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Assessment of Interregional Inequality of Tax Revenues

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ABSTRACT

Efficiency of economic activity of 85 regions of the Russian Federation is analyzed in this article. The **purpose** of the research is assessment the interregional inequality of the Russian regions. The analysis was based on the total tax revenues collected within all the Russian regions. The research was based on **methods** of analysis and synthesis, analogy and generalization, comparison and comparison, induction and deduction, economic-mathematical and statistical methods of estimation of income inequality. For its implementation, coefficients and indices were used: Lorentz, Ginny, Robin Hood, Theil, Atkinson, and Herfindahl-Hirschman. Part of the analysis was performed in the analytical module of the information system "Taxes of the Russian Federation". Based on the Russian Federation subjects' economic activity model, it is concluded that the total tax revenues collected on regions reflect the effectiveness of its functioning. A more accurate picture is described with the quotient of the tax revenues' division by the labor resources engaged in their creation. Based on the methods used and data provided by the Federal Tax Service of the Russian Federation and Rosstat, was made of the uniformity of tax revenue collection among 85 subjects of the Russian Federation in the period from 2015 to 2020, all applied coefficients and indices were calculated. Using the share of employed population and tax revenues, the Lorenz curves and size diagrams (box plot) for the ratio of these shares (*r*) in the period under consideration are constructed and the emissions (outlier) in the distribution of tax revenues are determined. The dynamics of tax revenues and their variation are estimated. The obtained values of inequality indicators and indices showed that the distribution of tax revenues among 85 regions of the Russian Federation is uneven. Simultaneously, this situation is evident throughout the period under review. The subjects whose tax income values can be attributed to outliers have been identified. It is **concluded** that the problem of uneven development of regions of the country is traced through centuries. A way out of this situation is to use differentiated financial and tax policies in relation to different regions of the country.

Keywords: income differentiation; Lorentz curve; Gini coefficient; Theil index; tax revenues; employed population

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INTRODUCTION

Today, research and monitoring of the economic condition' regions of our country is a very urgent problem. The economic development of the federal subjects is influenced by numerous internal and external factors. The main ones are: decline in economic growth as a result of the impact of the COVID-19 pandemic, complication of the geopolitical situation and the imposition of numerous sanctions. In this regard, it is necessary to closely monitor the level of economic development of the regions of Russia and identify factors that can stimulate or hinder their economic development.

In our country there are different opinions about the future of the Russian economy. For example, G. B. Kleiner points to significant economic problems such as: "Low growth rate, insufficient innovation activity, reduced purchasing power of a large part of the population, etc." [1, p. 113]. The scientist assigns a very important role to the meso-level in the development of the country's economy, considering it "an indispensable tool for integration and coordination of economic processes and objects" [1, p. 112]. Problems of mesoeconomic level are connected with "discoordination of economic agents, and excessive differentiation of economic condition of regions and sectors of national economy" [1, p. 114]. Aspiration thesis "to equalize regions in terms of their socio-economic condition" are declared [1, p. 117]. Quantitative assessment of this thesis, based on data provided by the Federal Tax Service of the Russian Federation and Rosstat, will be the main purpose of the article.

A similar point of view in the late XIX century was expressed by the eminent Russian scientist and financier N. P. Yasnopol'skii. Research in the field of regional finance is devoted to his work "On the geographical distribution of state revenues and expenditures of Russia" [2]. The main idea of this article is the uneven burden for the different localities of Russia, the extreme burden of the agricultural center without appropriate compensation, as well as the concentration of government expenditures in the capitals and outskirts. N. P. Yasnopol'skii wrote: "I was trying to find out the different meaning that the same Russian financial system had for the different localities of our homeland" [2, p. 1].

In one of his speeches, the President of the Russian Federation, V. V. Putin, stated the need to support regions that have taken a course towards sustainable development: "The stimulating role of federal support should be strengthened and, I [V. V. Putin] emphasize, the financial autonomy of those regions that are properly concerned with economic development, conduct responsible budget policy, develop regional programs, modernize the social sphere. That is, it is necessary to give more space for leaders, for the initiative of those who are willing to work, do actively and works effectively".[1]

The presented facts, on the one hand, confirm the relevance of the research through the centuries, the problems of economic stratification of the regions of Russia, and on the other, partially describe the factors causing it, which can be attributed to: climatic, socio-demographic, regional and even administrative aspects. On this basis, the main purpose of the proposed work, as well as the subject and object of the research, are formed.

METHODS

In this regard, the purpose of the research is to assess the interregional inequality of the regions of the Russian Federation, based on the analysis of tax revenues collected within their borders. 85 regions of the Russian Federation were the object of research, and the subject is socio-economic processes changes in their territories.

[1] Russian Prime Minister V. V. Putin held a meeting on the improvement of inter-budgetary relations. URL: http://bujet.ru/article/112142.php (accessed on 03.08.2022).

Methodological basis of research was the general scientific methods of cognition: analysis and synthesis, analogy and generalization, compare and contrast, induction and deduction. Economic-mathematical and statistical methods were chosen as special methods of cognition. Statistical methods of data processing are research private science methods based on the application of coefficients and indices measure of income inequality, such as: Lorenz and Gini coefficients, Robin Hood, Theil, Atkinson and Herfindahl-Hirschman indices.

