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On the creative climate and innovativeness at the country level*

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Abstract

The paper presents an explorative study on creative climate and innovativeness at the county level in the EU27. We explored a possibility to extend the Ekvall's concept of creative climate for innovativeness from the level of individual organization to the national level. The main research goal was to identify fragments of national creative climate and to prove its relation to innovativeness. As the measurement for national innovativeness we took the Summary Innovation Index. The fragments of national creative climate were identified by 25 questions and answers selected from different public opinion polls published in the Eurobarometers. Using hierarchical clustering we clustered all EU member states and compared them with the clusters that identify Innovation Leaders, Innovation Followers, Moderate Innovators, and Catching-up countries. We found membership of both sets of clusters similar, which means that two essentially different sets of variables arriving from two completely different sources led to comparable result. We also identify top ten variables that contributed the most to distingnishing between Creative climate clusters. Finally, we argued that understanding creative or innovative climate in the EU countries is an important national policy-making tool that could complement hard macro-economic indicators that are focused on innovative performance only, and not also on innovative socio-cultural environment. We wished-for a unified approach in the EU to develop an objective measurement for creative climate at country level. We also discussed some research challenges linked to this idea.

Key words: *summary innovation index (SII), national innovation performance, creative climate, Ekvall's dimensions, EU member states*

JEL classification: *A13, C12, O31*

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1. Introduction

The relation between innovativeness and organizational climate is an attention grabbing issue among practitioners and researchers. Regardless of different methodological approaches and research goals studies proved that encouraging climate significantly influence innovativeness in the organization (Danegan at al., 1992, Zain and Rickards, 1996, Hofstede, 1998, Montes at al., 2004, Ismail, 2005). Consequently, there is an interesting question if we can create a positive atmosphere for innovativeness also at national level. We would intuitively accept this idea because national economies or society are just organizations on higher hierarchical level. Many studies focused on different aspects of national social and cultural environment ant its impact on organizations and their economic efficiency (Pothukuchi at al., 2002, Deshpandé and Farley, 2003, Bavec, 2007). Some indirectly related works are dealing with social capital and its influence on economic development (Putnam, 1993, Halman, 2001, Francois and Zabojnik, 2005). However, these concepts are not fully overlapping with the concept of creative climate so they need some further explorations.

Our research interest was focused on two very general questions:

- Can we extend already proven and successful concepts of organizational innovativeness and climate from the level of a single organization to the national or regional level?
- Can we identify at least fragments of national creative or innovative climate that have a positive effect on innovativeness at the national levels?

Innovativeness alone is widely explored topic for decades (Damanpour, 1992, Mumford and Hunter, 2005, Likar at. al, 2008). On the other side the innovative or creative climate has extensively been studied just in the last ten or fifteen years. Particularly Ekvall's (1996) work on creative climate initiated lots of research on the innovative environment in the organization (Isaksen at al, 2001b, Susanj, 2000, Mathisen and Einarsen, 2004). Ekvall defined the climate as "the observed and recurring patterns of behavior, attitudes, and feeling that characterize life in organization". He proved that his approach to the climate measurement clearly differentiate the innovative and stagnated organizations. However, these researches and developed models were applied only at the level of an individual organization.

Less attention has been devoted to the related issue of creative climate and innovativeness at national or regional levels. The rationale behind this subject is well known fact that social and cultural environment in which particular organization operates significantly influence its organizational culture and consequently its organizational climate. Multinational companies were among the first that met the challenge of innovating in different social and cultural environments (Whitley,

2000, Lam, 2006), particularly the companies that used their subsidiaries across the globe as an important source of innovation. Quite pragmatically, they realized that they had to employ different managerial and organizational strategies in different environments. For them, it was quite obvious that their management can influence and stimulate just a part of organizational climate. The other part is more or less implanted from the environment in which organizations operate.

Illustrative is the study of innovativeness of two subsidiaries of a German multinational company operating in Germany and Malaysia (Mohd Nazri Khan, 2002, Zain at al., 2003). It was based on Ekvall's (1996) ten dimensions of creative climate and the Creative Climate Questionnaire (Ekvall at al, 1983). Both subsidiaries were part of the same company with the same organizational and managerial rules, so we could rationally expect similar behavior. However, the fact that the subsidiaries operated in different national and cultural environments led to the significantly different results. The subsidiary in Germany was better than Malaysian in all aspects that stimulates creative climate and innovativeness. Research proved that social and cultural surrounding of the companies played the decisive role in their in-house innovativeness. Many other researches led to similar conclusions. Westwood and Low (2003) came to the conclusion that culture can and does have impact on creative and innovation processes. However, the interplay between cultural values and creativity should not be considered *universalistically, simplistically or unreflexively.* Societies are much more complex organizations than individual businesses or governments, and hence, the concept of climate has to be significantly more complex and difficult to interpret.

