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Proceedings of the 9th European Conference on Innovation and Entrepreneurship

University of Ulster Business School and School of Social Enterprises Ireland Belfast, UK

18-19 September 2014

Edited by

Brendan Galbraith

acpi

A conference managed by ACPI, UK

Papers have been double-blind peer reviewed before final submission to the conference. Initially, paper abstracts were rea and selected by the conference panel for submission as possible papers for the conference.

Many thanks to the reviewers who helped ensure the quality of the full papers.

These Conference Proceedings have been submitted to Thomson ISI for indexing. Please note that the process of indexin can take up to a year to complete.

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E-Book ISBN: 978-1-910309-47-6
E-Book ISSN: 2049-1050
Book version ISBN: 978-1-910309-45-2
Book Version ISSN: 2049-1069
CD Version ISBN: 978-1-910309-46-9
CD Version ISSN: 2049-1077

Published by Academic Conferences and Publishing International Limited
Reading
UK
44-118-972-4148
www.academic-publishing.org

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Regional Structure of the Country on Costs and Results of Innovative Activity: The Case of the Russian Federation

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Abstract: Innovations have a great impact on the progress of modern society. Highly developed countries are homogenous in providing high living standards while countries with lower level of innovative activity cannot keep such a level and differ substantially from each other in values of main social indicators. We show it with the model of the relation between Global Innovation Index and Human Development Index for more than 100 countries. Generally the level of innovative development changes for the better worldwide. But the countries and their counties, or regions, progress in different ways. To provide the effective control of the regional devolvement it is important to obtain relevant information presenting regional structure of the country on innovative development indicators such as the output of innovative products and services and the expenditure on technological innovations. As a descriptive model we first use kernel density estimates of probability density function. Some groups in the structure are close to each other and hardly distinguished by traditional grouping procedures. In order to find if the regional system is really heterogeneous we use fuzzy approach to classification that seems to be the most suitable for compound structure analysis.It is based on a statement that each element (region) is a member of each group, and the degree of this participation is a value of the membership function. Both parametric decomposition of probability density function and nonparametric «c-means» clustering are applied for regions stratification on the innovation potential and activity indicators. For identified groups (strata) we search the influence of various factors on innovative development using weighted variables. As weights we apply the values of the membership function for corresponding group. For group profiling and modelling along with general indicators of regional economic development the specific indicators of small enterprise evolvement are used. Modelling results show the role of small entrepreneurship in innovative development in identified regional groups.

Keywords: innovative development, population well-being, regions stratification, fuzzy clustering, small enterprise

1. Introduction

Growth of living standards is the main goal of modern society. Population well-being indicators have become the decision-making criteria for social and economic policy. Countries and international organizations pay great attention to measuring and fostering the progress of society. Innovative technological development is considered to be the mainstream in providing of the progress.

Interconnection between innovations and quality of life becomes the matter of great importance. From one hand technological development create new possibilities for life improving. In turn, the quality of life is one of the most important factors of innovative development. The question is if there is a convergence in the processes of the modern society progress. For the answer we first have to define indicators characterizing various sides of the development.

For comprehensive analysis of the problem various approaches to the measuring of the population well-being should be considered. So named objective indicators using quantitative values characterizing consumption and living conditions can hardly be fitted for all the countries. At the same time some less-informative indicators based on the well-being subjective estimates are more universal. Their combination may give the proper perspective for the researcher.

Innovations have a great influence on economical, social and political progress of modern society. The achievements in innovative development make countries more competitive and create new possibilities for their population.

The level of innovative development varies from country to country. A lot of indicators for its monitoring are published and widely used in estimating competitiveness of the countries and other aspects of their economic and social development. Less investigated are the processes of innovative and technological development of regions in a particular country. Effective management of the technological development includes relevant

impacts to each part of the regional system. In order to provide the effective control of the development it is important to obtain the information support, which may be based on statistical models describing the structure of the regions. This analysis for such vast country as Russia may show if the regional structure of the country is substantially heterogeneous, and define the most important factors for fostering further progress.