Next, the concept of economic inequality and the methods used to measure it will be considered. For two centuries there has been a constant interest on the part of the scientific community in the research of issues related to economic inequality. At the same time, economists are primarily interested in wealth inequality and income inequality [3, p. 89; 4, p. 5]. As early as 1905, the American mathematician and economist Max Otto Lorenz shows a degree of personal income inequality and constructs a graph called the Lorenz curve. Note that socio-economic inequality refers to the unequal distribution of income, wealth, opportunities, etc. between different social groups.

This economic direction is very relevant to date. It is devoted to numerous works of domestic [5, p. 72; 6, p. 46] and foreign authors [7, p. 5; 8, p. 555]. The application of coefficients and indices is discussed further. The Lorenz coefficient for studying economic inequality is applied in the works [9, c. 141; 10, c. 101; 11]. The Gini coefficient is used to study income inequality in articles [12, p. 75; 13]. The Robin Hood index is considered in the source [14, p. 80] as an effective tool for smoothing regional economic inequalities, and in the work [15, p. 134] it is applied to the analysis of the level of social inequality in the regions.

Interregional inequality in Russia based on the Theil index assessed in the paper [16, p. 20]. The analysis of regional inequality in the Russian Federation is given in the papers [17, p. 481; 18, p. 82], and in the source [19, p. 202] similar research was conducted for a developing Latin American country like Brazil. The indexes described may be applicable not only to the economy but also to other subject areas [20, p. 74].

Note that there are works whose authors are critical to the use of quantitative indicators of income inequality. Thus, the article [21, p. 91] states: "...that at present statistical measures of inequality do not give unambiguous results".

As shown above, a lot of indicators exist for measure inequality, each of which has certain advantages and disadvantages. Therefore, when analyzing the inequality of a resource, it is logical to use different quantitative indicators, comparing the results of calculations. As a rule, quantitative measures of inequality describe the distribution of a selected resource among a set of objects that make up a certain social commonality, and to some extent imply a comparison with a case of equitable distribution. 85 regions of our State will act as a set of objects in this research.

RESULTS

The data for the research was freely provided socio-economic information distributed by the Federal Tax Service of the Russian Federation and Rosstat. Tax revenue data (TR) is obtained from the tax reporting form No. 1–NOM "Accrual and revenues of taxes and fees in the consolidated budget of the Russian Federation for foreign economic activities".[2] The number of employed population (EP) is presented in collections of Rosstat "Regions of Russia. Socio-economic indicators".[3] The basic formation used in calculations is consolidated into the database of the information system

[2] Otchet po forme 1-NOM po sostoyaniyu na 01.01.2021. Report on Form 1 as of 01.01.2021. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

[3] Federalnaya sluzhba gosudarstvennoi statistiki RF. Federal State Statistics Service RF. URL: https://rosstat.gov.ru/folder/210/document/13204 (accessed on 11.08.2022).

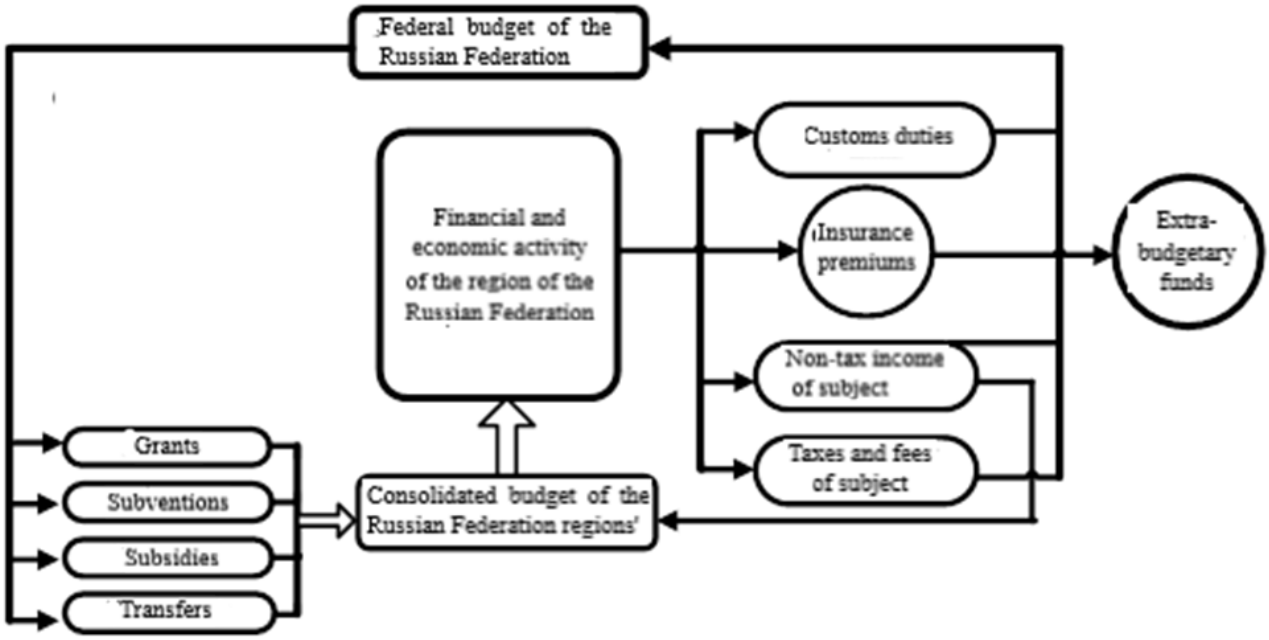

Fig. 1. **Model of Economic Functioning of the Russian Federation's Regions**

Source: Model was created by the authors [23, p. 125].