The concept of national climates and innovativeness exposes a lot of new research challenges. Just to mention an objective definitions and measurement of national innovativeness and national creative climate. For example, Florida and Tinagli (2004) introduced the 3Ts (Technology, Talent and Tolerance) indicator and a single Euro-Creativity Index. They overlap to some extent with the creative climate. However, we cannot interchange these concepts. Some research deals with isolated aspects of national creative climate and innovativeness; however there are no researches at national levels that can be compared with Ekvall's and other studies of creative climate and innovativeness at the level of individual organization. We can argue that the issue of the creative climate at a national level is just initially touched by researchers.

On the other hand, there are studies on national innovativeness as an independent national attribute. Lee (1990) defined national innovativeness by four variables: GNP per capita, literacy rate, the ratio of manufacturing and service sectors to total GNP, and number of scientists and engineers per population. It is obviously oversimplified perception of innovativeness, so others opted for other definitions (Kashifa and Hessels, 2007). A similar concept has been developed by Furman at al. (2002). They introduced the National innovation capacity as "the ability of a

country to produce and commercialize a flow of innovative technology over the long term". By their definition the national innovative capacity depends on the strength of a nation's common innovation infrastructure, the environment for innovation in a nation's industrial clusters, and the strength of linkages between these two. The model was tested on the segment of national patenting. However, the concept focuses intensively on industrial innovations with a limited value for more general perception of innovativeness.

Widely accepted and exploited concept of national innovativeness was developed under the patronage of the European Commission. The European Innovation Scoreboard - EIS (European Commission, 2008) publishes annually a comparative assessment of the innovation performance of all EU27 member states, as well as some other countries. The EIS includes the Summary Innovation Index (SII) that gives an overview of aggregate national innovation performance. The SII is a comprehensive index combining 25 indicators grouped into five categories: Innovation Drivers, Knowledge Creation, Innovation & Entrepreneurship, Applications, and Intellectual Property.

In our research we pragmatically used the SII as a measurement for national innovativeness, understanding that this indicator focused on national innovative performance and not on innovativeness as the state of the mind. But, currently this is the only annually updated and comprehensive indication of innovativeness for all EU countries.

2. Research questions and hypothesis

If we accept the relevance of creative climate for innovativeness at the level of an individual organization than we could reasonably imagine something as national *creative climate* that would power *national innovativeness*. To elaborate research questions that we presented in the introduction we implemented desk research based on already collected and publicly available data for EU27 countries. To initiate any data collection in EU countries exceeded the potential of our research group. We also believed that available data are sufficient to prove the hypothesis in the exploratory phase of our research.

The Summary Innovation Index (SII) is an aggregate index based on data from national statistics. It primarily reflects national performance and structural indicators. As such, it does not indicate national innovation climate. Of course, some would argue that the climate is reflected in the innovation performance. However, Ekvall (1996) and other authors treated the climate as an independent attribute of organizations that describes behavior and life in organization. Innovativeness is just one of the consequences of the climate.

Organizational culture and climate are two different concepts; however some of the variables from both set could be equal or similar. It means that the concepts are partially overlapping. To make this distinction clear let's look closer at the Ekvall's (1996) ten dimensions of the creative climate:

1. Challenge (How emotionally involved, and committed are employees to the work).
2. Freedom (How free employees are to decide how to do their job).
3. Idea time (The amount of time employees have to elaborate ideas).
4. Trust and openness (Do employees feel safe speaking their minds and offering different points of view).
5. Dynamism (The eventfulness of life in the organization).
6. Playfulness (How relaxed is the workplace).
7. Debates (To what degree do people engage in lively debates about the issues)
8. Conflicts (To what degree do people engage in interpersonal conflicts).
9. Risk-taking (The promptness of response to emerging opportunities and fear of failure).
10. Idea support (Are there resources to give new ideas a try).

Studying these dimensions we spontaneously concluded that many of them could be implemented also at the national level.

We based our search for fragments of national creative climate on Ekvall's approach. To characterize the creative climate of the particular country or region we could paraphrase Ekvall's original definition that the climate is "the observed and recurring patterns of behavior, attitudes, and feeling that characterize life in organization" just with changing the word *organization* with *nation* or *country*. With this general definition we are still far away from any measurable quantities. To define measurable variables Ekvall and other researchers developed the Creative Climate Questionnaire (Ekvall and Arvonen, 1983) or corresponding questionnaires (Mathisen and Einarsen, 2004). In our explorative phase of the research we didn't have any intention to develop a comprehensive questionnaire suitable for national level. We focused on identification of limited number of variables that could be in the future a part of such questionnaire.