Widely used ordinary clustering may be useless for defining the complicated structure of the objects. When classifying on the base of quantitative indicators the most effective is parametrical approach. It allows distinguishing groups which are close to each other and substantially intersected. Parametrical procedures are hardly applicable in multidimensional variable space and in the case of great enough number of extreme values, so we have to use nonparametric procedures like clustering. But they may be more relevant when fuzzy approach for really uncertain structures is applied. It is based on assumption, than each element is a member of each group at the corresponding degree. This kind of classification seems to be the most suitable one for defining the structure of regions.

2. Literature and data sources review

Official statics offices, international organizations, research centres, universities, national statistics services measure and publish indicators of population well-being on regular base. A great amount of information on the subject may be found in reports and papers. Some of them are focused on the methodology problems concerned constructing the indices and indicators.

There are many kinds of indicators of the population well-being such as Index of Economic Well-Being (Sharpe, 1998), Index of Social Progress (Estes, 1998, 2002), and others. One of the most widely used indicators is the Human Development Index (HDI). A lot of interesting indicators are proposed, but many of them are focused on the particular aspect such as Health-Related Quality of Life (Andersen, 1999), Social Weather Station (Mangahas, 1998).

As an indicator of innovative and technological development the Global Innovative Index (GII) can be used. It was created by Business School INSEAD, and since 2012 it is co-publish by INSEAD and the World Intellectual Property Organization (WIPO, a specialized agency of the United Nations). The Global Innovation Index ranks countries on parameters like Institution and Policy, Human Capacity, Infrastructure, Technological Sophistication and Business Markets to arrive at a global ranking for nations on innovation.

Many authors concentrate their attention on searching the impact of technological development on modern society, and in turn on the social progress influence on creating new technologies. Fagerberg et al (2011) analyze factors that shape the technological capabilities of individual U.S. states and European countries. The analysis demonstrates convergence in technological capabilities from 2000 to 2007. The results indicate that social capabilities, such as a highly educated labour force, an egalitarian distribution of income, a participatory democracy and prevalence of public safety, condition the growth of technological capability. Kundu and Sarangi (2004) presented the report concerning the methodology of building a Composite Index for Asia reflected both information and communication technologies and Human development aspects.

As a main data source the Russian Federal State Statistics Service database is used for solving problems and modelling indicators of innovative activity. For creating composite indicator of population well-being the indexes provided by Gallup are used.

3. Innovative development impact on quality of life

Well-being is an integral characteristic of social and economic conditions and the needs of the individual or social group. There are two methodological approaches for the measurement of the achieved level of well-being:

The first approach, which can be defined as a subjective one, bases on the well-being as a subjective degree of satisfaction of people with their lives. In this case, the man himself appreciates well or bad is his life on various criteria, so the idea of the well-being for each individual can be based on the results of sociological survey.

The second approach estimates the well-being of the population on the following principles:

- objective assessment of well-being;

- ability to compare indicators of well-being in the current period with their means in the previous periods;
- comparability of population well-being indicators in various countries and regions.

In this case, the well-being is the composite measure of subjective satisfaction of the person and objective indicators provided by other people who have complete and accurate information and the necessary skills in the field of research. This approach involves the construction of a socio-economic indicators framework that reflects human well-being in more comprehensive way. Many international and regional organizations are engaged in the development of well-being indicators. Each of them is developing indicators in accordance with their interests.

The most widely used and universal index of social progress of the society is the Human Development Index (HDI) that is an integral measure of human development. It measures the average achievements of each country in three basic dimensions: a long and healthy life (health), access to knowledge (education) and a decent standard of living (income).

Data availability determines HDI country coverage. To enable cross-country comparisons, the HDI is calculated on the base of data from leading international data agencies and other credible data sources available. According to the United Nations classification Russia is in the group of countries with high HDI.

Another universal index based on alternative approach may be constructed as the first principal component of the partial indexes provided by Gallup.

A uniform system of measuring the level of innovative capacity, as well as of measuring the level of well-being, does not currently exist, and every index depends on the organization, which conducts a survey of innovation activity, using different sets of parameters. One of the most interesting and universal in countries comparing is the Global Innovation Index. The GII "recognizes the key role of innovation as a driver of economic growth and prosperity and acknowledges the need for a broad horizontal vision of innovation that is applicable to both developed and emerging economies, with the inclusion of indicators that go beyond the traditional measures of innovation".

