INFLUENCE OF CULTURAL DIMENSIONS “LONG TERM ORIENTATION” AND “UNCERTAINTY AVOIDANCE” ON INNOVATIVE ACTIVITY

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ABSTRACT
The paper deals with national culture influence on countries’ innovative development. Main goal is to analyze the impact of national culture on innovative activity on the macroeconomic level. The article explores Geert Hofstede’s cultural dimensions that allow assessing influence of main human values and mentality special features on behavioral patterns. The authors research an interaction between long term orientation and uncertainty avoidance and a level of innovative activity in various countries by means of a multivariate correlation analysis. The authors use – high-tech exports (% of manufactured exports) for innovative activity assessment. The authors conclude that uncertainty avoidance influences innovative activity. According to the research an association between uncertainty avoidance and innovative activity is inverse, this fact corresponds with Hofstede’s theory, the lower uncertainty avoidance, the higher innovative activity level. According to Cheddok scale an association between uncertainty avoidance and high-tech exports is strong, a correlation rate is -0.7. As far as long term orientation is concerned, the authors did not find any association with innovative activity level.

Keywords: Long term orientation, uncertainty avoidance, innovative activity, high-tech exports

Introduction
The basis of economic development today is innovations, according to Schumpeter’s and Kondratieff’s theories innovations are reasons for economic growth and increasing standards of living. Schumpeter considered an innovation as “a change in existing production system to be introduced by the entrepreneur with a view to make profits and reduce costs”. According to his theory innovations can include introduction of a new production method or a new product, the conquest of a new source of supply of raw materials or semi manufactured goods and the carrying out of a new industrial organization like a monopoly creation. Any new combinations of these factors are necessary to start a development process (Schumpeter, 1942). Kondratieff, having developed Schumpeter’s theory, proved that such innovations as steam engines, railways, automobiles, radio and telegraph energized economic development dramatically (Kondratiev, 1984).

We can see that some countries are developing very fast, some – very slowly, what are reasons for such a difference in economic development? Of course, the most important factor, influencing the situation – investments in development and research, but we can see that some countries with huge investments in these fields develop more slowly than countries with the same or even lower level of investments. What other factors can influence the situation? What role do mentality and national cultures values play?
The main goal of this article is to analyze the influence of cultural specific features on innovative development of the countries.

In classical economic theory a human being is considered in isolation from his/her cultural specific features, feelings and emotions, but it is obvious that in real life people are influenced by them, and they are likely to play a key role in economic behavior.

There are rather few researches devoted to the influence of cultural specific features on economy, since it is rather difficult to emphasize the influence of cultural factors on economic behavior in the pure form, and it’s almost impossible to find a society with a homogenous culture.

Existing researches are dedicated to key cultural values, determining economic behavior in various countries.

A founder of research of a national culture and its influence on entrepreneurs behavior was Hofstede, analyzing key volumes of people, working on IBM in 72 countries since 1967 till 1973. According to his theory there are six cultural dimensions:

- power distance, showing an attitude to various kinds of inequality in the society;
- individualism/collectivism, demonstrating an extend of independence of the society members;
- masculinity/feminity, determining key motivating factors in one’s pursuit to be the best or to just live with the outworld with harmony;
- uncertainty avoidance, showing to what extend people are afraid of new and unknown things;
- long term orientation, demonstrating to what extend people use their past experience and a traditional approach to solve new problems.
- indulgence, showing to what extend people control their wishes, emotions and impulses.

Using these dimensions, Hofstede assessed the influence of national culture on values, formed in the hedges of companies’ organizational culture, that, in their turn, influenced entrepreneurs behavior (Hofstede, 2001).

The followers of Hofstede were Sagiv, Schwartz, House, Trompenaars and Inglehart, the researchers also emphasized cultural dimensions, describing people’s attitude to their place in the society, human volumes, outworld, inequality and new, unknown things (Sagiv, Schwartz, 2007; House, Javidan, Hanges, Dorfman, 2002; Smith, Dugan, Trompenaars, 1996; Inglehart & Baker, 2000). Despite of a large scientific contribution of these researches, Hofstede’s model dominates the field (Kirkman, Lowe, and Gibson, 2006).

The followers of Hofstede’s theory tried to find associations between cultural dimensions and indexes of entrepreneurial and innovative activities (Shane, 1992; Shane, 1993; Shane, 1994; Davidsson, Wiklund, 1997; Kovaleva, Bogacheva, Snezhko, Sopilko, 2017), they found out that such associations were not consistent.

We emphasized two Hofstede’s cultural dimensions, that, from our point of view, can influence innovative development of the countries, these dimensions are long term orientation “how every society has to maintain some links with its own past while dealing with the challenges of the present and future” and uncertainty avoidance “The extent to which the members of a culture feel threatened by ambiguous or unknown situations and have created beliefs and institutions that try to avoid these”(Hofstede, 2001).

According to our hypothesis, countries with high scores of long term orientation and low scores of uncertainty avoidance should have higher level of innovative development, since they have positive attitudes to new ideas and have necessary educational infrastructure for innovations development.

**Materials and Methods of Research**

The goal of the work is to check statistical significance of an association between innovative activity and cultural dimensions “long term orientation” and “uncertainty avoidance” by means of correlation analysis.

