial Education and Training data of Hungary shows profile between those of these two clusters.



**Fig. 2** Resultant membership degrees of countries for each cluster with respect to the “Basic-School Entrepreneurial Education and Training” data

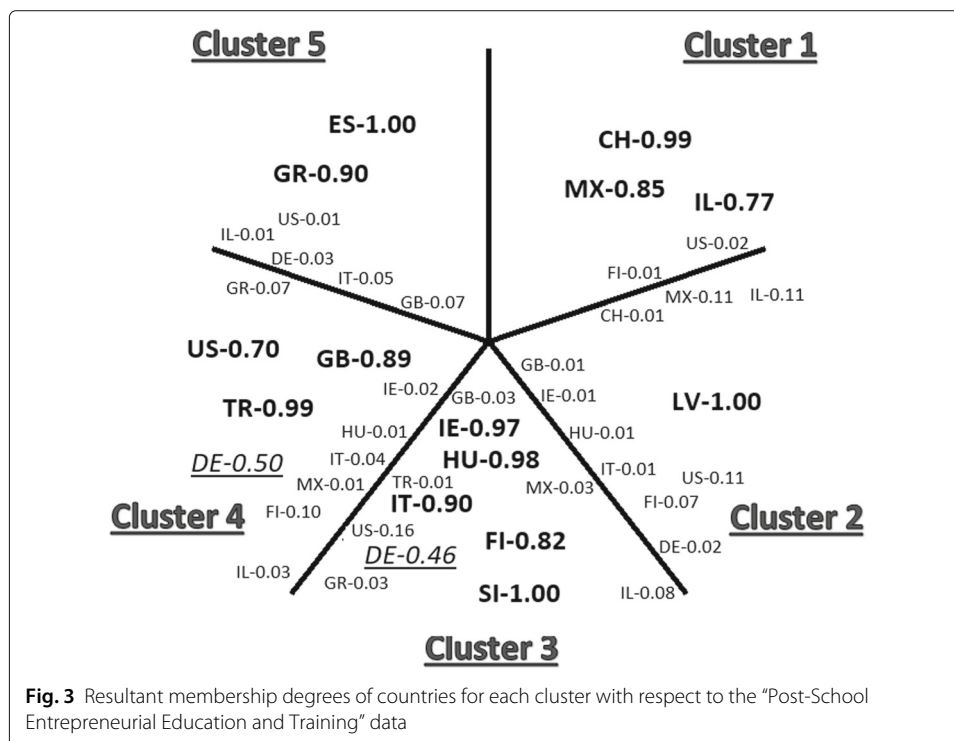
**Table 3** Resulting clusters of the analyses on the “Post-School Entrepreneurial Education and Training” data

Clusters	Member countries	Average value
1	Switzerland (0.99), Mexico (0.85), Israel (0.77)	3.25
2	Latvia (1.00)	3.04
3	Finland (0.82), Hungary (0.98), Ireland (0.97), Slovenia (1.00), Italy (0.90)	2.81
4	Germany (0.50), Turkey (0.99), UK (0.89), USA (0.70)	2.72
5	Greece (0.90), Spain (0.99)	2.44

Notes: The numbers within parenthesis show the membership degree of the country to the cluster

Table 3 and Fig. 3 show the fuzzy clustering results of the selected countries based on the entrepreneurship incentive, “Post-School Entrepreneurial Education and Training”. Switzerland, Mexico and Israel are in the top cluster. Greece and Spain are in the last cluster. High resultant membership degrees show that the countries within each group have similar profiles to each other regarding post-school entrepreneurial education. An exception to these high membership degrees is Germany. Its membership degrees are 0.50 for cluster 4 and 0.46 for cluster 3, which suggests that the post-school entrepreneurial education performance of Germany involves characteristics of both clusters with almost the same weight. This result also justifies the use of fuzzy clustering and shows the benefit of allowing partial memberships.

Table 4 and Fig. 4 show the fuzzy clustering results of the selected countries based on the entrepreneurship incentive, “Cultural and Social Norms”. Israel and the USA are in the top cluster here, while Italy, Greece, Hungary Slovenia and Spain are in the last cluster. Membership degrees of countries are again high, implying representative clusters.