The Global Innovation Index relies on two sub-indices, the Innovation Input Sub-Index and the Innovation Output Sub-Index, each built around pillars. Five input pillars capture elements of the national economy that enable innovative activities: Institutions, Human capital and research, Infrastructure, Market sophistication, and Business sophistication. Two output pillars capture actual evidence of innovation outputs: Knowledge and technology outputs and Creative outputs. Each pillar is divided into sub-pillars and each sub-pillar is composed of individual indicators. Sub-pillar scores are calculated as the weighted average of individual indicators; pillar scores are calculated as the weighted average of sub-pillar scores. Four measures are then calculated:

- The Innovation Input Sub-Index is the simple average of the first five pillar scores.
- The Innovation Output Sub-Index is the simple average of the last two pillar scores.
- The overall GII is the simple average of the Input and Output Sub-Indices.

The Innovation Efficiency Index is the ratio of the Output Sub-Index over the Input Sub-Index. The GII model is revised every year in a transparent exercise to improve the way innovation is measured.

For the research of interaction between innovative development and living standards the regression model has been constructed. Nonlinear regression model of HDI was specified as a logistic curve

$$HDI = \frac{y_{\max} - y_{\min}}{1+\exp(a_0 + a_1 GII)} + y_{\min} + \varepsilon,$$

where $y_{\max}$ and $y_{\min}$ are max and min levels of HDI for the model,

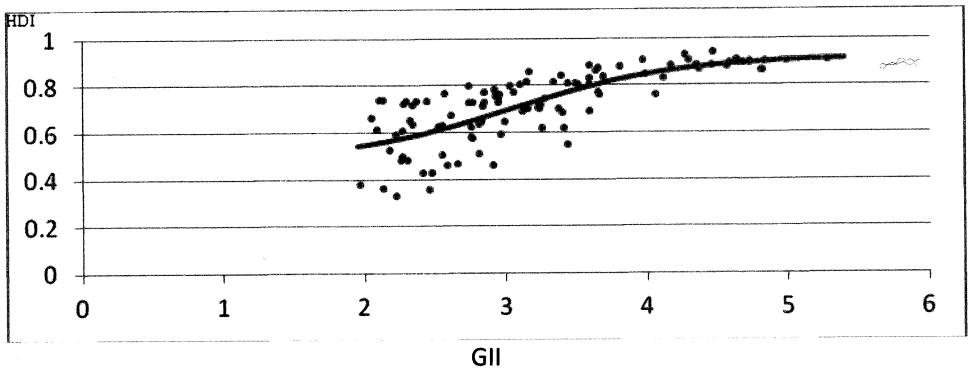
a_0 and a_1 are the parameters of the logistic curve,

ε is the error term.

After identification the model may be presented as follows:

$$HDI_{est} = \frac{0{,}443}{1 + \exp(5{,}174 - 1{,}698\ GII)} + 0{,}481$$

The model curve along with initial data is presented on Figure 1.



Source: own elaboration using data http://www.globalinnovationindex.org/gii/, http://hdr.undp.org/en/statistics/hdi

Figure 1: Model of the relation between global innovation index and human development Index

Countries with high level of both indicators form relatively homogeneous group, while countries with low level of innovative activity are extremely heterogeneous, and the level of HDI in these countries depends mostly of other factors, e.g. natural recourses, history etc. Some of countries are in between and tend to become the members of the advanced or the following groups.

From another perspective we can see on Figure 1 three domains with different variances according to the Global Innovation Index value. For the first (following) group value of GII is lower than 3, the lower border of the most developed countries is approximately 3.7, and the group in between may be referred to as the middle one. Inside each group we can hardly find any relation between HDI and GII, and the overall interaction is rather determined by the between-group difference in mean HDI. We consider the regional structure of Russia as substantially heterogeneous, and presenting the Russian regions as countries in the corresponding scatter plot provides the similar pattern with following, middle and leading groups of regions on innovation development.

Created models allow estimating social impact of innovative development indexes. The dual role of the social climate may be discussed in the context of the research. From one hand the social climate of the society is formed under influence of the technological environment. From the other hand the latter may be considered as a factor of progress in technology and innovations.

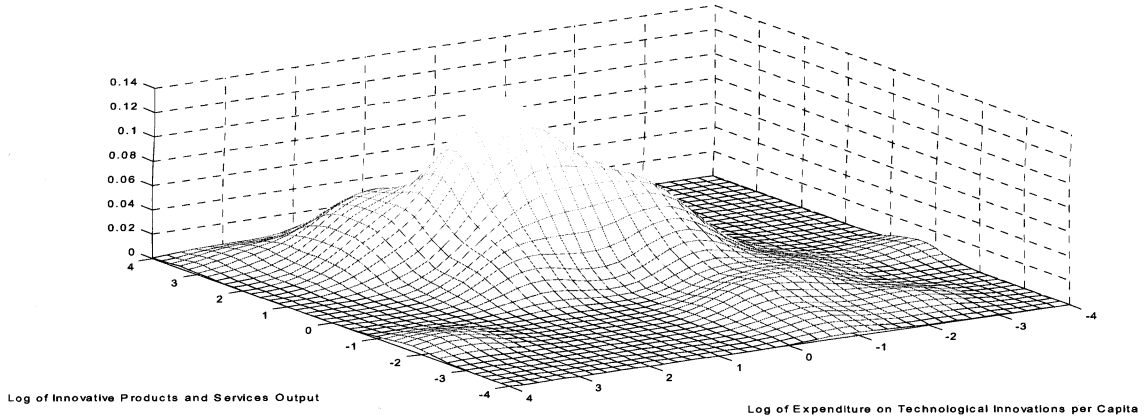
4. Selection of homogeneous groups of regions using parametric and nonparametric approaches

It is reasonable to produce analysis of the regional development separately for homogeneous groups of regions and compare the results. Russian Federation includes 83 regions; some of them are the components of more large ones. On economical reasons we also will consider Altay as an agglomeration of two regions: Altay region itself and Altay republic. Few regions can hardly be included to the list because of their peculiarities and lack of data for the particular period. So the main set includes 73 regions. They differ essentially on the level of development and structure of economy. Modern economy is based on innovations, so along with the variable characterizing the output of innovative products and services x_1 the expenditure on technological innovations x_2 will be used for modelling and stratification. While the former presents the achieved level of innovative development, the latter describes the innovative potential. Both factors are measured in million roubles per 1 inhabitants and logarithms of their standard deviations are approximately equal.

Classifying the best way to extract maximum information contained in scalar variable values is to create a parametric model of the probability density function (pdf). Theoretical assumptions along with the general view of the distribution can help in specification of the model.

Model of the distribution which is relatively free of theoretical guessing may be created on the base of kernel density estimation. One of the most preferable kinds of kernel is Gaussian that provides the smoothing of the

empirical distribution without breaks. The effective bandwidth should allow avoiding both over smoothing and under smoothing. The result of pdf kernel estimation is presented on Figure 2.



Source: own elaboration

Figure 2: Estimated probability density function for the logarithm of output of innovative goods and services in Russian regions, 2012 year (kernel bandwidth=0.5)

As it was predicted earlier, three groups of regions may be distinguished in that nonparametric model of general distribution.

We consider data to be a sample of a population of regions with the same properties as regions of Russia in corresponding proportions. Each value in the sample is an observed value of the population for one case (region). As usual the main problem of the parametric approach is to determine the type of theoretical distribution for population. In creating each value of x a great amount of factors act as multipliers, so we can suppose the lognormal distribution for the homogenous subpopulation

$$f(x) = \frac{1}{2\pi x_1 x_2 (1-\rho^2)|\Sigma|^{1/2}} e^{-0.5(\ln x-\mu)^T \Sigma^{-1}(\ln x-\mu)}$$

where $x = (x_1 \quad x_2)^T$ and $\ln x = (\ln x_1 \quad \ln x_2)^T$ are the vectors of variables, x_1 is the output of innovative goods and services, x_2 is the expenditure on technological innovations;

$\mu = \begin{pmatrix} E(\ln(x_1)) \\ E(\ln(x_2)) \end{pmatrix}$ and $\Sigma = \begin{pmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ \rho\sigma_1\sigma_2 & \sigma_2^2 \end{pmatrix}$ are the expectation and variance-covariance matrix of $\ln x$.

Considering three close to each other groups of regions in the population (see Fig.2) we may present pdf as a normalized weighted sum of three lognormal functions. Each i-th group in this sum is in turn a lognormal distributed homogeneous population $f(x, \mu_i, \Sigma_i)$. So for the whole population

$$f(x) = \sum_{i=1}^{3} q_i f(x; \mu_i, \Sigma_i),$$

q_i is a i-th group's share in the population so that $\sum_{i=1}^{3} q_i = 1$.