Innovative activity will be assessed by the index – high tech exports (% from manufactured exports), it is a dependent variable, cultural dimensions “long term orientation” and “uncertainty avoidance” are explanatory variables.

We used Cheddock scale for a qualitative evaluation of coefficients of correlation between – high tech exports and cultural dimensions.

Depending on a correlation rate an association can be: 0,1-0,3 feeble; 0,3-0,5 noticeable; 0,5-0,7 medium; 0,7-0,9 strong; 0,9-1,0 very strong. «+» means a direct relationship, «-» - an inverse association.
We used statistical data of high-tech exports of 10 countries for 17 years (2000-2016) for innovative activity assessment, we used average volumes of the index hi-tech exports (% from manufactured exports) (World Development Indicators) (Table 1).

Table 1. Hi-tech exports (% from manufactured exports) since 2000 to 2016

<table>
<thead>
<tr>
<th>Country</th>
<th>High-tech exports (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>13,9</td>
</tr>
<tr>
<td>Ireland</td>
<td>26,4</td>
</tr>
<tr>
<td>Israel</td>
<td>16,2</td>
</tr>
<tr>
<td>Japan</td>
<td>18,4</td>
</tr>
<tr>
<td>Germany</td>
<td>14,3</td>
</tr>
<tr>
<td>Russia</td>
<td>10,2</td>
</tr>
<tr>
<td>France</td>
<td>24,7</td>
</tr>
<tr>
<td>Singapure</td>
<td>51,2</td>
</tr>
<tr>
<td>The USA</td>
<td>21,2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>21,1</td>
</tr>
</tbody>
</table>

Indexes of “long term orientation” and “uncertainty avoidance” are presented in Table 2 (Hofstede, 2001).

Table 2. Cultural dimensions “uncertainty avoidance” and “long term orientation”

<table>
<thead>
<tr>
<th>Country</th>
<th>Uncertainty avoidance</th>
<th>Long term orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>48</td>
<td>36</td>
</tr>
<tr>
<td>Ireland</td>
<td>35</td>
<td>24</td>
</tr>
<tr>
<td>Israel</td>
<td>81</td>
<td>38</td>
</tr>
<tr>
<td>Japan</td>
<td>92</td>
<td>88</td>
</tr>
<tr>
<td>Germany</td>
<td>65</td>
<td>83</td>
</tr>
<tr>
<td>Russia</td>
<td>95</td>
<td>81</td>
</tr>
<tr>
<td>France</td>
<td>86</td>
<td>63</td>
</tr>
<tr>
<td>Singapure</td>
<td>8</td>
<td>72</td>
</tr>
<tr>
<td>The USA</td>
<td>46</td>
<td>26</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>35</td>
<td>51</td>
</tr>
</tbody>
</table>

Using indexes «uncertainty avoidance – high-tech exports (average)» and «long term orientation – high-tech exports (average)», we created factorial spaces (see Fig.1 and Fig.2). We found out a statistically significant association between a cultural characteristic “uncertainty avoidance” and high-tech exports. A correlation rate for an association is - 0,7, so can be considered as strong according to Cheddock scale.
Fig.1: Factorial space “uncertainty avoidance – high-tech exports (average)”

Fig.2: Factorial space «long term orientation – high-tech exports (average)»

Negative correlation rate means that the associations is inverse.
We did not find any association between long term orientation and high-tech exports, the correlation rate is 0.009. To create a model, describing the influence of uncertainty avoidance on high-tech exports, we chose the following formula:

\[ HTE_{\text{average}} = a \cdot UA' (1) \]

where \( a \) and \( b \) – coefficients, that should be calculated on the basis of statistic data for 10 countries for 17 years (2000-2016), UA – uncertainty avoidance, \( HTE_{\text{average}} \) – high-tech exports (average).

The model is non linear, but it can be transformed into a linear form by calculating a hyperbolic logarithm of \( HTE_{\text{average}} \) and UA.

So, for the association “uncertainty avoidance-high-tech exports (average)” an equation of the model is the following:
The graph of the association is presented on Figure 3. Statistic appraisals of the model are the following:
- Coefficient of determination 0.6497 shows that 65% of HTE deviations is connected with uncertainty avoidance;
- Each coefficient is statistically significant according to Student t-test;
- The model is significant according to Fisher LSD.

\[ HTE_{\text{average}} = 127.43 \cdot UA^{-0.4782} \quad (2) \]

**Fig. 3:** The graph of the association “uncertainty avoidance – high-tech exports”

**Conclusions**
We came to the conclusion that there is a statistically significant association between a cultural dimension “uncertainty avoidance” and innovative activity in various countries, for our research we used a correlation analysis of high-tech exports data of ten countries for seventeen years and Hofstede’s cultural dimensions. The correlation rate is -0.7. We did not find any statistically significant association between “long term orientation” and a level of innovative activity.

Our model shows an inverse association of uncertainty avoidance and innovative activity, it
corresponds with Hofstede’s theory – the less people are threatened by unknown, new things, the higher an innovative activity is.

We developed a linear model of the association “uncertainty avoidance – high – tech exports”, that would help to forecast a level of innovative activity on the basis of a cultural dimension.

Acknowledgement
The publication was prepared with the support of the RUDN University Program “5-100”.

References
World Development Indicators: