The Evaluation of Creativity Effects on the Regional Development in the Czech Republic

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***Abstract*—**This paper analyses the importance of creativity within a regional development. In the introduction, the historic concept of creative economy is presented. This theory is formulated on the basis of the previous growth theories. Within the analysis itself, the paper quantifies a creative environment for individual regions of the Czech Republic. The New Creative Index and Creative Industries Index are used as a tool in this work. The results of this paper confirm the significant positive correlation between indexes used and selected macroeconomic indicators. The relation between the level of the creative potential and presence of creative industries in a region is proved within the analysis, too. The data are analyzed for the years of 2009 and 2010, this enables the use of dynamic tools for the research a creative environment.

***Keywords*—**Creativity, Creative industries index, New creative index, economic growth, regional development, information and communication technologies.

I. The Origin of Creative Environment

THE historical development of mankind is based on the ability to learn and retain the gained knowledge. Thanks to these characteristics the living standard has been rising exponentially over the centuries. For the next millennium, this quality will be no longer the priority. The highest value would be based on creativity, and ability to create new knowledge [3].

To be ready for new challenges, it is necessary requirement for understanding the undergoing changes. At the beginning, this work sets the initial limits of creativity in relation to an economic growth. In this area many texts were written so far but the consensual definition of creative economics was never expressed [15].

Such a concept of the current growth theory is built on solid pillars of the previous theories and it is complemented by urban and socio-cultural aspect [16, 20]. The basic features of the previous theories can be found already in the work of the classical economists.

The main factor is the division of labour what was considered by Adam Smith as a basic unit of an economic success [27]. He understood that the removal of trade restrictions and an efficient allocation of resources is an essential element for an economic development. This was confirmed by another classical economist David Ricardo [22] as the law of comparative advantage.

Another inspiration for the creative economy can be found in work of Alois Schumpeter and his theory of entrepreneurship [25], which presents the entrepreneur as a person with an innovative approach to business. Schumpeter's entrepreneur has a creative mind and is able to make use of available knowledge, which transforms in order to achieve economic gain. The aforementioned publication also explains the impact of innovations on a business growth. The significant innovation waves tied to new technologies can significantly change established behavior patterns. This fact is strongly reflected in the creative economics, whose onset can be derived from the influence of important innovative waves tied to information and communication technology (ICT) and Internet.

The advent of new technologies has caused a lot more than just an economic growth, in form of increase in a production output [28, 23, 24]. The development of ICT, together with the internet has brought completely new possibilities for trade - new business models [10, 18], and it allowed more efficient allocation of resources, opened completely new industries and changed the way of work and leisure time [17, 26]. The growth of living standard accelerated.

These facts have created a demand for specific labour positions. The first group consists of productive workers, who are tied to a technological development. Their role can be identified with Schumpeter´s entrepreneur. They are creative, well educated people who have the potential to produce new ideas and transform them into innovations leading to an economic development [9]. The formation of the second specific group is related to the increase in living standards. The presence of people from this group, along with civic amenities sites, creates good socio-cultural environment. People have already secured their basic needs and thus became interested in a self-realization. Searching an environment where they can work, but as well as where can spend their leisure time adequately.

These specific labour groups are partly described by Richard Florida [4] as a creative class. In his studies he explains the different economic level of regions by the various representation of creative class in them. Some authors [7, 8, 2, 30] characterize the creative class with the help of selected

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industrial areas. The range of industrial areas defines the area of so called “creative industries”.

II. The Quantification of Creativity

As a pioneer in the field of creativity and a regional economic development we would label Jane Jacobs [12, 13], she provided the first description of the "open society". Open society is able to attract creative people and fully use their talents. Wilbur Thomson [31] was one of the first who presented the formation of new ideas and innovations among main functions of cities. These approaches were eventually supplemented by the contribution of a knowledge capital [19, 1].

The influence of creativity and knowledge on the development of the regions is attracting constantly more attention [14, 29]. Understanding of the basic development factors is necessary for targeted support and thus for remaining of competitiveness. The first attempts to quantify the creative potential were noticed at work of Richard Florida, who tried confirming the relationship between social capital, economic growth and its "creative index" [4, 5]. Their conclusions together with the work of Tiemann et al. [32] showed that the tolerant regions have higher rates of net migration, they are more heterogeneous, and that these regions have a higher GDP per capita.

On the other hand, some theoretical and methodological shortcomings of previous analytical procedures should be noted as well. From the field of theory, they must be supplemented by a comprehensive theoretical concept of creativity, and in terms of methodology, it is necessary to transform their construction. These methods work with indexes that are either hard to access or not suitable for smaller territorial units or there are less transparent [17]..

A. The theoretical concept of creativity

The presence of creativity itself does not secure the economic growth but it is just one of the basic preconditions. The first condition lies in a suitably adjusted institutional environment, which complies with model of free and economically developed country. An economic growth cannot be fully launched in countries where the weak enforcement of rights occurs and freedom of citizens is repressed [11, 21]..

But if the law enforcement is secured the creativity comes into place. The creativity is basic input in production chain of developed countries. The representatives of creativity are the people. The competitiveness of the region is based on the ability to attract these creative people, to retain them and simultaneously to raise them. The attention should be given to a four basic pillars [17]: (1) People – they are holders of the creativity, their presence forms a creative potential of the whole region. It is necessary to create adequate job opportunities with sufficient space for their self-realization. (2) Location – the creative class shows high rate of mobility. Not just to create appropriate job vacancies, but also to offer the location, which is open, friendly and equipped for appropriate spending of leisure time. (3) Local government – depending on the researched region. Anyway, the politics has a goal to form the effective formal institutional environment. (4) Education system – significant support of creativity development. The potential of education lies in forming of new creative workers and at the same time by its own knowledge capacities it is able to contribute to new forms of business and cultural development.

Provided that the region successfully set the four basic pillars of the creativity development, we can anticipate the high concentration of the creative potential which is able to create ideas that are transformable to innovations. The ability of implementation of these innovations is the final step leading to achievement of economic growth and development.

B. The paper objective

The objective of this work is to prove the influence of the creativity on the economic level of a region. Two analytic instruments were used for the research of the main objective. The first method explores a creative potential of the area by using the New Creative Index (NCI). The second method comes from the analysis of the creative industries and works with the simplified Creative Industries Index. Both analytical methods should contribute to the quantification of the influence of creativity on a regional development. Without the understanding of this influence, it is impossible to select an appropriate institutional support for regions.

With an example of the individual regions of the Czech Republic, this work tries proving the positive correlation between the creative environment and main macroeconomic indicators. The analysis is proceeded not just from the static point of view but it also offers the unusual dynamic perspective of the issue. The outputs of dynamic analysis should provide some information for the retrospective evaluation of external interventions, which were implemented in the region (incentives, legislation). The analysis itself tests these hypotheses: a) the relation between the creative potential (NCI) of an area and a presence of the creative industries (CII) would reach a significant positive correlation, b) a change of the development of the creative potential (NCI) should be symmetrically reflected within the development of the creative industries (CII), c) the basic macroeconomic indicators reach a positive correlation with the NCI and the CII.

C. The New Creative Index

With regard to theoretical concept of the creative economics the new methodology for a mapping of creative potential was developed. It is remotely based on Florida´s 3T model [4], but the model is significantly influenced and innovated by new indexes, which cover much larger area and are fully transparent and usable for smaller territorial units. The relevance of this methodology was testified earlier [16] with the example of German cities.

In the end, the New Creative Index (NCI), which consist of three sub-indexes is created. The first sub-index is the Tolerance index (Table 1). This index consists of eleven indexes mostly related to a socio-cultural environment and a migration.

Table 1. Tolerance Index

Tolerance index
The population increase caused by migration
The representation of foreigners from EU in the total population (%)
The proportion of workers employed at cultural, entertainment and recreational activities in total employment
New vs. terminated economical units
The ratio of registered subjects – cultural, entertainment and recreational activity
Attendance of accommodation facilities - guests
Attendance of accommodation facilities - overnight
Borrowings in the libraries per 1000 residents.
Cultural events organized in total
Concert organized in total
General criminality per 1000 residents (1/X)

The second sub-index deals with the educational base (Table 2). The selected seven indexes deals mostly with college students, science workers and the financial aid for research and development.

Table 2. Talent Index

Talent index
Population at age 15 and over with tertiary education
The ratio of employees – professional, science and technologic activities
The general unemployment rate at age 15 - 24 (1/X)
The ratio of registered entities – professional, science and technologic activities
Employees in research and development per 1000 residents
Spendings on research and development
The number of university students per 1000 residents

The third sub-index covers the topic which has most significantly contributed to the formation of creative economy (Table 3). This area is a technology, mainly in the field of ICT. Selected indicators deal with the ratio of businesses or employees working in the technological fields. At the same time the attention is paid to the patents and use of the internet.

Table 3. Technology Index

Technology index
The ratio of people employed - information and communication activities
The ratio of registered subjects – information and communication activities
The ration of businesses in industry field – computer, electronic and optical gadgets manufacturing
The ration of businesses in industry – electronic devices manufacturing
The average number of employees in industry– computer, electronic and optical gadgets manufacturing
The average number of employees in industry - electronic devices manufacturing
The number of patents sold
IT in households – Personal PC
Individual using - Internet
IT experts total per 1000 residents

All indexes used are based on the mentioned theoretical framework of creative economy. Their goal is to capture basic features of creative economy that are based on the equipment with the relevant knowledge and technologic capital. At the same time the emphasis is put on the equipment of the location, which plays big role in a regional development.

Individual indexes of NCI do not have to be always united, but during their construction it is necessary to take care about the basic parameters. It is essential to work with well defined and measureable indexes. As well as the number of indexes should be efficient in order to capture the structure of the theoretical framework of creative economy. Different importance and number of indexes is reflected in individual sub-indexes with the help of weighted average.

D. The Creative Industries Index

For exploitation of creative industries, the work uses so called "Creative Industries Index". The concept of this industry area is based on the definition of Great Britain government, especially on the Department for Culture, Media and Sport (DCMS). In this case, we use a simplified model of creative industries which proceeds from the basic classification of economic activities (NACE). Nowadays, this structure is used in most European countries and it is applicable for an international comparison, too.

The two areas are included in the sphere of creative industries. The first one is related to ICT and within the NACE it is classified into the group J, named as the "Information and Communication". The other area is related to knowledge and it is called "Professional, scientific and technical activities". In the NACE, it is presented by the letter M. The individual items are presented in the following table.

Table 4. The selected structure of industry (NACE) classified into the creative industries

J	Information and communication	M	Professional, scientific and technical activities
J58	Publishing activities	M70	Activities of head offices; management consultancy activities
J59	Motion picture, video and television programme production, sound recording and music publishing activities	M71	Architectural and engineering activities; technical testing and analysis
J60	Programming and broadcasting activities	M72	Scientific research and development
J61	Telecommunications	M73	Advertising and market research
J62	Computer programming, consultancy and related activities	M74	Other professional, scientific and technical activities
J63	Information service activities	M75	Veterinary activities

The determination of the Creative Industry Index is generated from the comparison of representation of the creative industries within the total industrial categories in the region. The number of businesses and employees classified in the mentioned areas of the NACE is compared to the all kinds of businesses and employees within the region. The final data are compared to the total average number of all regions. The weighted average of all indexes determines the amount Creative Industries Index for each region

III. The Analysis of the Creative Environment Influence

The intensity of a creative environment is characterized by two presented indexes in this work. The outputs of these indexes for the regions of the Czech Republic are captured in the Figure 1. NCI deals more with the creative potential of the region and its values vary from 0 to 1. The closer is the index to the value of 1 the higher creative potential has the region in relation to other researched regions. The determination of the CII is partially different. Therefore, particular region is able to reach value higher than 1. Such a region represents an area with an extremely high presence of the creative industries. The lower boundary is same at both cases.

With the first three regions, the high level of creative potential is confirmed when using both indexes. The area with the highest creative environment is tied to the capital city of Prague. The significant influence of big municipalities is underlined by the result at the second and third position. The second highest ranked region of South Moravia is related to the second biggest city of Czech Republic and the third region is again related to the capital as well as biggest city of the Czech Republic. These results confirm the positive influence of urban territories on a formation of positive creative environment.