As we already said, we opted for desk research, so we had to find these fragments in already available EU information sources. To be as close to the Ekvall's methodology as possible we scanned all public opinion polls published in the European Commission's Eurobarometers. The main reason that we concentrated on the public opinion polls were methodological similarities with the Creative Climate Questionnaire where members of organizations were asked about their perception of different aspects of organizational climate and innovativeness. In the

Eurobarometers we can find many researches with individual questions that reflect some aspects of creativity and Ekvall's dimensions. We are well aware that with a limited set of variables we cannot completely cover all Ekvall's dimensions at the country level because only fragments of possible indicators are already collected. However, we strongly believed that even fragments could give an initial indication of national creative climate. We selected 25 questions (Table 1) and answers from four different public opinion polls and conditionally called them the *Creative climate variables.*

The next research question was: "Is there any relation between the Summary Innovation Index (SII) representing national innovativeness and the selected Creative climate variables in the EU countries?" Looking closer at the questions in the Table 1, we couldn't be really confident that their joint effect will correspond to the SII, at all. We also have to decide, how to prove or reject their relationship with SII.

A common approach would be a factor analysis, calculations of correlations of individual variables with SII, and related statistical tests. However, we have decided to apply different approach. Using cluster analysis should lead to similar results. The rationale behind this decision is the fact that cluster analysis puts into the focus individual samples, their relationship and their grouping (Figure 1). We were interesting exactly in this issue. On the other side, traditional statistical approach focuses more on variables. The second reason for cluster analysis was the fact that the EIS published clustering of EU members states into four distinctive groups of countries representing:

- Innovation Leaders,
- Innovation Followers,
- Moderate Innovators,
- Catching-up countries.

Clusters were calculated on the basis of the SII scores in the last five years. We wanted to compare our results with these clusters. To avoid terminological ambiguities we introduced the term *SII Clusters* for the clusters from the EIS Report to distinguish them from the *Creative climate clusters* that are results of our analysis. To enable comparisons between the SII and the Creative climate clusters we followed this methodological course and clustered EU countries by all 25 Creative climate variables. Then, we statistically compared the membership of both sets of clusters and draw required conclusions.

On the basis of presented research questions we set up the following two hypotheses:

Hypothesis 1 - National innovativeness represented by the Summary Innovation Index (SII) is related to the creative climate in the country which means that the SII clusters have similar country membership as the Creative climate clusters.

Hypothesis 2 – The means of the Summary Innovation Index (SII) in the Creative climate clusters are statistically significantly different, proving that the Climate clusters are differentiated by the level of the SII.

Rationale behind the first hypothesis is based on the assumption that we have two sets of clusters on the same sample of countries. The SII Clusters are grouping countries with similar innovativeness and the Climate clusters countries with similar climate. Because similar climate stimulate a similar innovativeness these clusters should have a comparable membership. This relationship should never be perfect because there are also some other factors that influence innovativeness and climate that we haven't take into account in our research. However, if we proof that the similarity is high we indirectly proved that the climate plays relevant or even decisive role in innovativeness. Rationale behind the second hypothesis is a purely mathematical proof that an average innovativeness in all climate clusters is significantly different.

3. Input data and research methodology

From the Special Eurobarometers we selected four public opinion polls in EU27 countries:

1. Public perception of job and working environment (European Commission, 2006);
2. Public perception of Science and Technology (European Commission, 2005b);
3. Public attitude towards some cultural and environmental issues (European Commission, 2007);
4. Personal trust (European Commission, 2005a)

These polls have a large number of questions that are not relevant, or at least not very much by our opinion, for analysis of innovative or creative climate. It means that we had to reduce the number of questions to the total of 25 (Table 1). The selection of these variables was based on purely deductive approach (Ketchen and Shook, 1996). Our main guidance in their selection was anticipation that they are related to Ekvall's dimensions of creative climate at firms' level, allowing very subjective interpretation of his dimensions at the national level. In the Table 1 we can recognize many Ekvall's dimensions like Trust and Openness (22 and 23), Freedom (24), Conflicts (19), Dynamism (3 and 4), Challenge (8 and 9), or Playfulness (7). With such a broad interpretation of Ekvall's dimensions we decided on 25 questions that represented our Climate variables in the further clustering procedures.

Table 1: Questions from the public polls used in the research (all questions are citations from researches published in Eurobarometers)