"Taxes of the Russian Federation" [22]. Some calculations were also made using the analytical module of the information system.

Further assessment of inequality economic activity of regions of the Russian Federation will be based on the thesis that the value of TR reflects the effectiveness of their functioning. On the basis of the proposed thesis, it is possible to successfully intersubjective comparison. The authors of the article developed a conceptual model of economic activity of any of the regions of our country (*Fig. 1*). It follows from the model that the economic and financial activity of any province, region or republic is: tax revenues, insurance premiums and customs payments. Funds received are allocated to budgets at all levels, as well as come to extrabudgetary funds. These funds are outputs of the system. Inputs of the system are payments from the federal budget to the income of the consolidated budget of subject of the federation and payments from the federal budget, such as: grants, subsidies, subventions and transfers.

In the proposed work, the quantitative analysis is based on data on the total tax revenues of the regions of the Russian Federation (in other words, tax revenues from regions) to the state budget and the employed population. Tasks of monitoring and research of problems of elimination of inequality in tax revenues from regions of the Russian Federation, as well as development of methods and techniques of its measurement are still very relevant.

The indicators to measure interregional inequality, which use information on the total distribution of tax revenues, i.e. those calculated for all units or their groups, will be considered below. The calculations used data on tax revenues of regions of the Russian Federation and the number of employed population of the Russian Federation for the period 2015–2020. Note that Rosstat provides data on the employed population with a delay of two years, which is one of the basic indicators used in the calculations.

The measurement of inequality of tax revenues gets started with the Gini coefficient k_G, perhaps the traditional most common indicator of inequality. This indicator, as any other, has both advantages and disadvantages [24, p. 71; 25, p. 35]. Coefficient values range

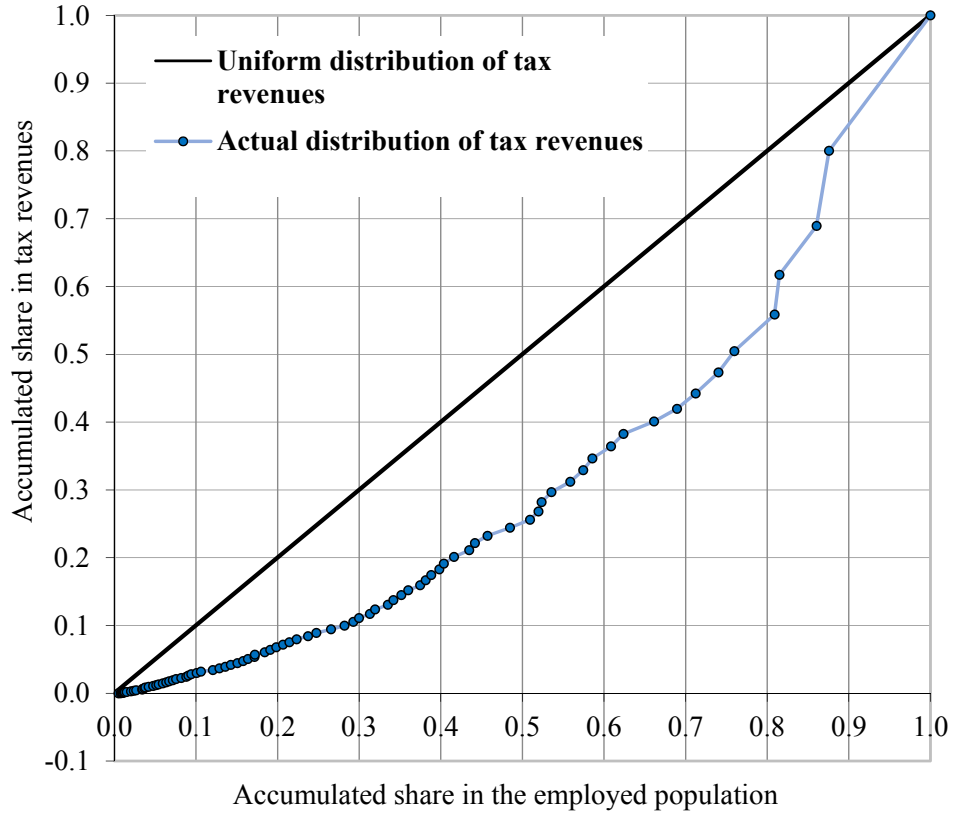

Fig. 2. **Lorentz Curve of Distribution Tax Revenues of the Russian Federation's Regions in 2020**

Source: Calculations of the authors according to the data of the Federal Tax Service of the Russian Federation and Rosstat. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022); URL: https://rosstat.gov.ru/folder/210/document/13204 https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

from 0 to 1, approaching to one with increasing number of observations. The maximum value of k_G equal $(N-1)/N$. The Gini coefficient is understandable and can be visually represented by the Lorenz curve. *Fig. 2* presents distribution of tax revenues from 85 regions of the Russian Federation in 2020. It can be seen that the Lorenz curve deviates very significantly from the straight line reflecting the uniform distribution of tax revenues of the regions of Russia. Note that the Lorenz coefficient was 0.307, the Gini coefficient — 0.340.