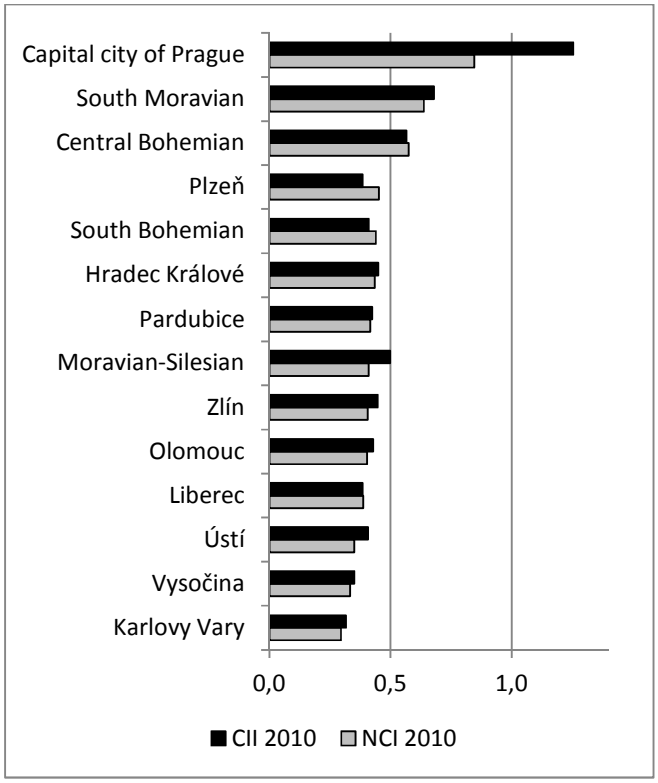


Fig. 1 The NCI and CII for the regions of the Czech Republic (2010). *Source:* Czech statistical office; own calculations.

The region with the lowest value of creative environment was represented by Karlovy Vary in 2010. This is the region which is mainly famous because of the recreational facilities (mainly spa). The most significant industrial field here is the brown coal mining. Regarding this fact, the ranking position according to the NCI and the CII is self-explaining. However, it is questionable if the tourist attractiveness would secure the sufficient development for the future years. According to the available results, we would reject this speculation [17].

The complete overview of NCI and CII is shown on the Table 5. The data below shows figures for year 2009 and 2010. In case of the NCI, the figures include also the individual sub-indexes. The analysis of the sub-indexes shows which area contributes more to the formation of the creative potential of the region. As the example of the capital city of Prague, the talent area constitutes the main part of the potential; the localization of the significant educational institutions confirms that. This fact is validated also by the South Moravian region which reaches the high creative potential also thanks to the support of talents. As same as in the case of the capital city, the important scientific and technical institutions are located in there.

Table 5. The complex overview of the creative environment indexes

	year	NCI	Tolerance	Talent	Technology	CII
Capital city of Prague	2010	0,85	0,81	0,92	0,82	1,25
	2009	0,85	0,82	0,91	0,80	1,27
Central Bohemian	2010	0,59	0,60	0,61	0,56	0,57
	2009	0,57	0,60	0,61	0,52	0,56
South Bohemian	2010	0,42	0,46	0,41	0,39	0,41
	2009	0,44	0,44	0,43	0,44	0,46
Plzeň	2010	0,42	0,42	0,40	0,44	0,38
	2009	0,45	0,48	0,42	0,46	0,43
Karlovy Vary	2010	0,29	0,41	0,22	0,26	0,32
	2009	0,30	0,41	0,22	0,26	0,32
Ústí	2010	0,34	0,33	0,30	0,41	0,41
	2009	0,35	0,37	0,28	0,40	0,38
Liberec	2010	0,38	0,41	0,35	0,37	0,38
	2009	0,39	0,49	0,34	0,33	0,33
Hradec Králové	2010	0,43	0,45	0,39	0,45	0,45
	2009	0,44	0,42	0,40	0,49	0,43
Pardubice	2010	0,40	0,30	0,41	0,49	0,42
	2009	0,42	0,33	0,43	0,49	0,45
Vysočina	2010	0,32	0,29	0,33	0,33	0,35
	2009	0,33	0,29	0,33	0,38	0,36
South Moravian	2010	0,66	0,56	0,79	0,64	0,68
	2009	0,64	0,52	0,76	0,63	0,68
Olomouc	2010	0,42	0,40	0,40	0,45	0,43
	2009	0,40	0,37	0,38	0,46	0,40
Zlín	2010	0,40	0,36	0,41	0,44	0,45
	2009	0,41	0,34	0,42	0,47	0,46
Moravian-Silesian	2010	0,42	0,30	0,48	0,49	0,50
	2009	0,41	0,33	0,48	0,42	0,47

Source: Czech statistical office; own calculations.