**Fig. 3** Resultant membership degrees of countries for each cluster with respect to the “Post-School Entrepreneurial Education and Training” data

**Table 4** Resulting clusters of the analyses on the “Cultural and Social Norms” data

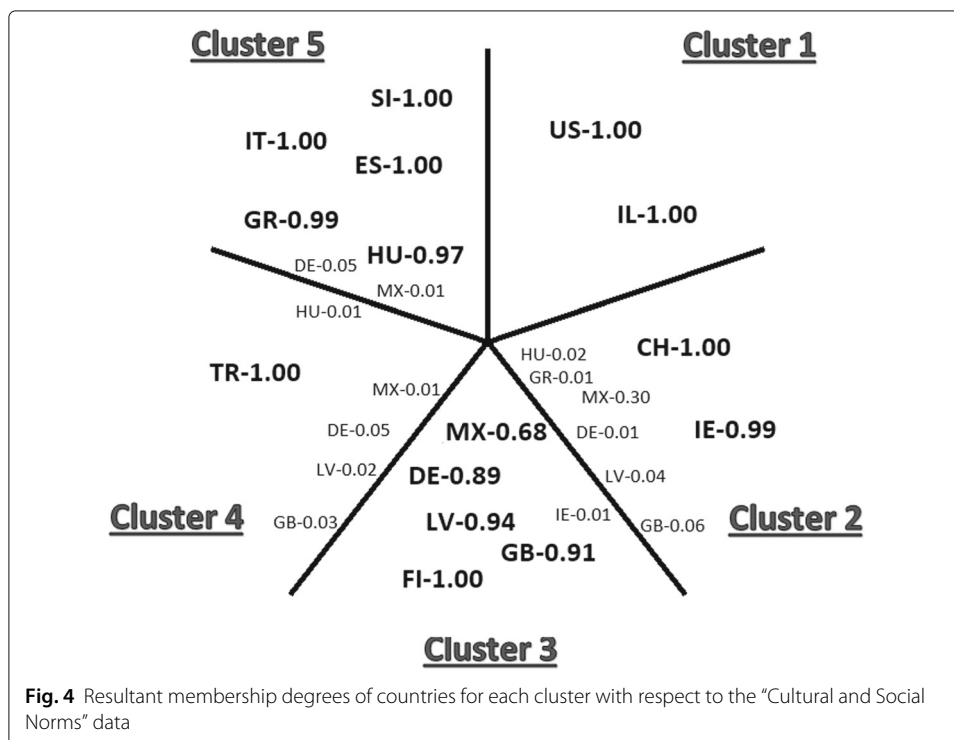
Clusters	Member countries	Average value
1	Israel (1.00), USA (1.00)	3.98
2	Switzerland (1.00), Ireland (0.99)	3.20
3	Mexico (0.68), UK (0.91), Latvia (0.94), Finland (1.00), Germany (0.89)	2.87
4	Turkey (1.00)	2.71
5	Italy (1.00), Greece (0.99), Hungary (0.97), Slovenia (1.00), Spain (1.00)	2.32

Notes: The numbers within parenthesis show the membership degree of the country to the cluster

Table 5 and Fig. 5 show the fuzzy clustering results of the selected countries based on the resultant “Nascent Entrepreneurship Rate”s of the countries. With the highest average nascent entrepreneurship rate, Mexico is the only member of the top cluster, revealing a successful entrepreneurship policy. Although their cultural and social norms are not totally supportive of entrepreneurship, a combination of governmental support and post-school education appears to be correlated with a high nascent entrepreneurship rate.

**Discussion**

The results of this study can be interpreted in terms of each of the environmental incentives of entrepreneurship. The resulting clusters based on governmental support and policies have a different structure from that of the clusters based on nascent entrepreneurship rates of the countries. This may be related to the higher impacts of other environmental incentives on entrepreneurship. This result is consistent with the findings of the previous literature that the impact of public policies on entrepreneurship varies from country to country (Hart 2003). Stevenson and Lundström (2007) have highlighted the complexity of policy-making for two main reasons. First, many and varied policies related to trade,



**Fig. 4** Resultant membership degrees of countries for each cluster with respect to the “Cultural and Social Norms” data



develop the entrepreneurial competences of students in Latvia. Varblane and Mets (2010) have also indicated that 71 percent of schools have entrepreneurship-oriented courses in Latvia. Baltrušaityte-Axelsson et al. (2008) have reported that Latvian business environment has considerably improved after 2004, on which Latvia became a member of the European Union (EU). They have highlighted the impact of the EU requirements for economic and social improvements on the increase of entrepreneurship rate. However Dombrovsky et al. (2011) have pointed out the better position of Latvia in entrepreneurial activities compared to the other post-socialist and the EU member countries (such as Slovenia and Hungary).

The third environmental incentive in our research is the cultural-social norms. The high score on cultural-social norms of the USA may explain its membership in one of the highest clusters of nascent entrepreneurship rate. Moreover, although Slovenia has moderate scores on governmental support and education, its low rate of nascent entrepreneurs may be a result of having one of the lowest scores in cultural and social norms. All of these findings show consistency with the previous researches, which have demonstrated the strong impact of culture on entrepreneurship. Liñán F and Ortega (2015) have analysed panel data of 55 countries and revealed the interactions of cultural values and entrepreneurship. Morales et al. (2015) have also obtained similar findings and emphasized the importance of entrepreneurial cultural values. Furthermore, Wach (2015) has investigated the roles of cultural and social norms on entrepreneurship on the basis of GEM data. His findings state that entrepreneurial culture has motivating impacts on individuals perceptions, which result in a higher entrepreneurship rate. All of these researches corroborate the potential dominant effect of culture on entrepreneurship rate and promote our related findings for the USA and Slovenia.