The Lorenz curve provides another quantitative measure of income inequality — Robin Hood index k_R. This indicator has other names, for example, Hoover index, Pietra index. The index k_R is equal to the share of the total TR of all regions of the Russian Federation, which must be redistributed to achieve uniform tax revenue (Hoover index values are in the range $0 \le k_R < 1$). Graphically, this indicator can be represented as the longest vertical segment (*Fig. 2*), connecting points on the Lorentz curve to the uniform distribution line, and the value of the Robin Hood index — as the length of this segment. Note that in 2020 the value $k_R = 0,270$.

When constructing the Lorentz curve, it is possible to determine another indicator of inequality of tax revenues in the regions. This is the Lorenz coefficient:

$$k_L = 0,5 \cdot \sum_i \left| d_i^{tr} - d_i^{ep} \right|, \quad (1)$$

where d_i^{tr} — tax revenue share of the *i*-region; d_i^{ep} — share of employed population of the *i*-region.

Possible Lorenz coefficient values belong to the interval [0–1].

The next class of indicators to assess the inequality of tax revenues of the regions of the Russian Federation can be obtained from the ratio of individual quantiles distribution. The most popular of this class of indicators is the decile coefficient k_d, which is the ratio of the lowest value of tax income among 10% (ninth decile d_9) regions [$min(d_9)$ with the highest TR to the highest income among the 10% lowest income regions ($max(d_1)$)].

To assess the inequality of tax revenues from regions of the Russian Federation we use another indicator — Herfindahl-Hirschman index. This is one of the few economic indicators that is used to assess the degree of market concentration, the share of companies or industries when comparing volume of their products. Here, this indicator k_H will reflect the shares of tax revenues from regions of the Russian Federation. The following formula was used to calculate the Herfindahl-Hirschman index:

$$I_{HH} = \sum_i d_i^2, \quad (2)$$

where d_i — tax revenue share of *i*-region.

Herfindahl-Hirschman values range from 1/*n* to 1, where *n* — is the number of regions of the Russian Federation $n = 85$ in this research).

As a measure of income inequality in society, indicators are also used that can be considered as a special case of a generalized entropy index. These include the Theil index k_T. In this paper, this indicator was calculated by the formula:

$$I_T = \sum_i d_i \ln(nd_i), \quad (3)$$

d_i — tax revenue share of the *i*-region;

n — number of regions of the Russian Federation.

The Theil index formula k_T shows, that in the case of an even income distribution, the index value will be $I_T = 0$, and is the smallest value, and the highest value — $I_T = ln(n)$. Since the highest value of the Theil index is unlimited, one can consider the Atkinson index k_A, which is in fact a normalized Theil index:

$$I_A = 1 - exp(-I_T). \quad (4)$$

Thus, in the analysis of the dynamics of inequality of tax revenues in 2015–2020, the following indicators were used: Gini index I_G, Robin Hood index I_R, Lorenz coefficient k_L, decile coefficient k_d, Herfindahl-Hirschman index I_{HH}, Theil I_T and Atkinson I_A. Add to this list such common statistical indicators of tax revenues: average $\bar{x}$, median *Me*, standard deviation σ and coefficient of variation $V = \sigma/\bar{x}$. Note that the Herfindahl-Hirschman index and the coefficient of variation are related as follows:

$$I_{HH} = \frac{V^2 + 1}{n}. \quad (5)$$

Consider the results of the quantitative analysis of tax revenues, the comparison of actual data with the uniform distribution, including the use of these indicators. It has already been noted above that for visual comparison of the actual distribution of tax revenues and the uniform distribution it is convenient to use the Lorentz curve. However, when such a comparison has to be considered in the dynamics, the Lorentz curve is not very useful. When constructing the Lorentz curve, the share of tax revenues of the *i*-region d_i^{TR} and the share of employed population of the *i*-region d_i^{EP} are used. Let's use these indicators and find the ratio of the share of tax revenues and the share of employed population of the *i*-region: $r_i = d_i^{TR} / d_i^{EP}$. Note that in uniform distribution of income for all subjects the value $r_i = 1$. *Fig. 3* visually shows the box-and-whiskers diagram for the resulting indicator.

It can be seen that for some subjects (4 to 7 depending on the year under consideration) the values of *r* can be attributed to "outliers" (these values are marked with dots). *Fig. 3* also shows the box-and-whiskers diagram, but without

