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## Cultural dimensions and innovation

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**Abstract:** This paper examines the effect of culture's dimensions on national innovation index. The results of Pearson correlation coefficient between culture dimensions and the Global Innovation Index (GII) are very similar to the results obtained in the case of Summary Innovation Index (SII) in European countries. The strong negative correlation was observed in the case of power distance and uncertainty avoidance whereas individualism has a positive effect on innovation index. The results suggest that low power distance and uncertainty-accepting countries may be more innovative than high power distance and uncertainty-avoiding societies.

**Keywords:** innovation, culture dimensions

## 1. Introduction

Innovations are nowadays considered as one of the most important factors of economic growth. Innovation has been narrowly defined only to technological advances (Edquist, 1997), more broadly not only to product innovation, but also process innovation that are new to firms (Nelson and Rosenberg 1993) and even new forms of organization (Lundvall 1992).

National culture can substantially determine business innovation (Porter, 2000; Mueller, 2013; Efrat 2014). Culture shapes the way people think about and behave in regard to taking risk, perception of opportunities, and the nature of entrepreneurial activity and, therefore, economic creativity and economic outcomes (Williams, McGuire, 2010). Innovation is important at the national level for promoting economic development (Westwood and Low, 2003). Technological progress closely related to innovations influences the productivity of resources, which sustains long-term increases in living standards (Grossman and Helpman 1991). Innovative activities are necessary to maintain the technological progress and productivity improvements that generate national prosperity (Williams, McGuire, 2010). A society's values provide social direction to the process of technological development. Herbig and Dunphy (1998) point the social organisation of a culture may either



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foster or inhibit technological development because culture tends to operate as a source of authority, responsibility, and aspiration, thus influencing the course of technological advance and the creation of material culture. Kołodko (2008) argues that the role of political and cultural determinants is very important for understanding the development or stagnation. The importance of these factors grows, so we should seek to understand them and use in practice. It is impossible to grasp the importance of cultural factors for development without historical analysis.

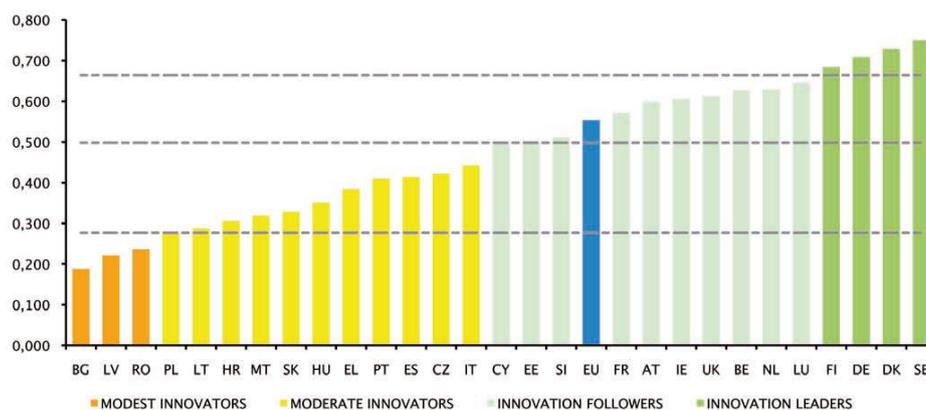
The level of innovation within a society is directly proportional to the encouragement and status given to entrepreneurial efforts within the culture (Herbig and Dunphy 1998). Landis (2000) argues that Max Weber had it right because if we learn anything from the history of economic development, it is that culture makes almost all the difference. Empirical finding of Williams and McGuire (2010) buttress the theoretical arguments that culture powerfully shapes the character of national innovation.

Despite the widely held belief that culture matters to innovation, there have been a lack of studies that provide empirical evidence of the influence of cultural dimensions on innovation index. Hence the article focuses on examining the effect of culture on national innovation. I examined the relationship between culture dimensions and Summary Innovation Index in European Union countries and Global Innovation Index in all countries. To analyze the impact of cultural dimensions of innovation were used three basic values by Hofstede's cultural dimensions: power distance (PDI), individualism (IDV), uncertainty avoidance (UAI). These three dimensions that are most likely to influence innovation projects (Shane, 1993).