	Questions (Climate variables)	Source and the ID of question
1	Job satisfaction scale	SEB 273, 2006, Page 22
2	I am well paid	SEB 273, 2006, QA9
3	My job offers good prospects for career advancement	SEB 273, 2006, QA9
4	Entrepreneurship is best embodied by Europe and other countries	SEB 278, 2007, QA17
5	My work is too demanding and stressful	SEB 273, 2006, QA9
6	My work is dull and boring	SEB 273, 2006, QA9
7	I work with people I like	SEB 273, 2006, QA9
8	My job allows me to take part in making decisions that affect my work	SEB 273, 2006, QA9
9	My job allows me to make use of my knowledge and skills	SEB 273, 2006, QA9
10	I am most interested in scientific research	SEB 282, 2007, QB1
11	I am most interested in economics and social sciences	SEB 224, 2005, QA2b
12	I am well informed on new inventions and technologies	SEB 224, 2005, QA3
13	Only by applying the most advanced technologies can our economy make more competitive	SEB 224, 2005, QA13b
14	The application of S and T will make peoples' work more interesting	SEB 224, 2005, QA12b
15	Progress and innovation is best embodied by Europe and other countries	SEB 278, 2007, QA17
16	We depend too much on science and not enough on faith	SEB 224, 2005, QA12a
17	Science has too negative image in society	SEB 224, 2005, QA15b
18	How you are in meeting in person people from other European countries	SEB 278, 2007, QA12
19	We should preserve and reinforce cultural diversity	SEB 278, 2007, QA16
20	We should preserve and reinforce respect for history and its lessons	SEB 278, 2007, QA16
21	We should preserve and reinforce respect for nature and the environment	SEB 278, 2007, QA16
22	Most people can be trusted	SEB 223, 2004, QD3
23	We should preserve and reinforce tolerance and openness to others	SEB 278, 2007, QA16
24	We should preserve and reinforce freedom of opinion	SEB 278, 2007, QA16
25	Science and technology can sort out any problem	SEB 224, 2005, QA12a

Source: European Commission

The EIS shows that the SII clusters have been very stable over the last five years with just few countries transiting from one cluster to another. This stability of the SII clusters justifies our methodological deficiency that we used data from public polls in the period from 2005 to 2007 and comparing them with the SII in year 2007. Similar findings are presented in a lot of research on social variables that proved to be quite stable over time. We supposed that the public answers would not noticeably change in the period of three years.

Further research took the following steps:

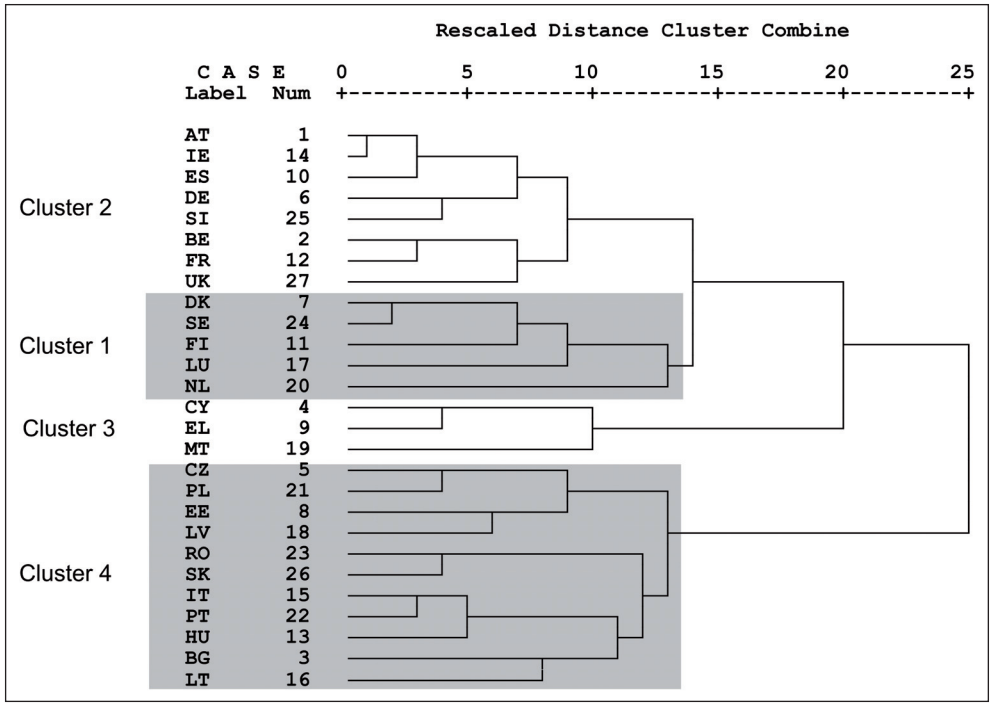
1. we clustered EU27 countries into four clusters using Hierarchical and K-Means clustering (in the paper we presented just results of the hierarchical clustering, but it led to very similar results as the K-Mean clustering);
2. Comparing cluster membership (countries) in the SII clusters with the Creative climate clusters (we calculated the percentage of membership matching between clusters);
3. Calculating the mean SII for each Creative climate cluster and testing the significance of means differences.

To validate results we used two clustering algorithms Hierarchical and K-Means clustering. On the level of two clusters we got nearly the same result by both methods (cluster membership), yet on the level of four clusters we noticed very similar membership in the clusters 1 and 2 (Figure 1) and some differences in the clusters 3 and 4. When we compared cluster membership of the K-Means clusters with the SII clusters we concluded that they also confirm both research hypotheses. However, the hierarchical clustering led to statistically more significant proof of the hypothesis. We also preferred to present the hierarchical clustering because the dendrogram (Figure 1) gives us graphical and easy to comprehend presentation of clusters and their sub-clusters. The dendrogram also enable a visual estimation of similarity of individual countries and an insight into their grouping. These characteristics of hierarchical clustering perfectly suited or research intention as we concentrated on samples (countries) rather than variables that describe their properties.