The maximum likelihood estimates $\hat{\theta} = (\hat{\mu}_1, \hat{\mu}_2, \hat{\mu}_k, \hat{\Sigma}_1, \hat{\Sigma}_2, \hat{\Sigma}_3, \hat{q}_1, \hat{q}_2, \hat{q}_3)^T$ for independent parameters of theoretical distribution may be obtained from the equation

$$L(\hat{\theta}) = \prod_{i=1}^{n} f(x_j, \hat{\theta}) = \max_{\theta} L(\theta), \quad \text{or } l(\hat{\theta}) = \ln L(\hat{\theta}) = \sum_{i=1}^{n} \ln f(x_i, \hat{\theta}) = \max_{\theta} l(\theta).$$

The estimating results are presented in Table 1.

Table 1: Estimates of parameters

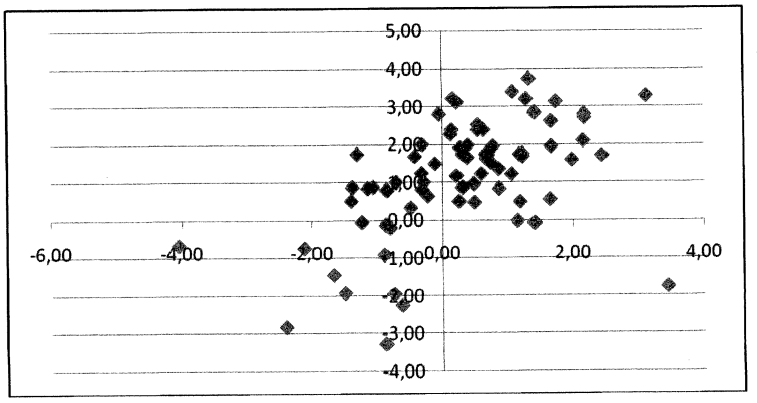
№ of stratus	$\hat{q}$	$\hat{\mu}_1$	$\hat{\mu}_2$	$\hat{\sigma}_1$	$\hat{\sigma}_2$	$\hat{\rho}$
1	0,14	-1,08	-1,66	1,79	0,92	-0,05
2	0,38	-0,08	0,87	0,88	0,60	0,04
3	0,48	0,98	2,21	0,82	0,74	0,08

Source: own elaboration

Three homogeneous groups have been identified with the model. The most numerous is the group of leading regions which includes just half of the whole population. The group of followers is the most variable like the group of the following countries on Fig.1.

To determine the real level of innovation development the scale effect should be eliminated, so the relevant indicators for this purpose should be normalized by its dividing on the population of the corresponding region or the number of employees. If the theoretical assumption meets the empirical estimates of the probability density function, the approach may be fruitful. But that is not the case. Taking into account the normalized data scatter plot (Figure 3), we can hardly rely on high goodness-of -fit of the estimated parametric model because of a great number of outliers on it.

That is why the nonparametric clustering seems to be more suitable. But the model should correspondent to the nature of the phenomenon, so the fuzzy modification of "k-means" clustering may be applied. In a traditional clustering it is supposed that each case should be a member of any one cluster. Fuzzy "c-means" clustering is based on the statement that each case obtains at some degree the features of all the clusters, and a measure of such a membership for i-th object (i=1,...,n) in j-th cluster (j=1,...k) is a value of a membership function $\mu_{ij} \subset [0;1]$.



Source: own elaboration using data of http://www.gks.ru/bgd/regl/b11_14p/Main.htm

Figure 3: Scatter plot of the Russian regions on logarithm of output of innovative goods and services and logarithm of expenditure on technological innovations, 2010 year

The membership function may be specified using the distance from the object to the centre of the cluster r_{ij} in the following way:

$$\mu_{ij} = (1/r_{ij}^2)/\sum_{j=1}^{k}(1/r_{ij}^2),$$

The number of clusters has to be defined in advance, and the empirical distribution analysis and its projections might be useful. Also it is necessary to select the starting centers of the clusters, for example, it may be first k cases. Then, we have to calculate the membership function for the next case correcting the centers of all the clusters

$$\overline{\ln x}_j^{(v)} = \sum_{i=1}^{n}\left(\ln x_{ij}^{(v)}(\mu_{ij}^{(v)})^2\right)/\sum_{i=1}^{n}(\mu_{ij}^{(v)})^2$$

After calculations using all data the procedure will be repeated while the maximum difference between the values of the membership function $\{\mu_{ij}\}^{(p)}$ and $\{\mu_{ij}\}^{(p+1)}$ for the same case and cluster at p-th and (p+1)-th iterations becomes less than predetermined threshold limit. All the values μ_{ij} form a membership matrix.