The work of Hofstede (1980) has been the basis for much of the research on most management aspects of national culture. Differences in national cultures call for differences in management practices. The dimensions included in Hofstede's model: power distance, individualism/collectivism, tolerance for uncertainty, have a universal character, whether they concern individuals, organisational cultures or social cultures and they can become a basis for such a multidimensional model and typology (Sułkowski 2013).

## 2. Results and discussions

Summary Innovation Index is published by the Innovation Union Scoreboard and it applies to countries belonging to European Union or countries that wish to be its members. Based on data relating to the results of innovation, the member states fall into the four performance groups. The first group of innovation leaders includes Member States in which the innovation performance is well above that of the EU, i.e. more than 20% above the EU average. These are Denmark, Finland, Germany and Sweden. The second group of innovation followers includes Member States with a performance close to that of the EU average i.e. less than 20% above or more than 90% of the EU average. Austria, Belgium, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK are the Innovation followers. The third group of moderate innovators includes Member States where the innovation performance is below that of the EU average at relative performance rates between 50% and 90% of the EU average. Croatia, Cyprus, Czech Republic, Estonia Greece, Hungary, Italy, Lithuania, Malta, Poland, Portugal, Slovakia and Spain belong to the group of Moderate innovators. The fourth group of Modest innovators includes Member States that show an innovation performance level well below that of the EU average, i.e. less than 50% of the EU average. This group includes Bulgaria, Latvia, and Romania (European Innovation Scoreboard 2015<sup>1</sup>).



**Figure 1. Innovation performance in EU Member States**

Source: Innovation Union Scoreboard

<sup>1</sup> [http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/files/ius-2015\\_en.pdf](http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/files/ius-2015_en.pdf)

For most innovation indicators, Polish results are below the average for EU countries. The relative strengths include expenditure on innovation other than expenditure on R&D, the percentage of young people with higher education. A strong decline relates to innovative small and medium-sized enterprises, cooperation in the field of innovation, new people with doctorates, sales of new products. The results in terms of particular innovation components in Poland are presented in the table 1.

**Table 1. The results of innovation components in Poland**

<b>ENABLES</b>	
Human resources	97
1.1.1 New doctorate graduates	33
1.1.2 Population completed tertiary education	110
1.1.3 Youth with upper secondary level education	111
Open, excellent and attractive research systems	24
1.2.1 International scientific co-publications	65
1.2.2 Scientific publications among top 10% most cited	35
1.2.3 Non-EU doctorate students	7
Finance and support	66
1.3.1 R&D expenditure in the public sector	67
1.3.2 Venture capital investments	58
<b>FIRM ACTIVITIES</b>	
Firm investments	79
2.1.1 R&D expenditure in the business sector	29
2.1.2 Non-R&D innovation expenditure	151
Linkages & entrepreneurship	15
2.2.1 SMEs innovating in-house	35
2.2.2 Innovative SMEs collaborating with others	37
2.2.3 Public-private co-publications	9
Intellectual Assets	67
2.3.1 PCT patent applications	11
2.3.2 PCT patent applications in societal challenges	9
2.3.3 Community trademarks	62
2.3.4 Community designs	143
<b>OUTPUTS</b>	
Innovators	49
3.1.1 SMEs introducing product or process innovations	43
3.1.2 SMEs introducing marketing/organisational innovations	39
3.1.3 Employment fast-growing firms innovative sectors	108
Economic effects	54
3.2.1 Employment in knowledge-intensive activities	70
3.2.2 Medium & high-tech product exports	92
3.2.3 Knowledge-intensive services exports	68
3.2.4 Sales of new to market and new to firm innovations	51
3.2.5 License and patent revenues from abroad	9