4. Presentation of results

Using the SPSS package we implemented the hierarchical clustering based on the average linkage between groups with the standardized variables (Z-scores) and the Squared Euclidian distance. The result of hierarchical clustering in the form of the dendrogram is presented in the Figure 1.

Figure 1: Dendrogram using Average Linkage between groups



Source: Author

We can immediately identify two distinguished clusters (at the rescaled distance between 20 and 25) that separate the thirteen old EU15 countries together with Slovenia, Cyprus and Malta from the other new EU27 member states, together with Italy and Portugal. These two countries are the only EU15 member states that are classified into the group with the new member states. Otherwise, the Cluster 3 is fairly compact and is obviously on the half way between the Clusters 1 and 2 on one side and the Cluster 4 on the other. If we associate this cluster to the Cluster 4 then this division between old end developed and new and less developed EU countries become even more distinctive. This result is the first indication that our climate clusters correspond to innovativeness because in the first cluster are concentrated Innovation Leaders and Innovation Followers and in the second Moderate Innovators and Catching-up countries (Table 2).

To match the four SII clusters and allows comparison with the climate clusters we decided to stop clustering at four Creative climate clusters, at the rescaled distance between 13 and 14. For easier interpretation of final results we reorder the labeling of the first two clusters.

It is interesting to notice that Nordic countries and Luxembourg are in a separate group (Cluster 1). These countries are also the most innovative European countries showing nearly perfect mach between innovativeness and selected fragments of creative climate. Other most developed and innovative European countries are in the Cluster 2, again indicating strong relation between innovativeness and climate. Surprisingly, Slovenia is the only new EU member state that is classified into this group. Cyprus, Greece and Malta are again group together (Cluster 3) indicating many social and cultural similarities. All other new EU member states are clustered jointly into one group (Cluster 4). Not going into detailed discussion of this cluster we could just bring attention to the sub-cluster with Italy, Portugal and Hungary, again indicating similarities between these countries. Similarly are grouped Czech Republic, Poland and Estonia.

An objective validation of clustering results can be a difficult task (Kechen and Shook, 1996), so we use few different methods to assess the results. We have already mentioned two different clustering algorithms: hierarchical and K-means. With Levene's test we confirmed the variance homogeneity for all variables, except for the variable 13. It is a precondition for using the ANOVA tests. However, our sample is large enough to anticipate in any case that the sample means will be normally distributed due to the central limit theorem. Results indicated that the model was statistically significant at $p<0.05$ for all variables except for the variable 15.

With the ANOVA post-hoc F-test we assessed how much an individual variable contributed to discrimination between clusters. The F-test indicated that the top ten variables that made the highest contribution to cluster discrimination are presented in the Table 2.

Table 2: Top ten variables with the highest contribution to cluster discrimination (ANOVA post-hoc F-test)

		F	Sig.
1	Trust (variable 22),	25.681	0.000
2	Job satisfaction (variable 1)	22.449	0.000
3	Interest in scientific research (variable 10),	18.065	0.000
4	Tolerance and openness (variable 23)	14.448	0.000
5	Use of knowledge and skills (variable 9)	13.557	0.000
6	Part in making decision (variable 8)	12.705	0.000
7	Work with people one likes (variable 7)	11.442	0.000
8	S&T can sort out any problem (variable 25)	10.856	0.000
9	Entrepreneurship embodied in EU (variable 4)	8.345	0.001
10	Demanding and stressful work (variable 5)	7.964	0.001

Source: Author

We could claim that these are the most significant Creative climate variables that we analyzed. We experimented further and repeated the clustering procedure only with these top ten variables. It resulted to identical clusters as in the case of all 25 variables. It was an additional confirmation that these variables are the most relevant.

Table 3: Country membership for the SII and Climate clusters

Country	SII Cluster Membership	Climate Clusters Membership	Summary Innovation Index
(1)	(2)	(3)	(4)
AT	B	2	0.48
BE	B	2	0.47
BG	D	4	0.23
CY	C	3	0.33
CZ	C	4	0.36
DE	A	2	0.59
DK	A	1	0.61
EE	C	4	0.37
EL	D	3	0.26
ES	C	2	0.31
FI	A	1	0.64
FR	B	2	0.47
HU	D	4	0.26
IE	B	2	0.49
IT	C	4	0.33
LT	C	4	0.27
LU	A	1	0.53
LV	D	4	0.19
MT	C	3	0.29
NL	B	1	0.48
PL	D	4	0.24
PT	D	4	0.25
RO	D	4	0.18
SE *	A	1	0.73
SI	C	2	0.35
SK	D	4	0.25
UK	A	2	0.57