The number of cases in the group or cluster is defined as a weighted sum of all the values of the membership function in the group. Generally it is not an integer value. Properties of each cluster may be presented with its etalon means, for this purpose a kernel of the cluster should also be used. The kernel of cluster includes regions with big enough value of the membership function $\mu_{sj} \geq \mu_0$ (e.g. $\mu_{sj} \geq 0{,}7$).

Classification using more than one variable seems to be more comprehensive. Fuzzy modification of the so named "k-means" clustering allows making this analysis more informative.

5. Fuzzy clustering results

According to the first (parametric) stage of classification three groups were considered. The results of fuzzy classification are presented in Table 2.

Table 2: Characteristics of the groups, 2010 year

Mean group value	Groups of Russian regions		
	Following	Middle	Leading
$\overline{\ln x_1}$	-0,52	0,38	0,74
$\overline{\ln x_2}$	0,24	1,14	1,77
Group share, %	26,9	31,5	41,6

Source: own elaboration

Despite the difference in values of indicators, the structures of this (nonparametric) and previous (parametric) models are alike. The most numerous is the leading group including more than 2/5 of all the regions. The least numerous is the group of underdeveloped on producing innovations regions with the share about 1/4.

The membership function values are presented in the Table 3. The membership for the particular region in the corresponding group is delighted by grey color which is the darker the greater is the value of the membership function.

Table 3: Membership function for Russian regions, 2010 year (fragment)

Regions	Following	Middle	Leading
Kemerovo	0,99	0,01	0,00
Kursk	0,90	0,07	0,03
Arkhangelsk	0,89	0,07	0,04
Krasnodar	0,82	0,12	0,07
Pskov		0,17	0,10
Altay		0,19	0,09
Kostroma	0,02	0,94	0,04
Penza	0,02	0,93	0,05
Smolensk	0,06	0,87	0,07
Vladimir	0,02	0,84	0,14
Ivanovo	0,09		0,24
Amur	0,25		0,15
Belgorod	0,00	0,01	0,99
Moscow (city)	0,00	0,01	0,99

Regions	Following	Middle	Leading
Udmurtia	0,00	0,02	0,98
Stavropol	0,01	0,05	0,95
Tomsk	0,01	0,07	0,93
Vologda	0,01	0,16	0,82
Orenburg	0,03	0,16	0,81
Leningrad	0,04	0,17	
Chuvashia	0,04	0,19	

Source: own elaboration

Regions with great enough value of membership function are considered to form the kernel of the corresponding group (Table 4).

Table 4: Regions of the group kernels in 2010 year

The most typical following regions	The most typical representatives of the middle group of regions	The most typical leading regions	
Kemerovo	Kostroma	Belgorod	Leningrad
Kursk	Penza	Moscow (city)	Chuvashia
Arkhangelsk	Smolensk	Udmurtia	Tula
Krasnodar	Vladimir	Stavropol	Novgorod
Pskov		Tomsk	Bashkortostan
Altay		Vologda	Moscow (reg.)
Transbaikalia		Orenburg	

Source: own elaboration

It is important that membership function close to the maximum value of one does doesn't obviously mean the best results in the innovative activity; it only means that the region is the typical representative of the corresponding group.

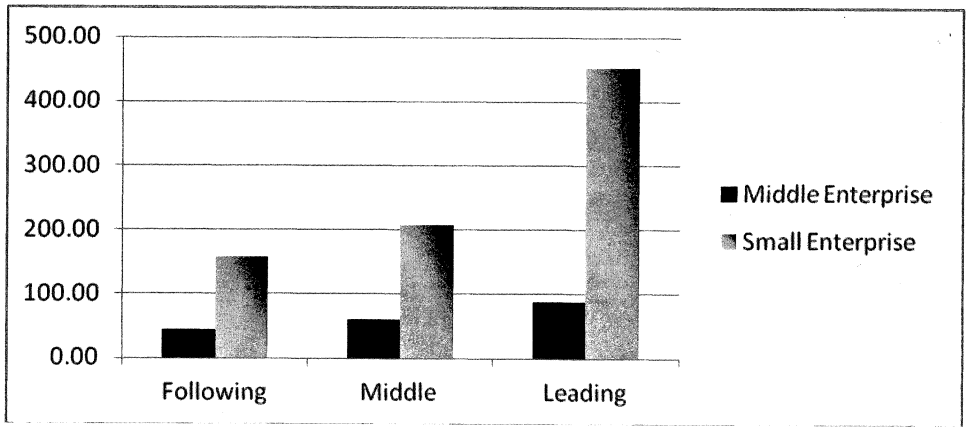
6. Determinants of the regional structure and features of the groups

Various aspects of regional development may be presented with corresponding indicators. Based on the available information a set of indicators has been constructed:

- regional domestic product per capita;
- mean monthly wages in regions;
- turnover of small and medium enterprises;
- manufacturing industry turnover;
- product proceeds

Mean values of indicators for each stratum should be calculated as a weighted means. The membership function values μ_{ij} are used as weight coefficients.

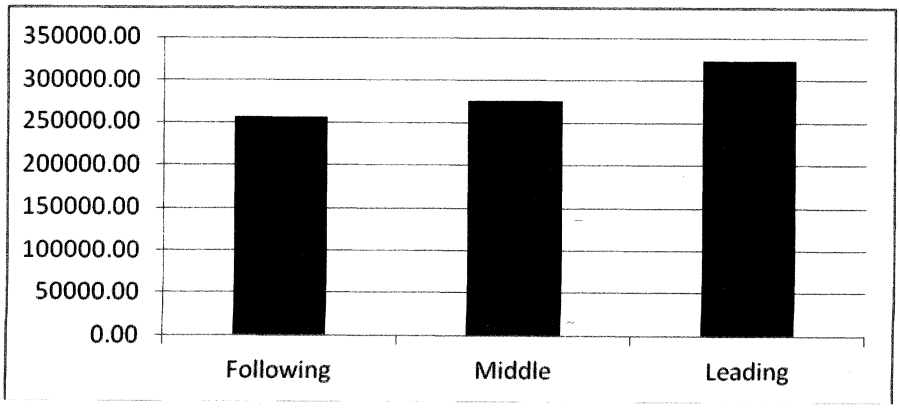
It is important to recognize the reasons for splitting the whole population to discrete groups. It seems to be that in Russian Federation as such a reason may be considered the level of small enterprise development. And prominent difference in values of corresponding indicators supports this statement (Figure 4). Medium and especially small enterprise development is greater in more innovative regions, and the difference in small enterprise can be the real determinant of leading regions as a mean for creating and using innovations.



Source: own elaboration using data of http://www.gks.ru/bgd/regl/b11_14p/Main.htm

Figure 4: Turnover of enterprises, thousand roubles per inhabitant

Difference in innovation activity provides the difference in economic development of the regions. In turn the level of economic development allows fostering innovations. Analyzing regional domestic product per capita (Figure 5) we can see increasing of its value along with the level of innovative development.

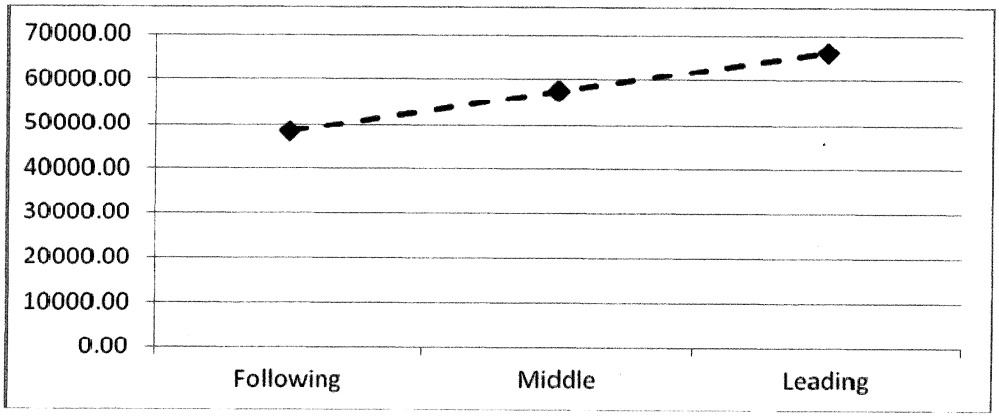


Source: own elaboration using data of http://www.gks.ru/bgd/regl/b11_14p/Main.htm

Figure 5: Regional domestic product per capita in groups of regions

Regional domestic product in the leading group exceeds the corresponding level in the following one by more than 26 percent.