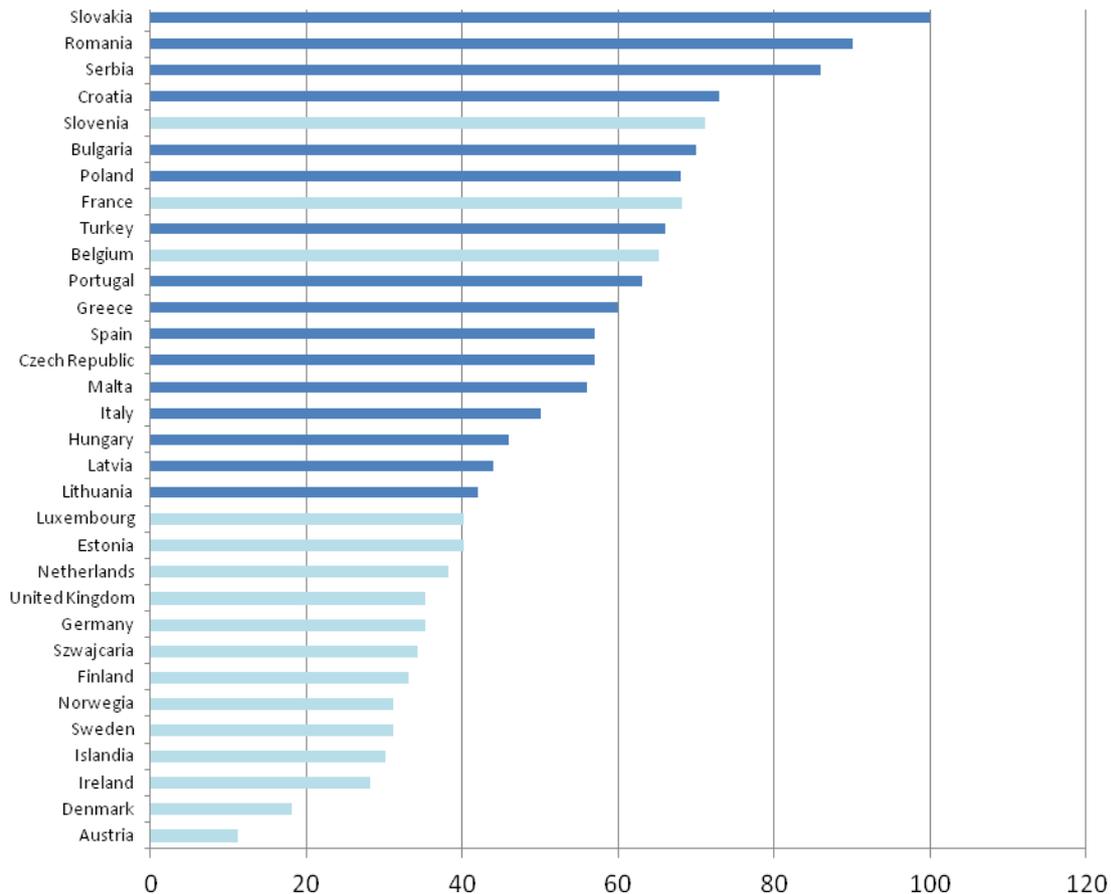
Source: based on European Innovation Scoreboard 2015

### ***Power distance***

Power Distance is defined as the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally<sup>2</sup>. Most countries with low power distance belongs to the group of countries innovation leaders and innovation followers. Exceptions are: France, Belgium and Slovenia with higher power distance than average for European countries and a relatively high Summary Innovation Index (Figure 2). All European countries with the highest innovation rates are characterized by power distance lower than average. Poland belongs to countries with high power distance. The lowest power can be seen in Austria and Denmark (Figure 2).

<sup>2</sup> <http://geert-hofstede.com/national-culture.html>

As points Moszkowicz (2000) organizational culture of Polish organisations is not unified. There are both: dynamic, unstable or even predatory private sector and often ineffective public sector, providing its employees more security and stability. Based on various studies (GLOBE: House et. al. 1998; Mięka and Nasierowski 1995), it may be assumed that the distance of power in Poland is high. Mączyński et. al. (1993) stated that superiors appreciating the importance of good relations with subordinates want to give the impression that they take into account opinions of subordinates and preferences in decision-making. However, the impact of subordinates on decisions was limited to matters of secondary importance, trivial and unimportant. Hryniewicz (2004) suggests that the relationship between Polish workers features a big distance between the manager - owner and employees, a very strong solidarity of workers against the leadership, collectivism and ethical relativism.