Source: European Innovation Scoreboard (columns 2 and 4) and author (column 3)

The next step in analysis was a comparison between four Climate clusters (Figure 1) and the four SII clusters (the membership is seen in the Table 3) which are labeled with capital letters:

A - Innovation Leaders

B - Innovation Followers

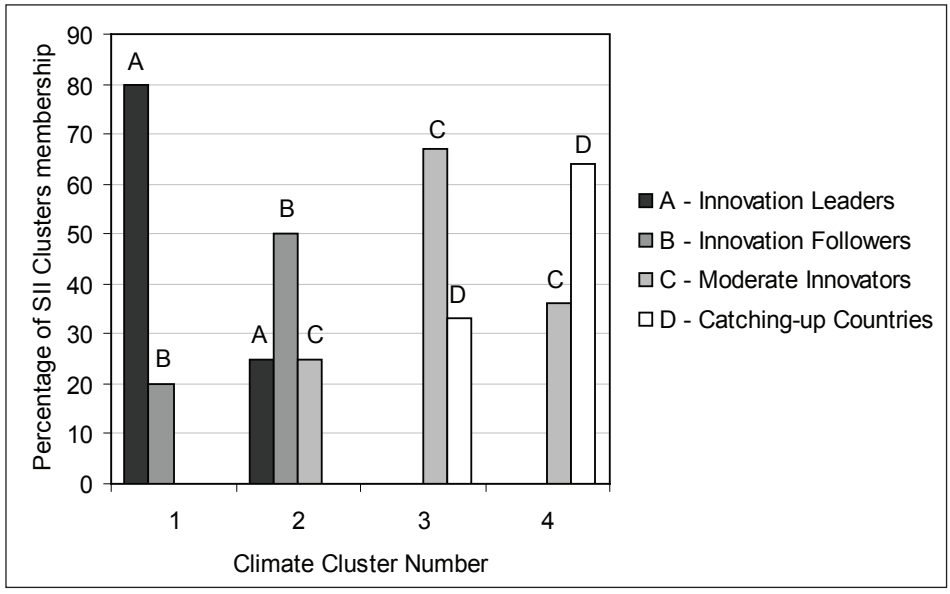
C - Moderate Innovators

D - Catching-up countries

Sweden performed better than other Innovation Leaders. In the EIS it forms its own cluster; however we placed it into the SII Cluster A.

For the SII clusters were available just data on their membership (European Commission, 2008) with no other statistical information, so we had to make relatively simple comparisons between clusters. For each Creative climate cluster we calculated the percentage of members from the SII clusters. Of course, we couldn't expect the identical membership in the SII and Climate clusters. However, the Figure 2 confirms that each SII Cluster corresponds to one Climate cluster with a single distinctly prevailing clusters' membership.

Figure 2: The SII clusters membership in the Climate clusters

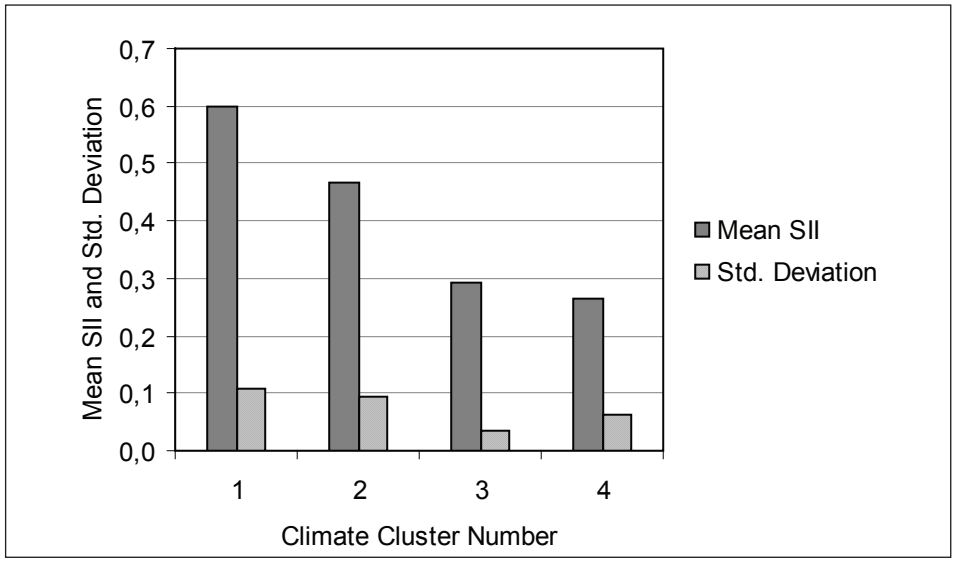


Source: Author

In the Figure 2 we can notice that in the Climate cluster no.1 there are 80% of the Innovation Leaders, 20% of the Innovation Followers and no Moderate Innovators or Catching-up countries. In the Climate Cluster 2 are prevailing Innovation Followers with 50% over Innovation Leaders with 25% and Moderate Innovators also with 25%. In the Climate Cluster 3 are strongly prevailing Moderate Innovators with 67% over Catching-up countries with 33%. In the last Climate Cluster 4 the largest number represents Catching-up countries with 63% followed by Moderate Innovators with 37%. Innovation leaders and followers are concentrated in the Climate clusters 1 and 2, with no occurrences in the Climate clusters 3 and 4. On the other side, Catching up countries are concentrated in Climate cluster 3 and particularly 4.