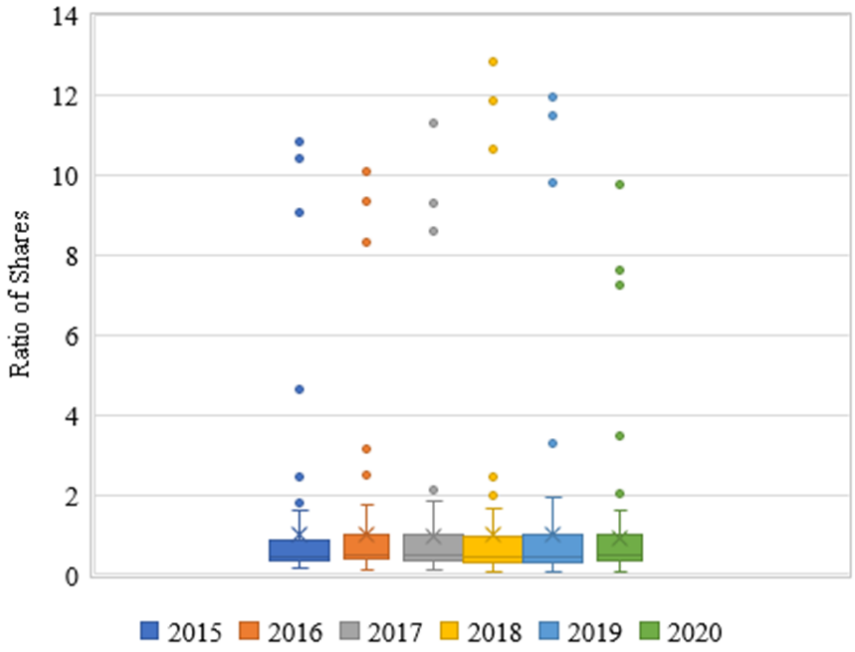

Fig. 3. **Box-and-Whiskers Diagram for the Ratio of *r* Shares in 2015–2020**

Source: Calculations of the authors according to the data of the Federal Tax Service of the Russian Federation and Rosstat. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022); URL: https://rosstat.gov.ru/folder/210/document/13204 https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

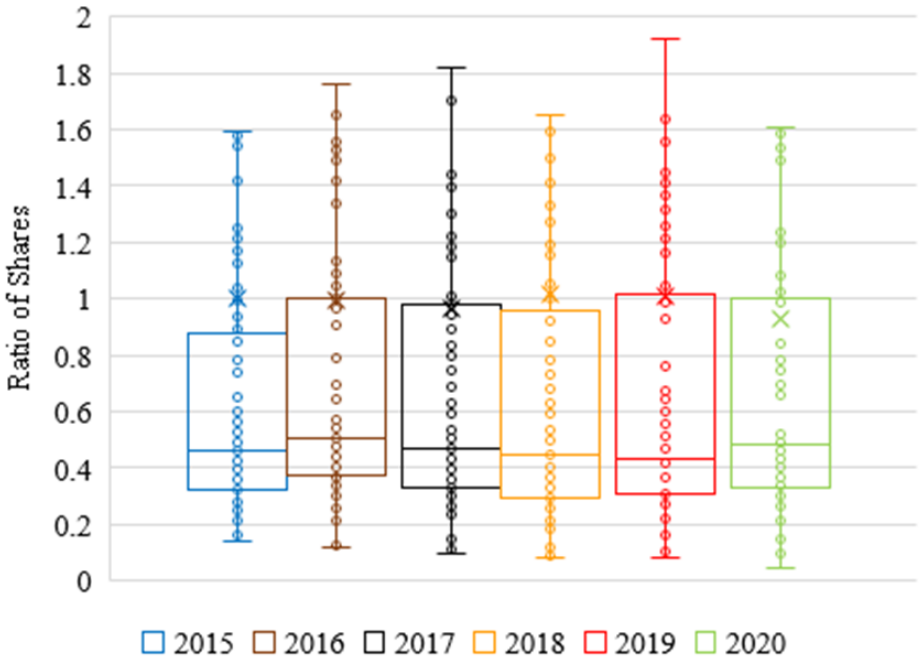

Fig. 4. **Box-and-Whiskers Diagram for the Ratio of *r* Shares Without Outliers**

Source: Calculations of the authors according to the data of the Federal Tax Service of the Russian Federation and Rosstat. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022); URL: https://rosstat.gov.ru/folder/210/document/13204 https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

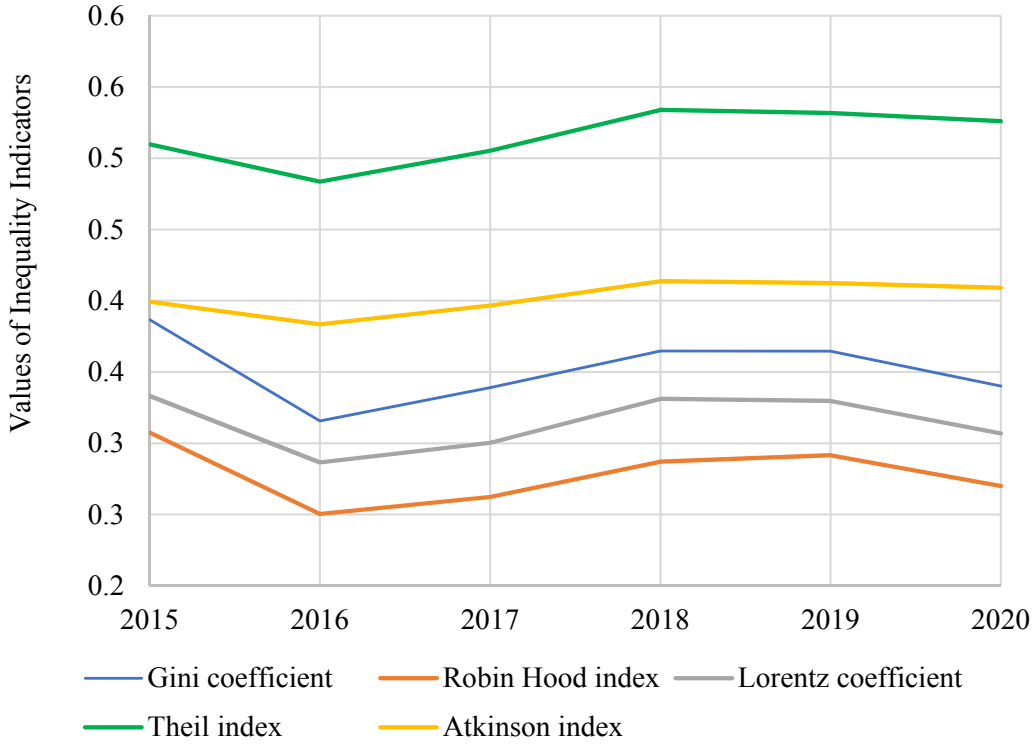

Fig. 5. **Dynamics of Inequality in Tax Revenues of the Russian Federation's Regions**

Source: Calculations of the authors according to the data of the Federal Tax Service of the Russian Federation and Rosstat. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022); URL: https://rosstat.gov.ru/folder/210/document/13204 https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

outliers and with the distribution of entities by the ratio of shares of tax revenues and employed population. Note that the average value of the sign *r* (on the graphs they are marked with a marker "x") is slightly different from one, except for 2020 ($\bar{r} = 0.93$), this year the positive dynamics of tax revenues from regions of the Russian Federation was disrupted, the total tax revenue in 2020 compared to the previous year decreased by almost 8%.

Fig. 3 shows that income distribution has a strong right asymmetry (asymmetry coefficient values $As = 4.43 - 4.80$). Median values of sign *r* (on "boxes" marked with horizontal segments) are much lower than average.

Diagrams *Fig. 4* show that the structure of tax revenues in the Russian Federation in the period 2015–2020 has not changed: the number of regions with tax income above the equal varies between 16–21, below the equal — respectively 64–69. At the same time, there is no trend of an increase in the number of regions with income above equal.

Fig. 5 presents a change some indicators of tax revenue inequality between 2015 and 2020.

Time series graphs of the five indicators show that they all provide roughly the same qualitative picture of changes in tax income inequality. It can be concluded that the structure of tax revenues from regions of the Russian Federation during the time period under consideration has not changed, there is no any general trend in dynamics of indicators of inequality. The values of the indicators presented in *Fig. 5*, one order and the graph of their change can be placed in one figure. However, there are indicators whose values are very different from those presented in *Fig. 5*. For example, Herfindahl-Hirschman index, decile differentiation coefficient, variation coefficient.

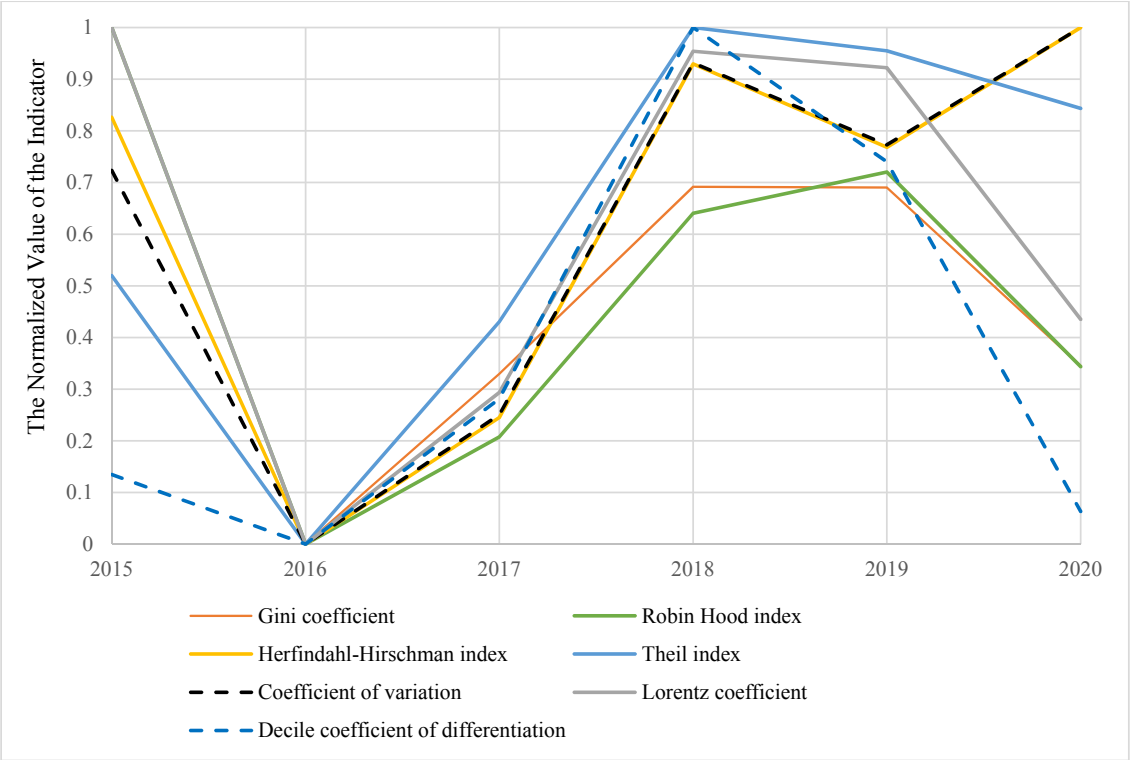

Fig. 6. **Dynamics of Inequality in Tax Revenues of the Russian Federation Region by Standard Indicators**

Source: Calculations of the authors according to the data of the Federal Tax Service of the Russian Federation and Rosstat. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022); URL: https://rosstat.gov.ru/folder/210/document/13204 https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

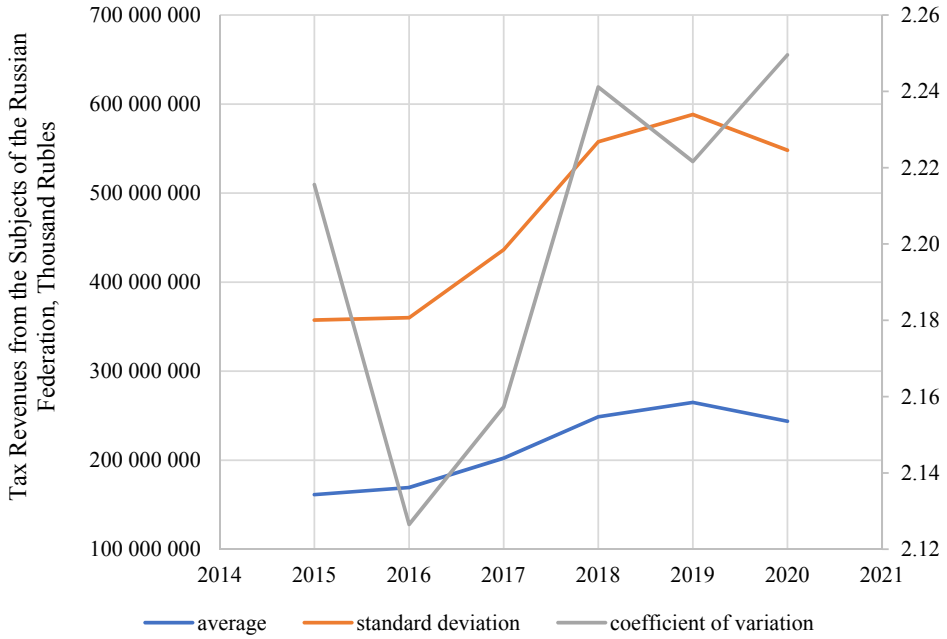

Fig. 7. **Dynamics of Tax Revenues and their Variation**

Source: Calculations of the authors according to the data of the Federal Tax Service of the Russian Federation and Rosstat. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022); URL: https://rosstat.gov.ru/folder/210/document/13204 https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

Table

Inequality's Indicators Tax Revenues Receipts in the Regions of Russia in 2015–2020

Indicators of Inequality	2015	2016	2017	2018	2019	2020
Gini Coefficient	0.387	0.316	0.339	0.365	0.365	0.340
Robin Hood Index	0.307	0.250	0.262	0.287	0.292	0.270
Lorentz Coefficient	0.333	0.287	0.300	0.331	0.330	0.307
Herfindahl-Hirschman Index	0.070	0.064	0.066	0.070	0.069	0.071
Theil Index	0.510	0.484	0.505	0.534	0.532	0.526
Atkinson Index	0.399	0.383	0.397	0.414	0.412	0.409

Source: Calculations of the authors according to the data of the Federal Tax Service of the Russian Federation and Rosstat. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022); URL: https://rosstat.gov.ru/folder/210/document/13204 https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/6092076/ (accessed on 11.08.2022).

For ease of comparison, measures of tax income inequality can lead to a single standard:

$$\dot{k}_t = \frac{k_t - \min(k_t)}{\max(k_t) - \min(k_t)}, \qquad (6)$$

where k_t — actual value; $\dot{k}_t$ — normalized value.

Normalized values of tax income inequality are shown in *Fig. 6*.

From *Fig. 6* it follows that various normalized indicators roughly of the same reflect the dynamics of inequality of tax revenues. The exception is the Herfindahl-Hirschman index and the coefficient of variation, we will remind that they are related by functional dependence (5). In 2020, these indicators point to an increase in income inequality, while the rest — are for a decrease. Consider the dynamics of the coefficient of variation. *Fig. 7* reflects changes in tax revenue statistics: average $\bar{x}$, standard deviation σ and coefficient of variation $V = \sigma/\bar{x}$.

Since the coefficient of variation is determined by the ratio of the standard deviation σ and average $\bar{x}$ of income, its change will depend on the growth rate of the numerator and the denominator. It is evident that in 2020 there was a significant decrease in tax revenues, but their variation also decreased. The decline σ was slower rate (standard deviation of income increased by 93% and income increased by 92%), leading to an increase in income inequality by coefficient of variation.

CONCLUSIONS

The article considers the actual problem of inequality distribution of regional tax revenues on the territory of Russia. Based on the developed model of economic functioning of the region of the Russian Federation, the thesis that the total tax revenues of any region of the country, attributed to the number of people employed in their creation, reflect the effectiveness of its functioning, is proposed and confirmed. Structure and dynamics of tax revenues in the period from 2015 to 2020 are reviewed.

It is concluded that the distribution of tax revenues by regions of the Russian Federation is significantly different from the uniform (*Fig. 2*). However, the difference between the actual and equal distribution of tax revenues is observed throughout the period under review.

The *Table* shows the values of the different indicators of income inequality.

