Analysis of distinctions of the development of education of the Russian macro-regions

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Abstract. The methodical approach to the analysis of distinctions of development of educational sphere in macro-regions, the federal administrative districts of Russia, is offered in the article. Feature of methodical approach consists in the choice, calculation and ranging of relative indicators of an assessment of preschool, general, professional and higher education in the macro-regions, and also in carrying out the analysis of variability of the specified indicators by application of methods of statistics.

1 Introduction

In domestic economic science and practice of one of the tasks having important economic value the research of indicators of interregional distinctions at the level of subjects of the Russian Federation is. Results of such researches allow to reveal bottlenecks and reserves of social and economic development of regions and are a basis for carrying out monitoring of regional development, formation and realization of regional strategy and target programs. In scientific literature publications on a research of social and economic processes at the level of subjects of the Russian Federation prevail. At the same time social and economic processes in such important territorial educations as federal districts which inherently are macroregions are insufficiently studied.

In the conditions of transition of Russia to the innovative economy and economy based on knowledge, the analysis of degree of distinction in development of the sphere of education in macroregions by means of application of statistical methods becomes an urgent problem. This circumstance is caused by the fact that priority development of regional education is defined by opportunities of formation and development of the human capital of both regional, and national economy. The offered article in which methodical approach to the analysis of distinctions of development of education in the federal administrative districts of Russia – macroregions is offered is devoted to the matter. Feature of the methodical approach developed by the author consists in the choice, calculation and ranging of relative indicators of an assessment of preschool, general, professional and higher education in macroregions, and also in carrying out the analysis of variability of the specified indicators by application of methods of statistics [1-3].

2 Methodological approaches and analysis

The statistical analysis of distinctions of development of education in the Russian makrorregion was carried out by us on preschool education, the general, professional and higher education on the basis of data of Rosstat in 2015/2016 academic year [4]. As analysis tools we chose indicators of the statistical analysis of discrete variation ranks:
- the place of the macroregion in a variation row on the analyzed relative indicator of education, macroregions - leaders and outsiders in other words are defined.

For an evident illustration of the analysis representation of indicators in the column histogram is offered;
- variation coefficient which is calculated by a formula:
  \[ V = \frac{\sigma}{\bar{X}} \times 100 \ (\%) \; ; \]
  where - \( \bar{X} \) is arithmetic-mean size for \( X_i \) \( i^{th} \) values - an indicator; \( \sigma \) - an average quadratic deviation; \( N \) – number of values of \( i^{th} \) indicator.

\[ X = \frac{1}{N} \sum_{i=1}^{N} X_i, \quad \sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (X_i - \bar{X})^2}, \quad N. \]

If the coefficient of variation is less than 10%, then extent of dispersion of data is considered insignificant; from 10% to 20% - average; it is more than 20% and less or equally to 33% - considerable;
If the value of coefficient of a variation doesn't exceed 33%, the set is considered uniform if it is more than 33%, – non-uniform.

3. Results
In the territory of the Russian Federation nine federal administrative districts are formed: Central (in abbreviated form the CFD), the North-Western (Northwestern Federal District), the Southern (Southern Federal District), North-Caucasian (North Caucasus federal district), the Volga (Volga federal district), the Ural (Ural federal district), the Siberian (SFD) and the Far East (FEFD) and Crimean (KFO).

Leaders in an indicator "VRP per capita" are the Ural and Central federal districts, and outsiders Crimean and North - Caucasian federal districts (Figure 1). The coefficient of a variation of this indicator is equal to 48.60% that proves the heterogeneity of distribution of VRP per capita on macroregions of Russia.

![Figure 1. VRP per capita (million rubles)](image-url)

The main indicators of education are the numbers of the organizations differentiated on education level and also number of pupils and teachers. Considering distinction of population of macroregions and heterogeneity of distribution of VRP per capita on macroregions for comparability of the analysis us absolute values of indicators have been given to their relative values in relation to some volume of selection of the population. Relative indicators were ranged, and the analysis was carried out differentially on preschool education, the general, professional and higher education.

Preschool education. The purpose of preschool education is ensuring intellectual, personal and physical development of the child of age from 2 to 7 years. The analysis of distinction of the sphere of
preschool education on macroregions was made on indicators: number of the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children on 10000 population; coverage of children preschool education, in % of the number of children of the corresponding age; security of children of preschool age with places in the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children is the share places of 1000 children.

The coverage of children is determined by preschool education as the relation of number of the children visiting the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children to the number of children at the age of 1-6 years for January 1 of the year following for reporting by an annual assessment of age and sex structure of the population on the basis of a population census and the current accounting of births, death and the population shift corrected on the number of children at the age of 5-6 years studying in the general education organizations. Security of children of preschool age with places in the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children, the number of places on 1000 children is determined as the relation of total number of places in the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children, to the total number of children at the age of 1-6 years, for January 1 of the year following for reporting, by an annual assessment of age and sex structure of the population on the basis of a population census and the current accounting of births, death and the population shift corrected on the number of children at the age of 5-6 years studying in the general education organizations, and increased for 1000. [5].

Leaders in an indicator "The number of the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children on 10000 population" are Siberian and the Ural Federal District, and outsiders Central and the North Caucasian Federal District. The coefficient of a variation is equal to 20.14% that speaks about considerable extent of dispersion of an indicator of Russia (Figure 2).

![Figure 2](image-url)

**Figure 2.** Number of the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children on 10000 population, piece.
Leaders in an indicator "Coverage of children preschool education, in % of the number of children of the corresponding age" are Northwest and the Ural Federal District, and outsiders the North Caucasian Federal District and the Crimean federal district. The coefficient of a variation is equal to 16.19% that speaks about average extent of dispersion of an indicator on macroregions of Russia.

Leaders in an indicator "Security of children of preschool age with places in the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children on 1000 children" are Northwest and the Ural Federal District, and outsiders the North Caucasian Federal District and the Crimean federal district. The coefficient of a variation is equal to 18.37% that speaks about average extent of dispersion of an indicator on macroregions of Russia (Figure 3).

Figure 3. Provision of children of preschool age with places in the organizations which are carrying out educational activities for educational programs of preschool education, supervision and care of children on 1000 children, places.

General education. The general education includes three steps. Getting the primary general education (1-4 classes) children acquire the first knowledge of the environmental world, skills in communication and the decision of application-oriented tasks, at the same time is created and the identity of the child begins to develop. The purposes of the main general education (5-9 classes) are creation of conditions for formation and formation of the identity of the student, development of his tendencies and interests, and the secondary general education (10-11 classes) - development of creative abilities of the student and formation of skills of independent training.

The analysis of distinction of the general education on macroregions was made on indices: number of the general education organizations (without the evening (replaceable) general education organizations) for the beginning academic for about 10000 years of the population; specific weight of students in state and the municipal general education organizations (without the evening (replaceable) general education organizations) which are engaged in the second and third changes (for the beginning of academic year; in % of the total number of students); the number of teachers of the state and municipal
general education organizations (without the evening (replaceable) general education organizations) thousands of people on 10000 population [6].

Leaders in an index "Number of the general education organizations (without the evening (replaceable) general education organizations) for the beginning academic for about 10000 years of the population" are Far East and Siberian Federal District, and outsiders Northwest and Central Federal District. The coefficient of a variation is equal to 18.70% that speaks about average dispersion of an index on macroregions of Russia.

![Figure 4](image_url)

**Figure 4.** Number of the general education organizations (without the evening (replaceable) general education organizations) for the beginning academic for about 10000 years of the population, piece

Leaders in an indicator "The specific weight of the studying state and municipal general education organizations (without the evening (replaceable) general education organizations) which are engaged in the second and third changes (for the beginning of academic year; in % of the total number of students)" is the North Caucasian Siberian Federal District, the outsiders are the Western and Crimean federal district. The coefficient of a variation is equal to 45.86% that speaks about heterogeneity of distribution of values of an indicator on macroregions of Russia.

Leaders in an indicator "The number of teachers of the state and municipal general education organizations (without the evening (replaceable) general education organizations) on 10000 population" are North-Caucasian and the Far Eastern Federal District, and outsiders Central and the Northwestern Federal District. The coefficient of a variation is equal to 15.70% that speaks about average extent of dispersion of an indicator on macroregions of Russia.

Professional education. Secondary professional education is aimed at training of skilled workers, employees and experts of an average link. The analysis of distinction of the sphere of professional education on macroregions was made on indicators: number of the professional educational organizations which are carrying out training of the skilled workers serving on 1 million people; number of the professional educational organizations which are carrying out training of specialists of an average link on 1 million people; release of skilled workers and employees, on 10 000 people of the population; the number of students of the state and municipal professional educational organizations studying according to programs of training of specialists of an average link for 10 000 people of the population.

Leaders in an indicator "The number of the professional educational organizations which are carrying out training of the skilled workers serving on 1 million people" are Crimean and the Far Eastern Federal District, and Northern outsiders - Caucasian and the Ural Federal District. The coefficient of a variation
is equal to 58.43% that speaks about heterogeneity of distribution of values of an indicator on macroregions of Russia [3].

Leaders in an indicator "The number of the professional educational organizations which are carrying out training of specialists of an average link on 1 million people" are Far East and the Volga Federal District, and outsiders Crimean and the North Caucasian Federal District. The coefficient of a variation is equal to 16.98% that speaks about average extent of dispersion of an indicator on macroregions of Russia.

Leaders in an indicator "Release of skilled workers and employees on 10 000 people of the population" are Siberian and the Far Eastern Federal District, and outsiders Central and the Northwestern Federal District. The coefficient of a variation is equal to 21.88% that speaks about considerable extent of dispersion of an indicator on makroregion of Russia.

Leaders in an indicator "The number of students of the state and municipal professional educational organizations studying according to programs of training of specialists of an average link for 10 000 people of the population" are Far East and the Ural Federal District, and outsiders Crimean and Central Federal District. The coefficient of a variation is equal to 19.49% that speaks about average extent of dispersion of an indicator on macroregions of Russia.

The higher education. The higher education is the top level of professional education. It includes set of the systematized knowledge and practical skills, which allow to solve theoretical and practical problems of a professional profile. The analysis of distinction of the sphere of the higher education on macroregions was made by us on indicators: the number of higher education institutions is at 1 million people of the population; the number of the students studying according to programs of a bachelor degree, specialist program, magistracy for 10 000 people of the population; the number of students of students according to programs of a bachelor degree, specialist program, magistracy on one worker of teaching personnel of the educational organizations of the higher education.

Leaders in an indicator "The number of higher education institutions on 1 million people of the population" are Central and the Northwestern Federal District, and outsiders Crimean and the Volga Federal District. The coefficient of a variation is equal to 27.58% that speaks about considerable extent of dispersion of Leaders in an indicator "The number of the students studying according to programs of a bachelor degree, specialist program, magistracy for 10 000 people of the population" are Central and the Northwestern Federal District, and outsiders the Crimean and North Caucasian federal district. The coefficient of a variation is equal to 11.05% that speaks about average extent of dispersion of an indicator on macroregions of Russia indicator on macroregions of Russia.

Leaders in an indicator "The number of students of students on programs of a bachelor degree, specialist program, magistracy on one worker of teaching personnel of the educational organizations of the higher education" are Ural and the Volga Federal District, and Northern outsiders – the Western and Crimean federal district. The coefficient of a variation is equal to 9.30% that speaks about insignificant extent of dispersion of an indicator on macroregions of Russia.

4 Discussion
For an assessment of distinctions in general on education of macroregions of Russia we have carried out the analysis of specific weight of number of coefficients of a variation of the indicators analyzed above on an interval of extent of dispersion of data. Total number of coefficients of a variation is equal 13 on number of the analyzed education indicators. Apparently from tab. 3 the largest specific weight of number of coefficients of a variation is the share of average extent of dispersion of indicators on macroregions (54%), the variation coefficients falling on considerable extent of dispersion (23%) follow further. The specified data show on uniformity of set of indicators of education in general on macroregions of Russia [11-13].

For the summary analysis of distinctions of macroregions on education the integrated indicator of a variation of G equal to percentage of number of coefficients of a variation of indicators on all education levels on which there is an insignificant and average dispersion of indicators to total number of coefficients of a variation (tab. 3) is calculated. Thus, $G = (8:13)*100 = 61.5\%$. We will accept an
interval of positive values $G = [0; 70]$. As $G \lt 70\%$, the variation doesn't exceed admissible values, and statistical set uniform.

However, the analysis of variability of the same indicator of education on all macroregions doesn't allow to reflect fully distinction of development of education as doesn't consider variability of all indicators on one macroregion. Variability of all indicators on one macroregion more characterizes heterogeneity of development of education in all macroregions that is caused by change of location (rank) of the same macroregion depending on values of all indicators. Therefore, the analysis of variability of the same indicator on macroregions has been added by us the analysis of variability of all indicators on one macroregion. For correct comparison of relative indicators of various nature and dimension relative indicators have been transformed to the corresponding ranks by the rule: the more value of an indicator, the less his rank. On ranks of indicators variation coefficients have been calculated [14-16].

By results coefficients of a variation of ranks exceed 33%, that is set of ranks on macroregions - non-uniform. It shows existence of considerable distinctions in development of education of macroregions of Russia. Thus, our calculations confirm the fact of the disproportions which have historically developed and remained so far in education of territorial subjects of the Russian Federation, and in particular macroregions, conducting to inequality of their educational potential. It will demand formation of system of priority selective support and regulation of education, and finally and alignments of educational capacity of macroregions by innovative development of education at all her levels, and also holding the relevant institutional, organizational and economic, material, methodical and personnel activities for improvement of educational process and its infrastructure.

5 Conclusions

So, the main collision of a present education system is a contradiction between an educational relict of an industrial and totalitarian era and urgent requirements of development of economy of innovative type. In system of domestic education, it is necessary to strengthen innovative, psychology and pedagogical and culturological aspects of teaching and educational process, suggest to solve this problem within so-called innovative approach. It is understood as connection of transfer of special knowledge with simultaneous formation of professional abilities, practical skills and development of personal qualities on the basis of modern educational technologies. At the choice of optimum forms and ways of training it is important to find answers to didactics questions: As Whom, to What Why to learn and Who will teach. Besides transfer of knowledge, it is necessary to take care of formation in the course of training of such specialized doctrines as, abilities to learn and most to study. Treat the prime targets of training assimilation of methodology of knowledge, (logicians and philosophies of this scientific area of knowledge and professional activity); development of abilities and education of feelings (emotional and spiritual development); social development as continuation of process of socialization of the personality, achievement of the high social status.

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