These results confirm the Hypothesis 1 that the Climate clusters have a similar country membership as the SII clusters.

Figure 3: Mean SII for the Climate clusters



Source: Author

As the final step, we calculated SII mean for each Climate cluster. From the Figure 3 we can see that SII means are significantly different for each Climate cluster. We can interpret them on a very similar way as the EIS - the Climate cluster 1 identifies potential Innovation leaders, the Cluster 2 potential Innovation followers, the Cluster 3 Moderate innovators and the Cluster 4 Catching-up countries. We are using the word *potential* because positive creative climate in the country doesn't automatically mean high innovation performance. An illustrative example is

Slovenia, which is grouped with the countries with a very positive creative climate. However, its innovation outcome is significantly lower and is in the range of the Moderate innovators.

To confirm the Hypothesis 2 that that the means of the Summary Innovation Index (SII) in the Climate clusters are significantly different we used the One-Way ANOVA F-test because the Levene's test of homogeneity of variances confirmed its homogeneity. The ANOVA test confirmed ($F=24.34$ and $Sig.<0.01$) that the means of the SII are significantly different, so we confirmed also the second hypothesis.

5. Issues for further research

The presented research was truly exploratory. When we started to experiment with available data we were not certain that we can prove any correlation between the Summary Innovation Index (SII) and any of public opinions from the Eurobarometers. We speculated from the beginning that some public opinions can tell something about innovative climate on the national level. We are fully aware that our selected fragments of climate at national level are more intuitive than methodologically unambiguous concept. In our research we were limited with availability of data on the EU level. However, we demonstrated that public opinion on selected issues (Table 1) correlates with the SII. Even their composite effect leads to similar clustering as SII undoubtedly differentiating the innovative and stagnated nations: Innovation Leaders, Innovation Followers, Moderate Innovators and Catching-up countries.

We proved that there is possible to find national indicators that reflect innovative climate on the similar way as we analyze innovative climate at organizational levels. The major limitation of the study is the fact that we studied just opinion polls showing public perception of job and working environment, perception of S&T, and public attitude towards some cultural and environmental issues. Including other questions that will comprehensively cover all ten Ekvall's dimensions we could come to more objective measurement for creative climate at national level. It is obvious that some of these potential variables are also part of other social indicators. For example, trust is an important part of social capital (Francois and Zabojnik, 2005). It just illustrates that creative climate could overlap with other social or cultural issues, so there is no reason for its separate treatment.

The main challenge that deserves further studies is how far we can go comparing the climate as defined by Ekvall with the national climate. It is obvious that the nation is incomparably more complex system than a single organization. We can presume that climate at national level would be equally more complex concept. The first research challenge would be to define the dimensions for the national climate on the similar way

as Ekvall and to identify independent variables that describe these dimensions. In the paper, we just indicated possible candidates. The variables should be tested in different countries to prove their relevancy in different economic and social environments. To develop such questionnaire we can use all Ekvall's dimensions of the creative climate and many of 50 questions in the Situational Outlook Questionnaire (Isaksen at al., 2001a). Not covered by any of current polls are particularly Ekvall's dimensions like Idea time, Dynamism, Risk-taking, and Conflicts.

The second, much tougher research challenge would be to investigate if we should or could include in the concept of the national climate also individual organizations. Rationale behind this concern is an assumption that national innovativeness is combination of innovativeness of individuals and innovativeness of organizations. However, this is just a reflection of discussions in our research team.

6. Some policy implications

In the EU we are regularly measuring innovation performance of member states in the form of the SII. We are essentially focusing on the final innovation outcome of many forces that shape innovativeness, not fully considering what these forces are. The variables that define the SII basically measures two groups of indicators:

- National efforts and investments into education, ICT, R&D, and venture capital;
- Economic aspects like high-tech exports, employment in medium and high-tech manufacturing, and patent submissions.

As we see, there is very little in these indicators that directly refer to creative climate at the country level. National policy makers could easily oversimplify this issue. It looks that they can boost national innovativeness just by higher investments into R&D, ICT or education, and by increasing incentives into high-tech industry and services. From the authors' experience, it is a prevailing political thought, in the new EU member states. It is obvious that such perception ignores many other relevant mechanisms that strengthen innovativeness and absorption ability for new technologies or services (Dyker, 2001, Furman at. al., 2002, Florida and Tinagli, 2004).

