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. Valentyev (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                          |
| Europe               |                               |
| Austria              | 30,5                          |
| Bulgaria             | 36,0                          |
| Germany              | 30,1                          |
| Denmark              | 29,1                          |
| Poland               | 32,4                          |
| the United Kingdom   | 32,6                          |
| (Great Britain)      |                               |
| Finland              | 27,1                          |
| French               | 33,1                          |
| Asia                 |                               |
| India                | 33,9                          |
| China                | 42,1                          |
| Japan                | 32,1                          |
| Algeria              | 42,7                          |
| Democratic Republic  | 42,1                          |
| of Congo             |                               |
| Egypt                | 30,8                          |
| Morocco              | 40,7                          |
| America              |                               |
| the USA              | 41,1                          |

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 leveraging 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-economic 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 region 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 according 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 (inhomogeneity) 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-economic 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 preventing 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 according 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. 1 and 2.

![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)](image)

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).
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 Sarap region                             | Republic of Ingooeshetia                     |
| the Ryazan region                              | Moscow                                      | Karachai-Cherkess Republic                  |
| the Smolensk region                            | the Republic of Karelia                      | Stavropol Territory                         |
| the Tambov region                              | Komi Republic                                | the Republic of Mari 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 Kavkazino-Balkar Republic                  | Saint-Petersburg                             | the Byzat Republic                           |
| The Republic of North Ossetia - 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 Nizhnii Novgorod region                    | Yamalo-Nenets 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 Khakassia                    |
| Zabaikal'skii Krai                            | the Tomsk region                             | Zabaikal'skii 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 Kamchatska region                          | the Kamchatka region                         | the Kamchatska Krai                          |
| Primorski Krai                                 | Primorski Krai                               | the Primorski Krai                           |
| Khabarovsk Krai                                | Khabarovsk Krai                              | the Khabarovsk Territory                     |
| the Amur 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 inhomogeneity, 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 makorregions, 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).

| 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 2008 the 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.

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References

[1] The review on “The atlas of upgrade of Russia and its regions: Socioeconomic and sociocultural tendencies and problems”, Collective scientific labor, Originator and editor-in-chief, corresponding member of RAS N. I. Lapin”, Center of studying of sociocultural changes, Institute of philosophy of RAS, Moscow- Vechir, 2016

422
S. D. Valentey, Constituent entities and their role in economic development of the federal state, New economics association, 2011, № 10 (10), pp. 175-177.

A.G. Granberg, “Regional economics and regional science in Russia, ten years later”, Region: economy and sociology, 2004, N 1, pp. 57–81.

V.Ya. Yelmeev, Methodology bases of social development planning, Moskow, 1974.

V.V. Kistanov, “Scientific problems of enhancing economic regioning”, Territory problems and practices of the USSR labour force positioning, Moskow: Nauka, 1976, pp. 55-79.

V.N. Leksin, “The present and the future of the settlement”, Feodalizm, 2001, № 1 (61), 57-74.

Russian regions. Social economicalindexes. http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1138623506156

O.O. Smimova, L.A. Belyaevskkaya-Plotnik, N.U. Sorokina, “Evidence-Based Model of Integration of Regions for Ensuring Economic security and sustainable Development of the Russian Federation”, MID (Modernization. Innovation. Development), 2017, vol. 8, № 4 (32), pp. 492-504.

About the strategy of economic security of Russian Federation for the period of 2030 year, Russian Federation President Decree, № 208, 2017.

Zh.T. Toshenko, Social Planning in the USSR, Moskow, 1981

V.K. Senchagova, Economic Security in Russia regions: monography, Nizhnii Novgorod, 2012, pp. 253.

T. Herzfeld (2008), Interregional Income Distribution: A Comparison of Russian and Chinese Experience, Post-Communist Economies, Vol. 20, No 4, pp. 431—447.

P. Krugman, A.J Venavles, Integration, Specialization, and Adjustment, European Economic Review, 1996, Vol. 40, pp. 959-967.

P. Martin, G.I.P Ottaviano, Growth and Agglomeration, International Economic Review, 2001, Vol. 42, N4, pp. 947-968.

D. Puga, A.J. Venavles, “Preferential trading arrangements and industrial location”, Journal of International Economics, 1997, Vol.43, pp.347-368.

N.Y. Sorokina, R.V. Gubarev, N.E. Bondarenko, T.P. Maksimova, “An Assesment of the Level of Economic Integration of Russia’s Regions within the System of Economic Security”, Espacios, Vol. 39 (№27), 018.

- http://www.revistaespacios.com/a18v39n27/18392723.html

S. Yitzhaki, E. Schechtman, The Gini methodology, A primer on a statistical methodology, New York: Springer, 2013.