**Figure 2. The results of power distance in European countries**

\* lighter color indicates the countries belonging to groups Innovation leaders and innovation followers

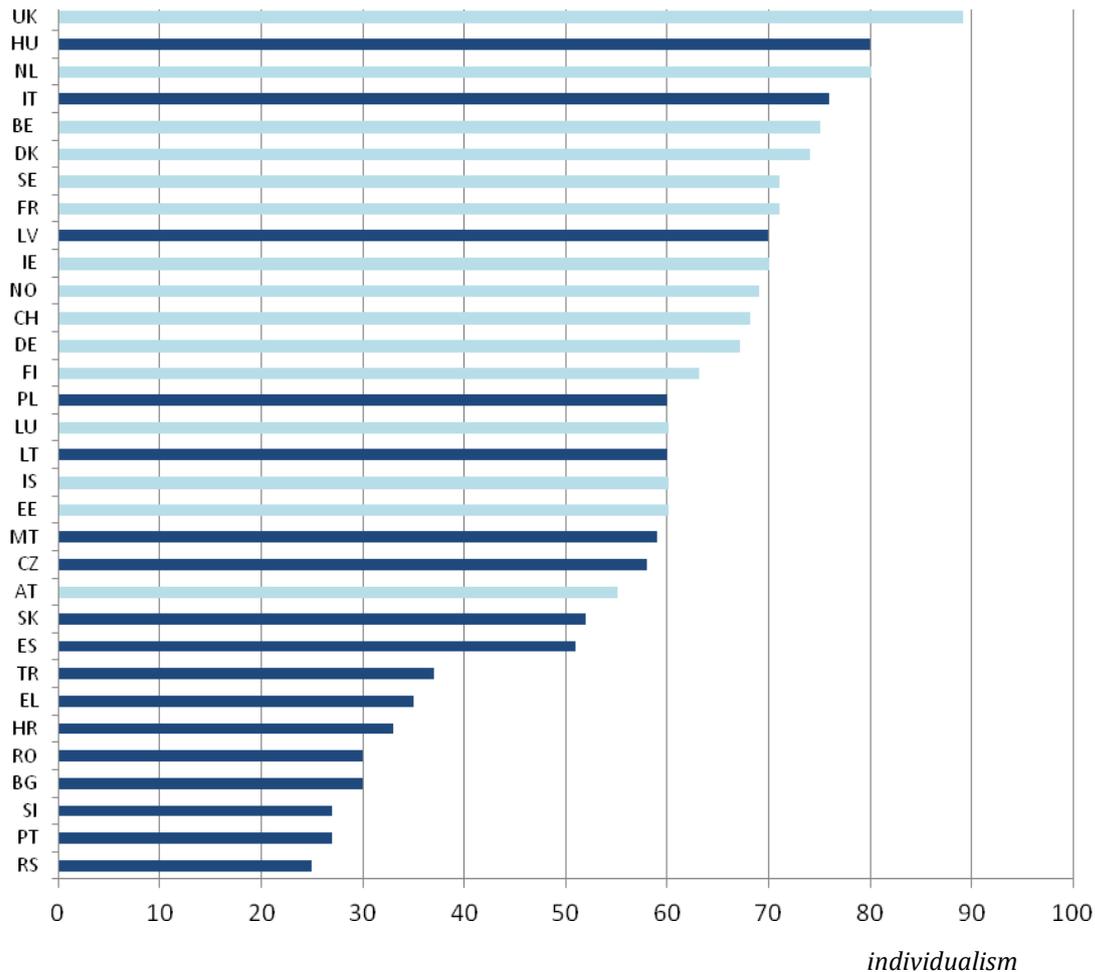
Source: based on: <http://geert-hofstede.com/countries.html>