We have to emphasize that even the EIS concluded in the Executive Summary that the *social capital and knowledge flows are potential key factors in innovation performance*. However authors didn't elaborate the issue into more details. They stayed at the conclusion that *beyond GDP, differences in social capital and technology flows have the greatest power to explain differing levels of innovation performance*. In the paper we advocate for creative climate in the country as one of the relevant variables that should be included into national and EU development policies.

We believe that the European Commission and the EU member states should develop a comprehensive index that would reflect innovative climate at country levels, as a part of regular statistical researches. Balanced national innovation and development policy should be equally based on the current innovation performance expressed by *hard* macroeconomic indicators, as well as on the *soft* indicators showing innovative or creative climate. For example, we showed that public awareness on S&T significantly correlates with innovation performance. Consequently, we can presume that government investments into public awareness and acceptance of S&T would also increase national innovativeness. It could be one of the cheapest government's supporting mechanisms. In the paper we didn't investigate which innovation performance and which innovation climate variables are causes and which are consequences. We could just guess that innovation climate stimulates innovation performance, but on the other side the innovation performance also influence innovation climate.

7. Conclusions

We argued that understanding creative climate in the EU countries could be an important national policy-making tool that will complement *hard* macro-economic indicators that are focused on innovative performance and not on creative socio-cultural environment. Such combination of hard and soft indicators is already well proven managerial approach and an efficient strategic tool at company levels. We would expect similar effects at country or EU levels. That is the reason that we advocate for a unified approach in the EU to develop a objective measurement for creative climate at country level.

We had no intention to propose an all-inclusive set of variables describing creative climate at the country level. In our preliminary research we just pointed to some variables that are supposed to be considered in measuring creative climate. Top ten variables that discriminate our Creative climate clusters are very likely among them.

The study was distinctly exploratory and faced many limitations. Positive results open some interesting research questions. Future research on identification of relevant creative climate variables requires a clear methodological approach. It has to be investigated if we could use Ekvall's dimensions, or we have to develop new set of dimensions. From our understanding of the problem the answer would be no. Another challenge is how to combine two different worlds. We should focus on individual citizens and their perception and attitudes toward different creative climate issues. This was a pragmatic approach we employed. However, working on our research we gradually came to conclusion that we also have to investigate attitudes of individual companies because they are independent subjects that are relevant in building national creative climate. An important part of citizens'

attitudes is in reality born and shaped in organizations where they work. Introducing organizations into this research equation could significantly complicate the problem. In further researches we would suggest a two-level approach because we think that an efficient model of national creative climate should be based on individual citizens and also on individual organizations.

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O kreativnoj klimi i inovativnosti na razini države

Cene Bavec[1]

Sažetak

U članku je predstavljena inicijalna studija o kreativnoj klimi i inovativnosti na razni država u Europskoj uniji. Istražili smo mogućnost proširenja Ekvallovog koncepta kreativne klime za inovativnost sa nivoa individualne organizacije na nivo države. Glavni istraživački cilj je bio identificirati fragmente nacionalne kreativne klime i potvrditi da je u relaciji sa inovativnošću. Kao mjerilo nacionalne inovativnosti uzeli smo sumarni indeks inovativnosti (Summary Innovation Index). Fragmente nacionalne kreativne klime identificirali smo pomoću 25 pitanja i odgovora koje smo selektirali iz različitih istraživanja javnog mnijenja u EU objavljenih u Eurobarometru. Koristeći hijerarhičnu klaster metodu grupirali smo članice EU i usporedili dobivene klastre s grupama koje identificiraju inovacijske vođe, inovacijske sljedbenike, prosječne inovatore i države koje se tek priključuju (klasifikacija Europske komisije). Rezultat je pokazao da je zastupljenost država slična u obje skupine klastera što znači da su dvije bitno različite skupine varijabla iz dva potpuno različita izvora dovela do vrlo sličnog rezultata. Identificirali smo deset najznačajnijih varijabli, koje najviše pridonose distinkciji između klastera. Na kraju smo iznijeli tvrdnju da je razumijevanje inovacijske klime u državama EU značajno oruđe za vođenje nacionalne politike koje je komplementarno tvrdima makroekonomskim indikatorima koji su fokusirani samo na inovacijski učinak a ne i na socijalno i kulturno okruženje. Predložili smo unificiran pristup EU ka razvijanju objektivnog mjerila za inovativnu klimu na razini država članica. Identificirali smo i nekoliko istraživačkih izazova vezanih za tu ideju.

Ključne riječi: *sumarni indeks inovativnosti (SII), nacionalna inovacijska učinkovitost, inovacijska klima, kreativna klima, Ekvallove dimenzije, EU članice*

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