The relation between the NCI and CII is evident in the Figure 1 and the Table 5. In the regions with the high creative potential, the concentration of creative industries reaches higher values, too. This relation is closely analyzed in the Figure 2, which shows the direction of the trend of these two variables. The coefficient of determination is situated at 0,89 level, what means that both indicators are extremely interdependent. Correlation coefficient between NCI and CII was 0,94 in 2010 and 0,95 in 2009.

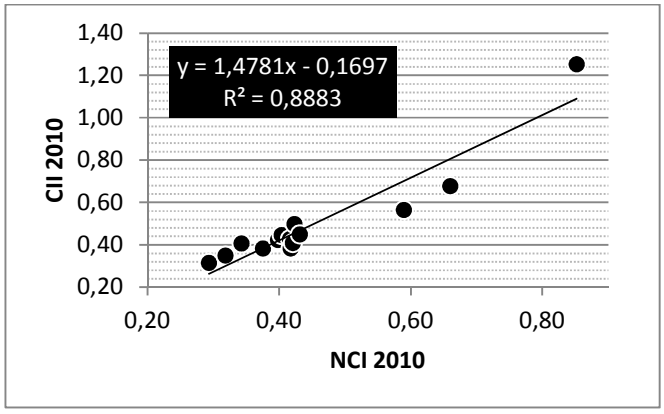
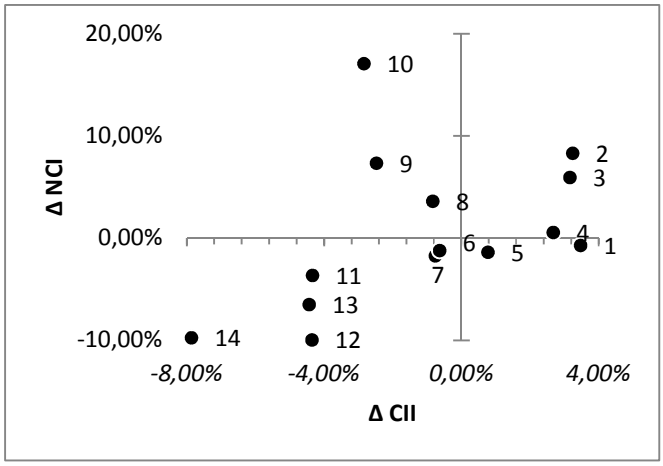


Fig. 2 The relation between the NCI and CII in 2010; *Source:* Czech statistical office; own calculations.

The indicators mentioned above show just a static perspective on the analyzed areas. The dynamic analysis is achieved by comparing of individual indicators. This analysis shows also trends reached by the indicators. Consecutively to the analysis of the relation between the NCI and CII, the Figure 3 was created. In this Figure the percentage change between the years 2009 and 2010 is captured for each region. In most cases the relation between NCI and CII is proven. When one index goes in any direction the other goes the same direction or stagnated with the exception of two regions (Liberec and Ústí).



* 1. South Moravian, 2. Olomouc, 3. Moravian-Silesian, 4. Central Bohemian, 5. Capital city of Prague, 6. Karlovy Vary, 7. Zlín, 8. Hradec Králové, 9. Ústí, 10. Liberec, 11. Vysočina, 12. South Bohemian, 13. Pardubice, 14. Plzeň.

Fig. 3 The development of the NCI and CII for the years 2009 and 2010; *Source:* Czech statistical office; own calculations.

The deeper analysis of each indicator of creative environment is provided on the Table 6. The negative changes in the development are highlighted by the grey field. The analysis of individual sub-indexes of the NCI enables to find out which area contributes the most to the change of the creative environment. These changes are compared with the actual development in the society in order to discover how the external interventions influence the expansion of the regional creative potential.

With the example of the Central Bohemia region, we can assume that the increase in the creative potential was generated by the Technology index. We suppose that the region is very attractive for investors who want to realize a production operation in the technologic area. On the other hand, the Usti region detected the decrease in creative potential despite the Talent index generated the significant growth. The decrease in the creative potential in this case was caused by a change in the region attractiveness which was low in the analysed period; the Tolerance index detected the significant decrease.

