Interregional Social Differentiation as Safe Socio-Economical Dynamics in Russia

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Abstract– **It has been proved that high interregional social differentiation which is understood here as unequal distribution of regional societies according to key indicators of social development, is a source of inner threat to economical security and it impedes Russia's integration into the world economic area. It has been found that in order to group regions according to the level of social development, it is reasonable to use multidimensional analysis (cluster analysis). Three regional clusters (with high, medium and low levels of social development) have been determined and the clusters' composition has been specified. The received data have demonstrated regions' "migration" from the clusters with low social development to the clusters with higher social development and proved positive dynamics in social processes and a tendency towards a reduction of interregional social differentiation in the Russian Federation.**

Keywords— interregional social differentiation, economic security, socio-economic dynamics, cluster analysis.

I. INTRODUCTION.

High interregional differentiation is the main factor hindering steady development of countries with federative framework. We agree with professor S.D. Valentey (Valentey, 2011), who states that in the world economy there are no countries with equal development of regions. That is why most developed countries delimit the differentiation, reaching which allows interpreting this socio-economical phenomenon as not just a problem but as a threat to national strategic interests. This approach transforms the issue of interregional differentiation from regional economics into national and economic safety.

Though inequality in dynamics of regional socio-economical systems can be noticed in most modern countries, exactly in Russia it is so significant and long-time running that attract attention of scientists and researchers. According to the key issue denoting the level and scales of regional differentiation – Gross Regional Product (GRP per capita), federal districts of Russian Federation differ more than 4 times (Russian Regions, 2017). Somewhat below is interregional differentiation according to the parameters of social development: in particular, according to the level of population income per capita Central Federal District, taking

the first place and North-Caucuses Federal District with minimal income differ nearly 2 times.

The scale of the problem is understood completely when we compare Russia with Europe and Asia countries (table 1) by the key parameter of estimating the level of social inequality – Gini index, which allows characterizing the degree of interregional inequality by income per capita (Yitzhaki, Schechtman, 2013):

TABLE 1. DIFFERENCE IN INCOME CONCENTRATION (GINI INDEX)

	Parameters value, %	Comparing with RF (Russia=1)
Russia	41,2	1
Europe		
Austria	30,5	0,74
Bolgaria	36,0	0,87
Germany	30,1	0,73
Denmark	29,1	0,71
Poland	32,4	0,79
the United Kingdom (Great Britain)	32,6	0,79
Finland	27,1	0,66
French	33,1	0,80
Asia		
India	33,9	0,82
China	42,1	1,02
Japan	32,1	0,78
Africa		
Algeria	42,7	1,04
Democratic Republic of Congo	42,1	1,02
Egypt	30,8	0,75
Morocco	40,7	0,99
America		
the USa	41,1	1

Source. Calculated according to the data: Russia and world countries – 2016 http://www.gks.ru/bgd/regl/b16_39/Main.htm

Income concentration in Russia is higher, then in developed countries of Europe and Asia (except for China), according to this parameter our country is in the same group with countries of Africa (Angola, Congo) and the USA. Reduction in regions' differentiation in Russia according to the income per capita is a positive tendency at the level of national economy, turns into real problem when viewing it from the point of higher level system – the world economy in general. So, interregional social differentiation is, on one

side is a source of internal threat to economic security, from the other side, worsens Russia's integration into the world economy space.

II. BACKGROUND AND METHODS.

The issue of regional differentiation increase, through social factors, is discussed by Russian and foreign scientists. Reasons and causes of regional discrepancies were studied at different periods, and special state actions for overcoming regional difference have been studied. In connection with this it is important to take into account developed countries politics for regulating regional social development and fastening their economic security.

It should be noted that in 1950–1960 OECD countries announced equity of regional development as a main priority of regional politics. Achieving equality was considered as levering regional disproportions in social development of territories. At this period the characteristic feature of regional politics of foreign countries was admitting social factor as key parameters of regional social-economical dynamics. Later, in 1970-1980 foreign countries denied regional development as a key factor and stressed competitiveness of territories. Reorientiering from social on economical factors caused vulnerable places in regional social development, and as a result, increase in threats and challenges to regional security in social sphere. Later investigations of foreign scientists in XX-XXI, proved that for security promotion and providing steady development of the territories it is better to concentrate finance, and other components of strategic potential including social possibilities (Krugman, 1991; Krugman, Venables, 1996; Puga, Venables, 1997; Martin, Ottaviano, 2001). From the scientists' point of view this approach minimizes significant regional disproportions in socio-economic development, provides reliable security level of territories by rational utilization of social resources and possibilities.