### ***Individualism versus collectivism***

This dimension of culture describes "the relationship between the individual and the collectivity which prevails in a given society" (Hofstede 1980). Based on Hofstede<sup>3</sup> research it can be stated that all innovation leaders and the most of innovation followers are individualistic nations. Relatively more collectivistic is Austria which has the level of individualism similar to average in European countries. Hungary is relatively highly individualistic country. With a score of 80, it is an individualist society in which individuals are expected to take care of themselves and their immediate families only. The most collectivist country are located in warmer climates in the south-East part of Europe.

The value of individualism in Poland is similar to the European average. However, according to a study in the project GLOBE (House et al., 1998: 49), collective values are higher in Poland because people create numerous, collective connections of *Gemeinschaft* type which are spontaneous, based on direct contact and built on the "lower" levels of social organization: family, friends, support groups. Polish people lack the ability to create groups of *Gesellschaft* type - reflective, based on a social contract and the rational pursuit of goals.

<sup>3</sup> <http://geert-hofstede.com/national-culture.html>



**Figure 3. The results of dimension individualism/collectivism in European countries**

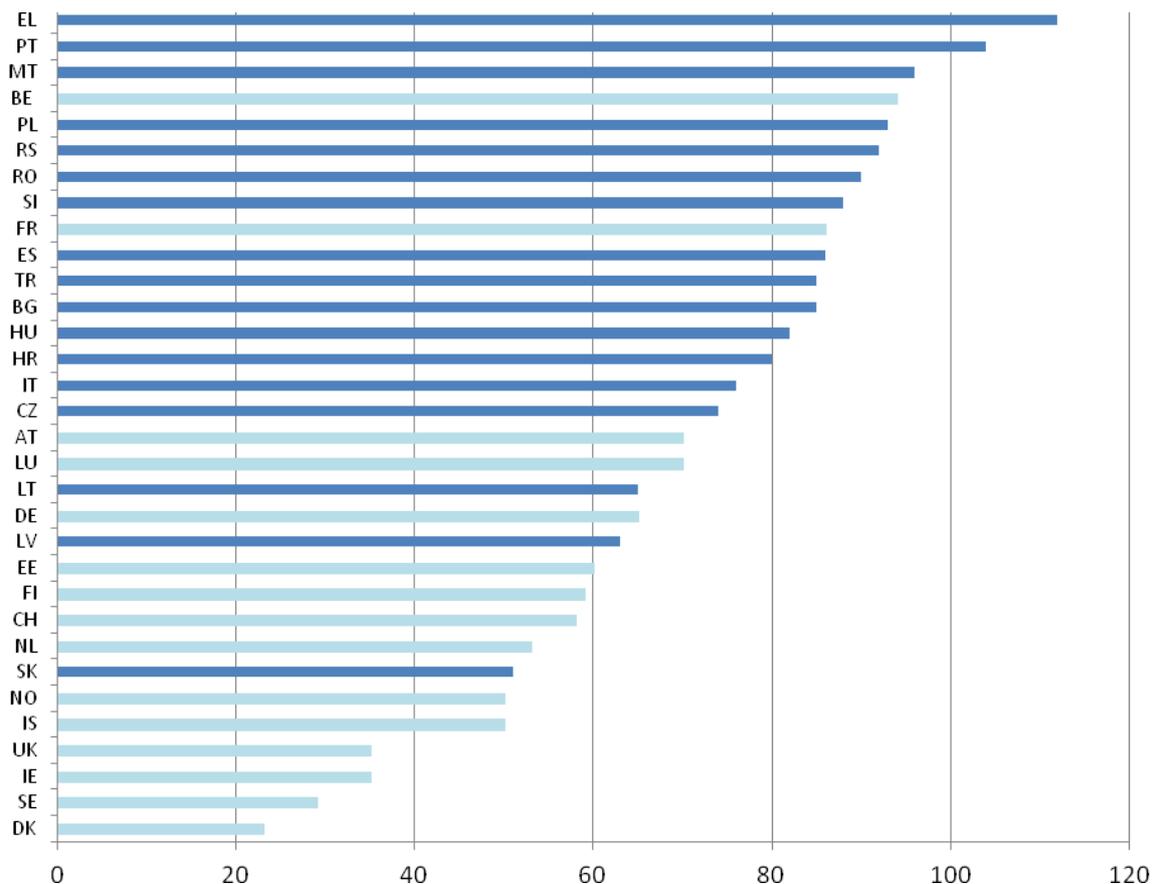
\* lighter color indicates the countries belonging to groups Innovation leaders and innovation followers

Source: based on: <http://geert-hofstede.com/countries.html>

### ***Uncertainty Avoidance***

The Uncertainty Avoidance (UAI) dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known<sup>4</sup>. The majority of innovation leaders and innovation followers are low uncertainty countries. The exception is Belgium and France with a score greater than 80. Greece and Portugal with a score over 100 are the countries with the lowest tolerance to uncertainty. According to Hofstede Poland is a country with strong uncertainty avoidance. A characteristic feature of the Poles, stimulating strong uncertainty avoidance, is deep distrust to life and pessimistic vision of the world.

<sup>4</sup> <http://geert-hofstede.com/countries.html>



**Figure 4. The results of dimension uncertainty avoidance in European countries**

\* lighter color indicates the countries belonging to groups Innovation leaders and innovation followers

Source: based on: <http://geert-hofstede.com/countries.html>

**Pearson's correlation coefficient**

To investigate the correlation between the variables was used Pearson's correlation coefficient. Pearson correlation between the variables was the strongest between power distance and the Summary Innovation Index (SII), the weakest in the case of individualism. The correlation coefficient above 0.5 indicates strong correlation between the two variables, which is statistically significant.

**Table 2. Pearson correlation between culture dimensions and the Summary Innovation Index (SII)**

Summary Innovation Index (SII)	PDI	IDV	UAI
	-0,65	0,53	-0,56
	p<0,000	p<0,002	p<0,001

Source: the author

The strongest correlation was observed in the case of power distance and SII. This correlation is negative what means that greater power distance is associated with a lower innovation results. A similar relationship exists in a case of the dimension uncertainty avoidance. Individualism has a positive effect on innovation index.

**National culture dimensions and Global Innovation Index (GII)**

The Global Innovation Index (GII) covers countries around the world and uses 79 indicators across a range of themes. Measuring s progress of innovation has become a priority for policy makers who are seeking ways to assess the effectiveness of their innovation policies and innovation systems.GII can be used to monitor progress in innovation and identify areas of strengths and weaknesses in innovation efforts. The technology gap between developing and developed countries is narrowing. One explanation for this phenomenon is that more

and more developing countries outperform in innovation inputs and outputs relative to their level of development<sup>5</sup>. The top 25 countries in the GII consistently score well in most indicators. These countries have strengths in areas such as information and communication technologies and business sophistication, which includes: knowledge workers, innovation linkages, and knowledge absorption; they also create high levels of measurable outputs including creative goods and services.

The results of Pearson correlation coefficient between culture dimensions and the Global Innovation Index (GII) are very similar to the results obtained in the case of Summary Innovation Index in European countries. The strong negative correlation was observed in the case of power distance and uncertainty avoidance whereas individualism has a positive effect on innovation index.

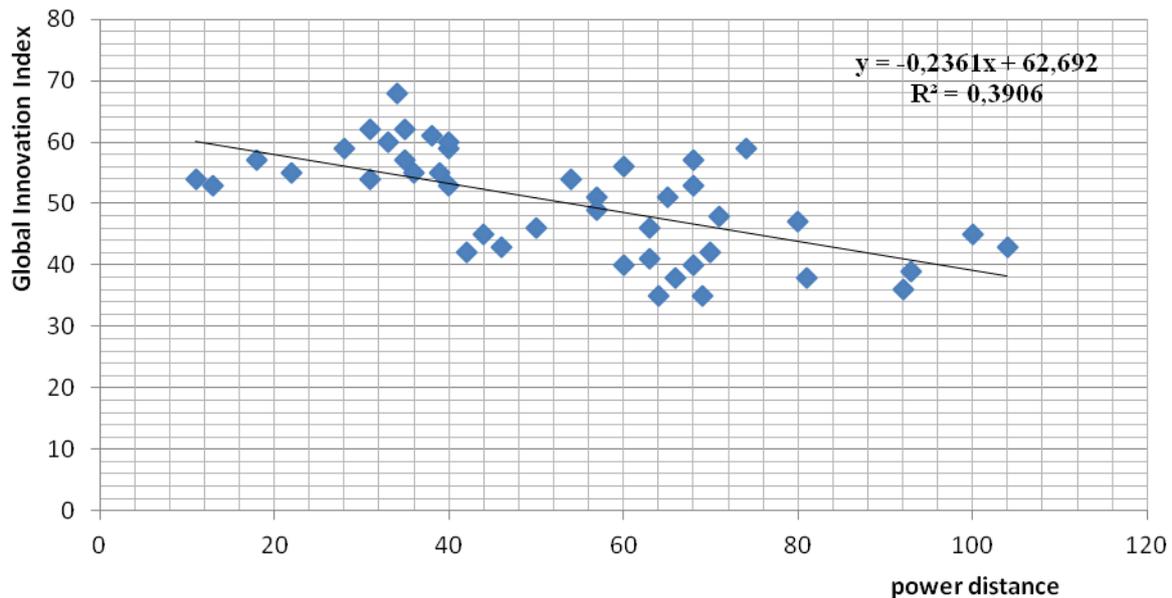
**Table 3. Pearson correlation between culture dimensions and the Global Innovation Index (GII)**

	PDI	IDV	UAI
Global Innovation Index (GII)	-0,65	0,52	-0,59

$p < 0,001$

Source: the author

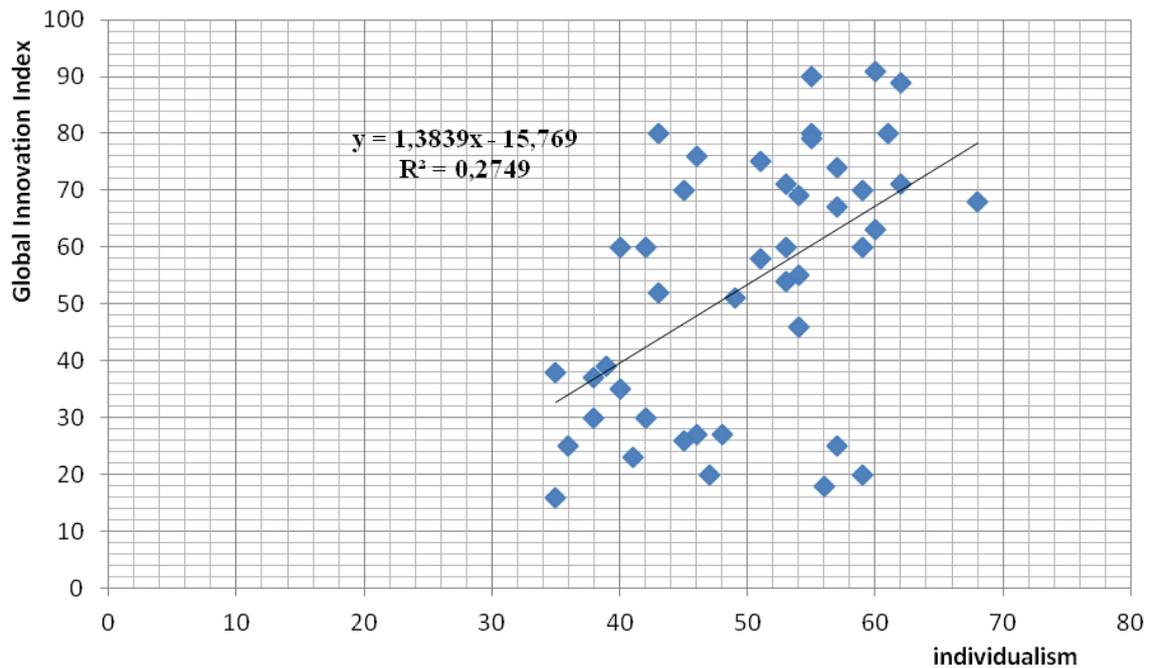
The figures present graphically linear regression determining the influence of culture's dimensions on Global Innovation Index. The value  $R^2$  is the highest in case of power distance (0,39) and uncertainty avoidance (0,34).