Table 6. The change in creative environment indicators in 2009 - 2010

	NCI	Tolerance index	Talent index	Technology index	Δ CII
Capital city of Prague	0,78%	-1,15%	1,21%	2,26%	-1,38%
Central Bohemian	2,68%	1,17%	-0,16%	7,74%	0,55%
South Bohemian	-4,35%	2,94%	-4,29%	-11,71%	-9,95%
Plzeň	-7,86%	-12,97%	-4,73%	-5,36%	-9,74%
Karlovy Vary	-0,63%	0,11%	-1,59%	-0,97%	-1,21%
Ústí	-2,47%	-12,57%	6,14%	0,94%	7,33%
Liberec	-2,84%	-16,41%	2,72%	11,38%	17,07%
Hradec Králové	-0,83%	8,78%	-3,55%	-6,82%	3,61%
Pardubice	-4,43%	-7,95%	-5,23%	-1,40%	-6,49%
Vysočina	-4,34%	2,79%	0,39%	-13,80%	-3,64%
South Moravian	3,48%	7,39%	3,10%	0,72%	-0,71%
Olomouc	3,25%	10,30%	4,45%	-3,30%	8,31%
Zlín	-0,76%	6,51%	-1,85%	-5,07%	-1,73%
Moravian-Silesian	3,17%	-9,27%	1,28%	14,92%	5,94%

Source: Czech statistical office; own calculations.

The results of dynamic analysis provide the information about changes in the creative environment. On the other hand they do not cover the data about the relation between the level of creative environment and economic level. Therefore, another analysis was carried out. This analysis objective is to express the relation between the level of creative environment, economic growth and selected macroeconomic indicators.

To test the relation, the correlation coefficient was selected, this instrument can examine the dependence of variables. The result of this analysis is captured in the Table 7.

Table 7. The interactions of creative environment indexes and selected macroeconomic indicators in 2009 and 2010

	year	NCI	Tolerance index	Talent index	Technology index	CII
GDP per inhabitants	2010	0,836	0,809	0,777	0,813	0,957
	2009	0,876	0,823	0,806	0,849	0,973
Net income -average	2010	0,836	0,881	0,756	0,768	0,888
	2009	0,863	0,901	0,770	0,775	0,910
Vacancies per 1000 inhabitants	2010	0,500	0,465	0,441	0,540	0,540
	2009	0,769	0,814	0,675	0,692	0,840

Source: Czech statistical office; own calculations.

It was discovered that the CII reaches an extremely tight positive correlation with many macroeconomic indicators. In the area of net earnings, the correlation coefficient range around the level 0,9 and in case of GDP is reaches even higher values. The fact is captured in the separate Figure 3 where the correlation coefficient reaches the extreme value of 0,91. By the view on the figure itself, it is obvious that one region is beyond the others. This region is situated in the upper right corner. It is the region of the capital city of Prague. To test the influence of this region on the total results of the analysis, the separate correlation analysis of the CII and DGP per capita without this region was undergone. The resulting value is still at the significant level (0,77) and it confirms the actual influence of the creative industries on GDP per capita in all regions.

As the last, there was tested the relation between the CII and new job vacancies. The positive relation was detected here too, however, the partial drop occurred in 2010.

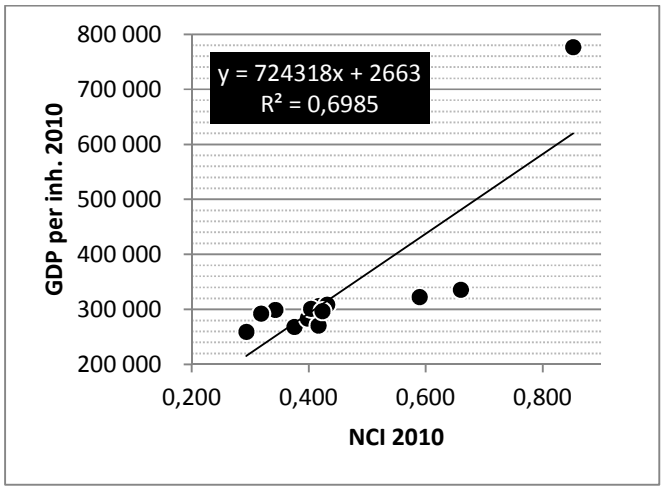


Fig. 3 The relation between the CII and GDP per capita (2010); *Source:* Czech statistical office; own calculations.