Issues of regional differentiation are investigated by Russian scientists. Such works of Russian scientists are widely known (Granberg, 2004; Kistanov, 1976; Leksin, 2011) denoting the problem; proving the topicality of its solution for states with federative structure; suggesting their own approaches to differentiation reduction in territory development and its elimination in future. V.K. Sengachev and his co-workers on economic safety (Sengachev, 2012) treated the issue of regional differentiation in the context of threats and challenges to strategic interests of Russian Federation, state national security. Special attention should be given to works devoted to studies of regional social differentiation which we understand as distribution of regional communities accourding to key factors of social development. This approach agrees with basic ideas of the theory of social planning, formulated by sociologists V.Ya. Yelmeev, N.I. Lapin, Z.T. Toshenko and others in the middle of XX c. (Yelmeev, 1974; Lapin, 1976; Toshenko, 1981). This approach states that the main reason of regional social differentiation is that dynamics of social development depends on national, cultural, resources and other peculiarities of territories. It should be noted that the issues of regional differentiation have distinct interdisciplinary character that is why they attract attention of specialists from

different fields of knowledge – economists, executives, sociologists. This conclusion is fair in relation to the problems of interregional social differentiation, with complex, multidisciplinary character and having important practical consequence for providing national and economical security of Russian Federation.

Problem complexity of studying interregional social differentiation in the context of economic security demanded more complex analytical tools. Nowadays, the most common methods are:

- using variation of Theil indexes, Ginni, Herzfeld (Herzfeld, 2008), polarization index and other statistic indexes, allowing to control inequality (inhomogenity) of spatial development and the level social inequality of population;

- index method, supposing computation of integral (summing up) index, basing on which regions rating is formed by the level of economic security, in particular, in social sphere;

- modeling with the use of econometric models giving quantitative estimation of the level of social differentiation and regions economic security threats;

- multidimensional data analysis (cluster analysis), allowing to group regions according to totality of features. The advantage of this method in studying regional differentiation problems is that it allows analyzing plurality of factors, evaluated with total factors, with different units of measurement, without additional agreement and standardization procedures.

As we understand regional social differentiation as the source of internal threats to economic security of Russia, metrics for controlling its level and dynamics should be based on criteria of economic security state determined in the Strategy of economic security of Russian Federation for the period until 2030 year (table 2).

TABLE 2. METRICS SYSTEM FOR ESTIMATING REGIONAL SOCIAL DIFFERENTIATION

Index	Characteristics
X1 – Active working population in total amount of population	This index characterizes region labour resources
X2 – Amount of population with the income lower than minimum subsistence level	This index characterizes population poverty rate, calculated in percents of total regional population number
X3 – Distribution of workers in economics according to the literacy level	This index characterizes the level of literacy of working population
X4 – Rich/poor coefficient	This index characterizes degree of social inequality of the regional community
X5 – Amount of workers with salary below minimum subsistence level for active working population	This index characterizes poverty rate among active working population

The suggested system of indexes reflects adequately real processes in the field of social differentiation of Russian regions, that is why modeling results will accurately reflect a real state of things in the regional system and can be a ground for considered and grounded decisions on providing economic security of the territory.

The dynamics of these parameters is especially interesting in periods when they changed under the influence of serious, repeated "signals": we talk about 2008, 2010 and 2014. 83 regions of Russian Federation were the objects of investigation (the Crimea and Sevastopol were not analyzed, as we have reliable statistics data per 2008 and 2010 on these regions).

We used multidimensional analysis (cluster analysis) as the main method - relatively new method of investigating socio-economical processes and recommended for analyzing issues of regional differentiation (Sorokina N.Y., Gubarev R.V., Bondarenko N.E., Maksimova T.P., 2018). Its idea is that by clusterization procedure jointed groups (clusters) are distinguished, where regions have similar indexes of social development. In relation to territories forming a cluster there may be measures of regional social politics and economic security politics reflecting specific problems of a certain group of regions. Thus, multidimensional analysis procedure allows forming qualitative information for developing differential regional socio-economic politics, providing selective problem-solving approach to the solution of life-activity of the population of Russian Federation, independent of its place of living.

The issue of regions clustering according to indexes of their social development may be formulated as follows: we have n-regions with the level of social development in the contents of preve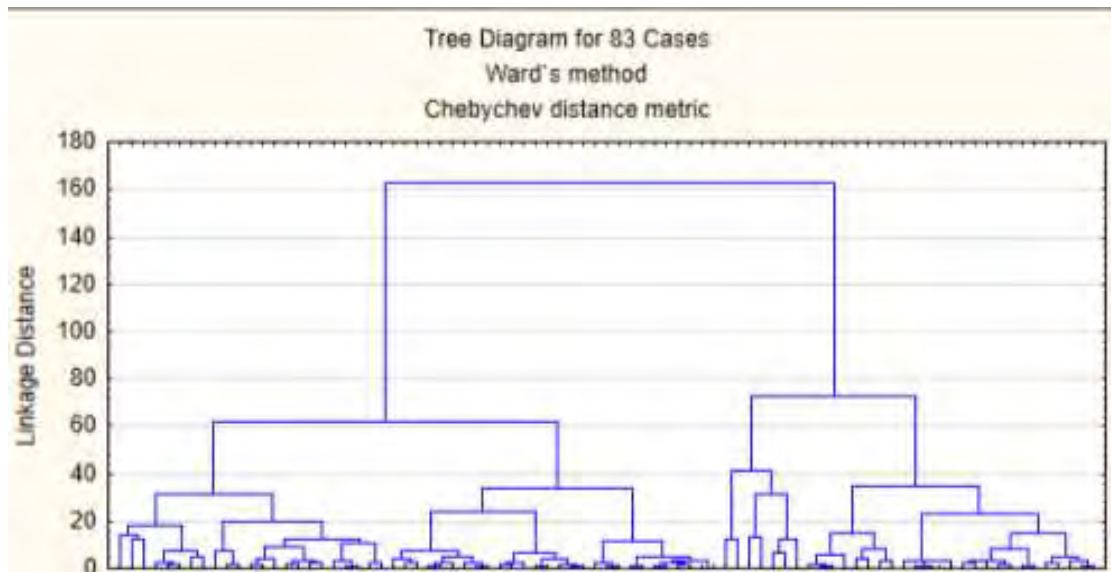nting economic security treats may be characterized by m-variables. With the help of cluster procedure regions should be classified as r-th cluster, herewith cluster territories will have similar parameters characterizing nature of social processes.

To obtain qualitative results clusterization should be fulfilled in two stages: by realization of hierarchical and non-hierarchical (iterative) procedures. During clusterization with hierarchic methods, the researchers think, the choice of distance ratio (similarity), and classification algorithm developed necessary for adequate cluster structure. By interative procedures, in particular k-mean method, specification of carried out earlier regions division into groups. More details of clusterization method choice and types of distances for the purposes of grouping regions and investigating regional differentiation are given in the work (Smirnova, Belyaevskaya-Plotnik, Sorokina, 2017).

III. RESULTS.

Computer-assisted regions clusterization in order to create similar groups accourding to the level of social development is done by computer programme "STATISTICA 10.0". A massif of latest data was used as an input data in the view of performance measures of the level of regional social differentiation are given in Table. 3.
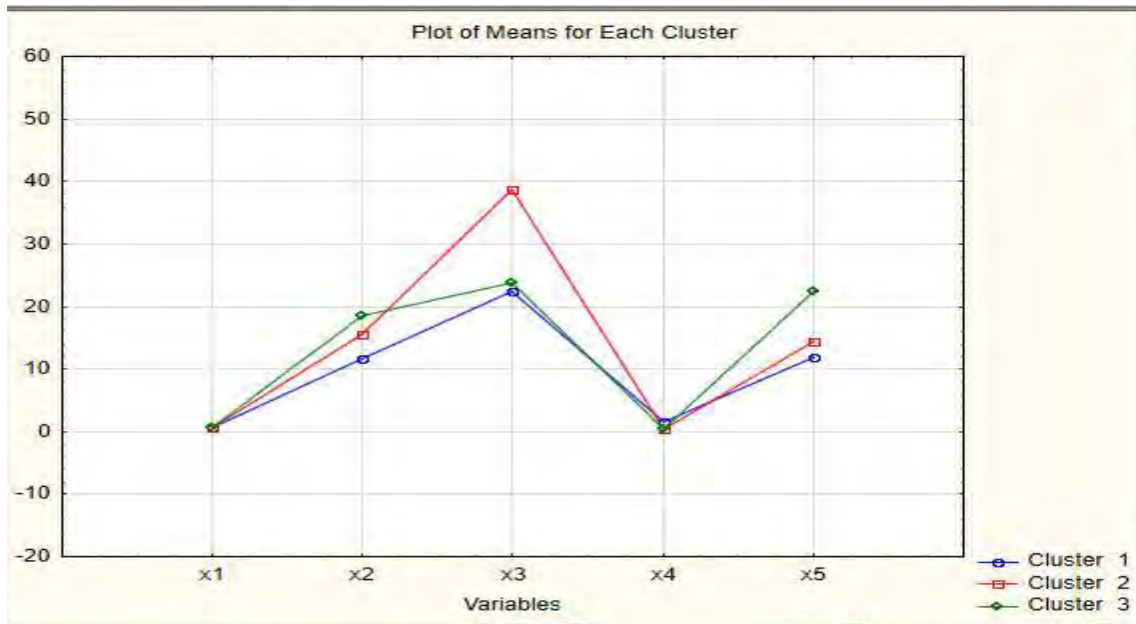
The results of regions hierarchical clusterization are given in pic. 1and 2.

Picture 1. Hierarchic clustering dendrogram of regions of Russian Federation with Ward method with the use of distance "Chebyshev metrics" in program "STATISTICA" (without the Crimea Republic and Sevastopol)

Hierarchical clusterization procedure allowed regions division into three groups (clusters). To confirm this division and specify the composition of every group clusterization interative procedures realization was used, exactly, k-means method. Implementing procedures of regions clusterization we receive the following values (pic. 2).

Picture 2. Graphic representation of clusters in program "STATISTICA10.0"

TABLE 3. CLUSTERS STRUCTURE OF RUSSIAN FEDERATION REGIONS BY INDEXES OF SOCIAL DEVELOPMENT

Cluster 1 (average level of social development)	Cluster 2 (high level of social development)	Cluster 3 (low level of social development)
the Bryansk region	the Belgorod region	the Ivanovo region
the Vladimirskaya region	the Kaluga region	the Republic of Adygeya
the Voronezh region	the Lipetsk region	Republic of Kalmykia
the Kostroma region	Moscow region	the Astrakhan region
the Kursk region	Tula region	Republic of Dagestan
the Oryol region	the Yaroslav region	Republic of Ingooshetia
the Ryazan region	Moscow	Karachai-Cherkess Republic
the Smolensk region	the Republic of Karelia	Stavropol Territory
the Tambov region	Komi Republic	the Republic of Marii El
the Tver region	Archangelsk region	Republic of Mordovia
the Novgorodsk region	Nenets Autonomous Area	the Kirov region
the Pskov region	the Vologda region	the Orenburg region
the Krasnodar Territory	the Kaliningrad region	the Penza region
the Volgograd region	the Leningrad region	the Saratov region
the Rostov region	the Murmansk region	the Republic of Altai
the Kabardino-Balkar Republic	Saint-Petersburg	the Buryat Republic
The Republic of North Osetia - Alania	the Chechen republic	the Republic of Tyva
the Republic of Bashkortostan	the Tatar republic	the Altai Territory
the Udmurtian Republic	the Sverdlovsk region	the Jewish Autonomous region
Chuvash Republic	the Tyumen region	
Perm region	the Khanty-Mansi Autonomous Area - Yugra	the Perm Territory
the Nizhniy Novgorod region	Yamalo-Nenetz Autonomous Okrug	the Nizhnii Novgorod region
the Samara region	the Chelyabinsk region	the Samara region
the Ulyanovsk region	the Krasnoyarsk Territory	the Ulyanovsk region
the Kurgan region	the Irkutsk region	the Kurgan region
the Republic of Hakkasia	the Kemerovo region	the Republic of Khakassiia
Zabaikalskii Krai	the Tomsk region	Zabaikalskii krai
the Novosibirsk region	the Magadan region	the Novosibirsk region
the Omsk region	the Sakhalin republic	the Omsk region
the Sakha republic (Yakutia)	the Chukot Autonomous Area	the Sakha republic (Yakutia)
the Kamchatka region	the Kamchatka region	the Kamchatka Krai
Primorski Krai	Primorskii Krai	the Primorskii Krai
Khabarovsk Krai	Khabarovsk Krai	the Khabarovsk Territory
theAmur region	the Amur region	the Amur region

Graphic presentation of clusters shown in picture 2, may be interpreted as following:

- by index X1 (population share of the working age in total number of population) and X4 (rich/poor coefficient) regions under investigation have high degree of homogeneity;

- by index X2 (for citizens with income lower than minimum subsistence level) and X5 (employees share with a salary lower minimum subsistence amount of the working age population) regions demonstrate average degree of uniformity, that is proved by slight deflection of indexes on the graph;

- by index X3 (distribution of workers in economics according to the literacy level) in relation to investigated regions there is a certain degree of inhomogenuity, that evidences about "dropping out" the index from sample density, about its distance from cluster center. Indicator values X3 should be excluded from the analyzed sample density, as they are extreme and can cause significant errors in calculation and inadequacy of conclusions.

Clusterization with k-means method with indexes X1, X2, X4 and X5 allowed drawing confirmation from preliminary hypothesis about regions' distribution into three clusters and specifying the composition of these clusters (table 3).

We can interpret the data in the table as following:

1. The first cluster regions have average parameters of social development. Cluster "nucleus" is formed by well-developed regions of Central and Volga federal districts (half of the total number of regions in the cluster). Also, this group includes region-leaders of socially-economically less developed makroregions, in particular, Sakha republic (Yakutia), Novosibirsk region and others.

2. The second region clusters have high level of social development. It includes region-leaders of Russian Federation according to the indexes of social development - Moscow, the Moscow region, Saint-Petersburg, the Republic of Tatarstan, and regions distant from the center which have created comfort conditions for population, active development and system reproduction of human and labour potential (Tyumen region).

3. The third cluster regions are characterized by the lowest social criteria among the whole number of territories. They have not succeeded yet in providing adequate standard of living and stimulate development of social infrastructure on the level of regions-leaders (the second cluster).

Region clusterization has been done three times: in 2008, 2010 and 2014, that allowed to make a conclusion about cluster density (it is estimated by the number of regions in the cluster), and detect tendencies of its changes in time (table 4).

TABLE 4. CLUSTER DENSITY IN REGIONS OF RUSSIAN FEDERATION
ACCORDING TO THE INDEXES OF SOCIAL DEVELOPMENT

Clusters	Number of regions in cluster			Cluster density		
	2008	2010	2014	2008	2010	2014
Cluster 1	34	32	29	41%	38%	35%
Cluster 2	30	33	38	36%	40%	46%
Cluster 3	19	18	16	23%	22%	19%
Total	83	83	83	100%	100%	100%

These data evidence that in 2008the most density was in the first cluster, but during the following years the density of the second cluster increased, which has high level of social development. This positive tendency is achieved by joining to cluster 2 such regions as the Sakha republic (Yakutia), Primorski Krai and Khabarovsk Territory which earlier were in the first cluster. During this period Stavropol Krai migrated from the third into the second cluster. Such migration from lower level cluster into higher level cluster evidences about increase in quantitative values of social development in regions, and evidences the tendency in decreasing the level of social differentiation in Russian Federation. A similar situation was in 2014, when the second cluster density increased by joining five regions from

the first cluster (Kamchatka Krai, Khabarovsk Krai, the Amur region, the Krasnodarsk Krai, the Rostov region), and the third cluster density decreased due to the migration of Dagestan Republic and Orenburg region into the second cluster.

Detected regions migration among clusters can be considered as a positive tendency, evidencing about reduction of the level of regional differentiation according to indexes of social development and lowering economic security threats of Russian Federation.

IV. CONCLUSION.

This research allows making several conclusions about peculiarities of regional social differentiation and dynamics of economic security threats in Russian Federation caused by it.

1. In modern economic conditions the problem of regional differentiation is transformed from the level of regional economics into the level of providing national and economic security. Considering regional social differentiation as the source of inner threats to economic security of the state allows following it dynamics and level with the use of economics security indexes determined in "Strategy of Economic Security of Russian Federation" up to 2030 year".

2. A promising method of investigating regional differentiation is a multidimensional data analysis (cluster analysis), allowing grouping regions according to several indexes with the bulk of data, having diverse units of measurement, without additional agreement and standardization procedures. Basing on it we can get original and adequate conclusions about the level and dynamics process.

3. Hierarchic procedure of clusterization showed three clusters in Russian Federation, differing significantly by the level of social criteria: regions with high, average and low level of social development.

4. Regions "migration" from cluster of lower level of development into cluster of higher level of development, evidencing about leveling quantitative values of region social development indexes, and as the consequence, about decreasing the level of regional social differentiation. Positive index dynamic of social development evidences about increase in social resources of territories, is the main component of its strategic potential, which is necessary and sensible in struggling the risks and economic security threats.

5. Applying cluster analysis allows forming informative data base for recommendations on differential regional socio-economic policy, providing selective approach to the solution of life activity of population of Russian Federation independent of the place of its living.

Acknowledgements

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