Greater level of economic development creates additional opportunities for improving of the population well-being. The difference in mean wages is more impressive than in regional domestic product: it is more than 36 percent (Figure 6).



Source: own elaboration

Figure 6: Mean monthly wages in groups of regions

Hence, we can see the evidence of that high level of innovative activity provides essential impact on economic development of regions, and it is strongly connected with medium and especially small enterprise development which seems to be the key factor of innovative development.

7. Conclusion

There is relation between innovative development and quality of life. All the countries with high value of the Global Innovative Index are the best in providing human development. Less innovation developed countries are not so homogenous, and they differ enough in both objective and subjective indexes of the population well-being. While the human development index rely mostly on historical background, cultural traditions and other general factors, the subjective index may be connected with the dynamic and achieved level of innovative activity. It is important to find additional evidence to this assumption on regional level in further research.

The proposal of substantial difference in innovative development in such a vast country as Russian Federation is supported by the model using fuzzy approach to classification of stratified objects. It shows that country includes three relatively homogenous groups that differ substantially from each other in costs and results of innovative activity. The profiles of the groups are different, but there are two kinds of indicators describing the groups. When indicators of small and medium enterprise development show the reasons of the difference in innovative activity of the regions, the indicators of general economic development and living standards of the population present the consequences of that difference.

Advanced methods of parametric and nonparametric classification permit to provide comprehensive analysis of the regions innovative development and technological progress. The progress in measuring additional indicators on regional level needs improvement of statistical base and providing up-to-date information.

References

Acs, Z.J., Audretsch, M.P. (1990). Innovation and Small Firms, MIT, Cambridge

Alderson, Arthur S. and François Nielsen (2002) *Globalization and the Great U Turn: Income Inequality Trends in 16 OECD Countries*. American Journal of Sociology, Vol. 107, No. 5, pp 1244–1299

Anand, S., Sen, A. (1997) Human Development Index: Methodology and Measurement, Human Development Report Office

Blind, K. (2012) The influence of regulations on innovation: a quantitative assessment for OECD countries. Research Policy, 41 (2), pp. 391-400

Bogliacino, F., Pianta, M. (2011) Engines of growth, Innovation and productivity in industry groups. Structural Change and Economic Dynamics, 22, pp. 41-53

Ciftci, M., Cready, W.M. (2011) Scale effects of R&D as reflected in earnings and returns, Journal of Accounting and Economics 52, pp. 62-80

Estes, R. (2002) *Poverties and wealth competing Definitions and Alternative Approaches to Measurement. In Rich and Poor. Disparities, Perceptions, Concomitants*. Social indicators research series. Vol. 15. Kluwer Academic Pablishers

Fagerberg, J., Feldman, M, Srholec, M. (2011) Technological Dynamics and Social Capability: Comparing U.S. States and European Nations, Working Papers on Innovation Studies 20111114, Centre for Technology, Innovation and Culture, University of Oslo

Gallup [online] http://www.gallup.com/poll/wellbeing.aspx

Human Development Index (HDI) [online] http://hdr.undp.org/en/statistics/hdi

ICT and Human Development: Towards Building a Composite Index for Asia, (2004) UNDP

Indicators of innovative activity (2012), National Research University Higher School of Economics, Moscow

Regions of Russia: Social and Economic Indicators (2011) [online] http://www.gks.ru/bgd/regl/b11_14p/Main.htm

Sharpe, A. (2006) *New Estimates of the Index of Economic Well-Being for Canada.* Centre for the Study of Living Standards, Ottawa, Ontario, Canada

Social Weather Stations [online] http://www.sws.org.ph/fel-news.htm

The Global Innovation Index [online] http://www.globalinnovationindex.org/gii/