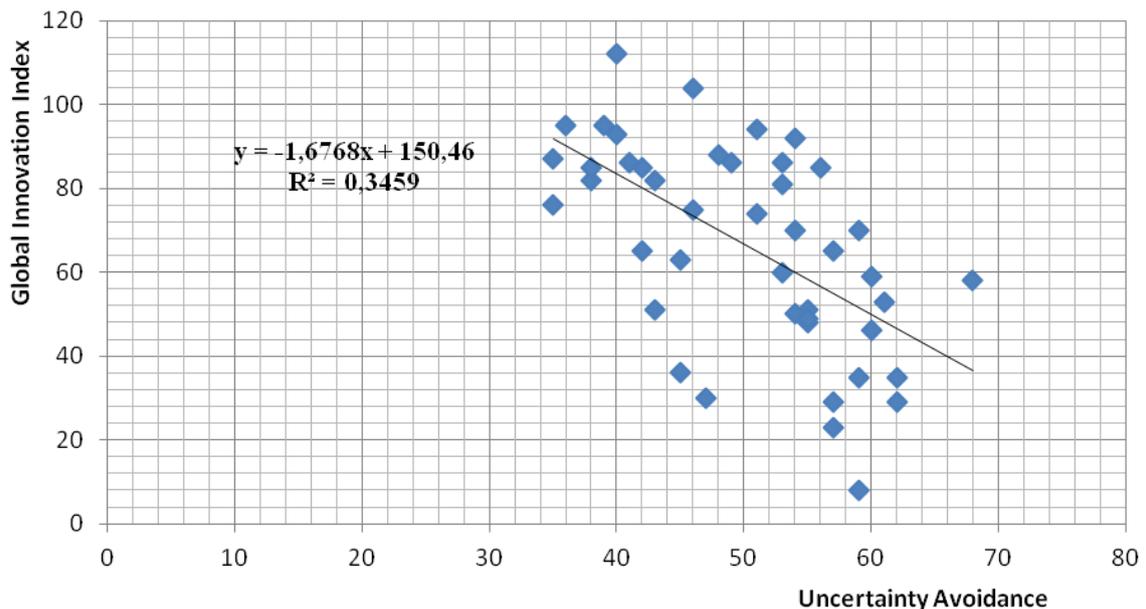
**Figure 5. The relationship between the dimension power distance and Global Innovation Index**

Source: the author

<sup>5</sup> <https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2015-v5.pdf>



**Figure 6. The relationship between the dimension of individualism/collectivism and Global Innovation Index**  
Source: the author



**Figure 7. The relationship between the dimension of Uncertainty Avoidance and Global Innovation Index**  
Source: the author

### 3. Conclusions and recommendations for further research

The results of this study point out several courses of future research. I focused on culture influence on innovation but it does not suggest that other factors do not significantly influence national innovative results. Traditionally, economists have argued that research and development infrastructure, industrial structure, societal wealth, country size explain national differences in innovativeness. However, the analysis has shown that the cultural values in countries may influence innovative efforts. The analysis presented in this article may be a useful starting point for researchers who seek a comprehensive explanation of culture's impact on

innovation and prosperity. I have used Hofstede's model of national culture, but additional studies that use data from other culture frameworks would be appropriate.

## Appendix. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <http://sepd.tntu.edu.ua/images/stories/pdf/2015/15saadai.pdf>

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