Within the analysis of the NCI and the sub-indexes and its relation to selected macroeconomic indicators, the high positive correlation was proved, too. In case of indicators related to GDP amount and net earnings, the tight correlation was demonstrated, it exceeded the value of 0,8. At the same time the assumption that regions with high creative potential generate more job vacancies was confirmed.

The interesting fact is that the often discussed Tolerance index shows at all indicators high level of dependence, often higher than the rest of sub-indexes from the field of talent and technology.

The closer analysis of the NCI and GDP per capita is shown in Figure 4. Every point in the figure represents an individual region. It is obvious that one region significantly differs from the others. It is the region of the capital city Prague. This region is also main creative centre of the Czech Republic. If the capital city of Prague is excluded from the range it has no significant influence on the value of the correlation coefficient which remained at the significant level (0,78).

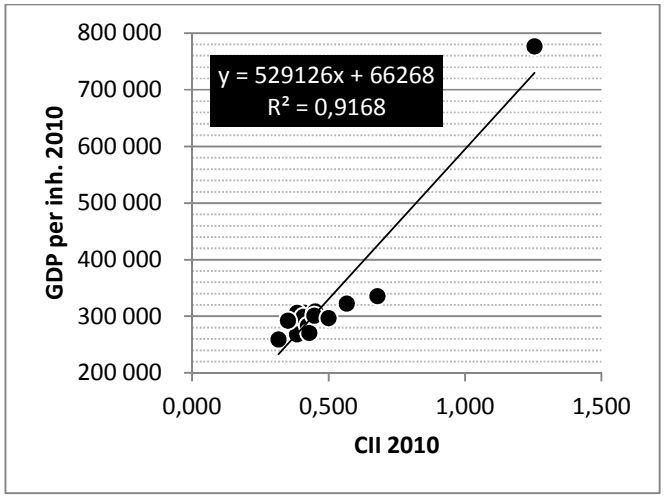


Fig. 4 The relation between the CII and GDP per capita (2010); *Source:* Czech statistical office; own calculations.

In Figure 3 the direction of trend and coefficient of determination (R2) is shown. By its high value (0,7) the coefficient confirms the significant relation between the creativity and the economic level. This fact supports the fundamental paradigm of creative economy.

The topicality of the area attracts more and more attention. Nowadays, when the distances are shortening, the markets are developing and the competitiveness is expanding [5] it is necessary to understand the factors, which ensure the remaining of region competiveness. The understanding of the creative economy is the first step to providing a suppost whitch is effectively target exactly to increase the competiveness of a region.

IV. Conclusion

The objective of this study was to prove the influence of creative environment on the economic level of a region. In the introduction, the historic concept of creative economy is presented. This theory was shaped on the basis of previous growth theories. Creativity got into the human development since the onset of human kind. Recent development connected with the arrival of technology wave, interconnecting of markets and expansion of life standard has multiplied the importance of the creativity New working classes have appeared; they had specific requirements for work and for the services of the locations. These employees have become the bearers of the creativity and the creativity ensured the economic development in the highly competitive times.

The work laid down three basic hypotheses, which were subsequently analyzed. Two indexes were selected as the methodological instrument for the analysis. The NCI was applied to analyze the creative potential. On the other hand the CII speak about the presence of the creative industries in the regions.

At the beginning of this work, the analysis confirmed the hypothesis saying that there is a strong correlation between these indexes. Correlation coefficient determining this relation reaches 0,94 in 2010. The dynamic perspective on the analyzed issues confirmed these conclusions. The change in one index is reflected by the change of other index, this confirmed the second hypothesis.

The last and main hypothesis assumed the correlation between the level of creative environment and economic level of the region. The economic level of the region was characterized by selected macroeconomic indicators. This hypothesis was confirmed by results of both used indexes. With the help of correlation coefficient, the positive correlation was proved for both the indicators related to GDP per capita and the one related to net earnings. In all cases the level of correlation coefficient exceed the level of 0,8. In area of job vacancies, the significant correlation was also confirmed, both indexes exceed 0,5 level. In the end, all hypotheses were verified and the significant influence of creativity on economic development of regions was confirmed.

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