The main findings of this research reveal some important features of incentives of entrepreneurship. First, even if a country does not particularly perform well (e.g., be a member of the first or second cluster) with respect to every environmental incentive, performing well only in one or few of the incentives may result in a relatively high nascent entrepreneurship rate, if the well-performed incentive is dominant over the other incentives for that country. The examples of Latvia and Slovenia explained above highlight the idea that for some countries some specific indicators may be more crucial and require specific focus in order to encourage entrepreneurship. This would help decision makers to take their actions efficiently and effectively in entrepreneurship context of their countries. Analysing which incentive is dominant among others for entrepreneurial development may increase the success of related decisions and implications.

The findings related to Turkey compose another part of our discussions. These obtained findings reveal that all of the environmental incentives of Turkey are at moderate level and consistently Turkey is in the third (moderate) cluster regarding nascent entrepreneurship rate. This result suggests that countries may choose to compare their positions with other countries and may decide to take political, educational or cultural actions moderately. These may provide a risk-averse policy, which proposes a neither high nor low entrepreneurship rate in the country.

## **Conclusion**

The integrated framework and international comparisons help to develop more comprehensive approaches to entrepreneurship. Gnyawali and Fogel (1994) gave specific



emphasis on relationships of environmental dimensions and elements of new venture creation. Their study has identified that a match between environmental factors and requirements of individuals to become an entrepreneur would lead to greater potentiality and sustainable new ventures in the long-term. While, the existing literature has revealed the environmental indices of entrepreneurship and examined their impacts on entrepreneurial decisions of individuals, most of them have focused on a fraction of environmental factors. Although there is conceptual framework in literature, there is a gap in empirical researches which shows overall pictures on countries' main indicators of entrepreneurial environments and the rate of new entrepreneurship activities. Clustering countries, ordering these clusters and indicating relative positions of countries according to their positions for entrepreneurial environment and new entrepreneurs' rates provide empirical ground for practical recommendations.

The findings of the current study should be of interest not only for researchers, but also for policy makers, teachers and parents. This study approaches to entrepreneurship by three environmental motives that are legal, educational and cultural supports, and illustrates countries profile on these aspects. On the practical level, our findings provide an opportunity to policy makers to note their global position and compare themselves to other countries in terms of entrepreneurship context. Also for researchers, the countries that each cluster contains and the position of the cluster among all clusters would be helpful for interpreting the results related to other environmental or individual motives of entrepreneurship. Besides the overall pictures of countries, this research also helps to demonstrate different country contexts (such as Latvia or Slovenia) on main environmental incentives.

#### **Limitations and suggestions for further researches**

Similar to all researches, this study should also be considered in light of its limitations. The first limitation of this study is about data. The data were obtained from Global Entrepreneurship Monitor database and organized according to our research question. However, the missing countries across the years led us to analyze 15 countries for the period of 2009-2013. Further studies can be conducted with larger scale of data and for longer period of time. This would be helpful in order to illustrate global context of entrepreneurship more comprehensively.

The second limitation concerns the methodology. Fuzzy clustering approach may assign an object to more than one category, even though one of these categories more heavily shape the features of the object. This provides more elastic and sensitive approach than classic clustering analysis. However, the methodology of the current study does not demonstrate any relationships or predictions between variables in question. The future studies may consider the predictions of roles of environmental incentives on nascent entrepreneurship rates or entrepreneurial intention. More specifically, the differences on common public policies, training programs or cultural norms between countries can be considered as reference variables and the entrepreneurial profile of countries can be compared internationally in further researches. Further comparative or clustering researches would be beneficial in order to indicate countries' overall relative status for specific time periods and may reveal how same or parallel policies and cultural background could predict entrepreneurial activities differently depending on countries.

As mentioned previously, public support, educational infrastructure and culture might be considered as main incentives, but surely environmental factors are not limited to these. Our findings related to Switzerland demonstrated that Switzerland has had relatively high scores in all environmental incentives that are considered in this study. However, its membership in nascent entrepreneurship rate was obtained in fourth cluster. This may be interpreted within the broad concept of entrepreneurial environment and the impacts of other environmental or individual dynamics which are not considered in the present study. The concept of environmental incentives is broad in terms of the associated variables and time. Therefore, our findings suggest that an important direction for future researches which is incorporating other possible motivators of entrepreneurship into the analyses for a broader discussion.

Lastly, differences regarding to environmental incentives of entrepreneurship and their impact on the rate of nascent entrepreneurship cannot only be found between nations or states but also within them. Therefore, further studies which will consider the contextual motives may explain their findings within country-context.

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All authors of this research paper have directly participated in the planning, execution, or analysis of this study and have contributed and approved the final version submitted.

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