In the conclusion we want to quote N.P. Yasnopol'skii, which shows in his work [2] the impossibility of using single tax and financial approaches to the regions of our vast homeland: "Now the time has passed for faith in the seemingly immutable rules of economic life that apply to all times and places. On the contrary, even economic science, rather than practice, has now become almost a commonality — recognition of the need to apply to the conditions of place and time" [2, p. 7].

REFERENCES

1. Kleiner G.B. A system reboot of the Russian economy: Key directions and prospects. *Nauchnye trudy Vol'nogo ekonomicheskogo obshchestva Rossii = Scientific Works of the Free Economic Society of Russia*. 2020;223(3):111–122. (In Russ.). DOI: 10.38197/2072–2060–2020–223–3–111–122
2. Yasnopol'skii N.P. On the geographical distribution of state revenues and expenditures in Russia (in 2 vols.). Vol. 1. Kiev; 1891. 236 p. (In Russ.).
3. Ibragimova Z., Frants M. Measuring income opportunity inequality: A structural review and meta-analysis. *Prikladnaya ekonometrika = Applied Econometrics*. 2021;(1):89–109. (In Russ.). DOI: 10.22394/1993–7601–2021–61–89–109
4. Kartseva M.A., Kuznetsova P.O. Is income inequality fair in Russia? Inequality of opportunity and income inequality. *Prikladnaya ekonometrika = Applied Econometrics*. 2020;(2):5–31. (In Russ.). DOI: 10.22394/1993–7601–2020–58–5–31
5. Tskhadadze N.V. Socio-economic inequality in the distribution of income. *Mirovaya ekonomika: problemy bezopasnosti = World Economy: Security Problems*. 2021;(1):72–76.
6. Tskhadadze N.V. Inequality in the distribution of income. *Finansovye rynki i banki = Financial Markets and Banks*. 2020;(4):46–49.
7. Andreoli F., Zoli C. From unidimensional to multidimensional inequality: A review. *Metron*. 2020;78(1):5–42. DOI: 10.1007/s40300–020–00168–4
8. Bortot S., Fedrizzi M., Marques Pereira R.A., Nguyen T.H. The binomial decomposition of generalized Gini welfare functions, the S-Gini and Lorenzen cases. *Information Sciences*. 2018;460–461:555–577. DOI: 10.1016/j.ins.2017.07.028
9. Lebedev V., Lebedev K. The construction of the Lorenz curve and estimation of indicators of differentiation of monetary incomes of population based on exponential distribution. *Vestnik universiteta (Gosudarstvennyi universitet upravleniya)*. 2018;(1):141–148. (In Russ.). DOI: 10.26425/1816–4277–2018–1–141–148
10. Davies J., Hoy M., Zhao L. Revisiting comparisons of income inequality when Lorenz curves intersect. *Social Choice and Welfare*. 2022;58(1):101–109. DOI: 10.1007/s00355–021–01343-w
11. Baíllo A., Cárcamo J., Mora-Corral C. Extreme points of Lorenz and ROC curves with applications to inequality analysis. *Journal of Mathematical Analysis and Applications*. 2022;514(2):126335. DOI: 10.1016/j.jmaa.2022.126335
12. Nivorozhkina L.I., Arzhenovsky S.V., Tregubova A.A. Inequality profiles based on Gini coefficient decomposition with hidden household income. *Uchet i statistika = Accounting and Statistics*. 2021;(3):75–87. (In Russ.). DOI: 10.54220/1994–0874.2021.63.3.009
13. Chakravarty S.R., Sarkar P. New perspectives on the Gini and Bonferroni indices of inequality. *Social Choice and Welfare*. 2023;60(1–2):47–64. DOI: 10.1007/s00355–021–01311–4
14. Khakimov A. Kh. The mechanisms and methods of smoothing of regional economic differences and inequalities. *Gorizonty ekonomiki*. 2016;(6–2):80–84. (In Russ.).
15. Gratsinskaya G., Puchkov V. The assessment of social inequalities level in the region and possible ways of reduction whereof. *Zhurnal pravovykh i ekonomicheskikh issledovanii = Journal of Legal and Economic Studies*. 2018;(4):134–137. (In Russ.).

16. Gagarina G. Yu., Bolotov R. O. Valuation of inequality in the Russian Federation and its decomposition using the Theil index. *Federalizm = Federalism*. 2021;26(4):20–34. (In Russ.). DOI: 10.21686/2073–1051–2021–4–20–34
17. Belyaeva O. I. Strategic priorities of state policy in reducing regional inequality. *Ekonomika i predprinimatel'stvo = Journal of Economy and Entrepreneurship*. 2021;(10):481–484. (In Russ.). DOI: 10.34925/EIP.2021.135.10.092
18. Kamaletdinov A. Sh., Ksenofontov A. A. Index method of evaluating the performance of economic activities. *Finance: Theory and Practice*. 2019;23(3):82–95. DOI: 10.26794/2587–5671–2019–23–3–82–95
19. Pestsov S. K. The problem of regional inequality and the experience of managing regional development in Brazil. *Ekonomika: vchera, segodnya, zavtra = Economics: Yesterday, Today and Tomorrow*. 2019;9(10–1):202–209. (In Russ.). DOI: 10.34670/AR.2020.92.10.025
20. Kartseva M., Kuznetsova P. Are we responsible for our health? Inequality of opportunities in the health of the adult population of Russia. *Demograficheskoe obozrenie = Demographic Review*. 2021;8(2):74–94. (In Russ.). DOI: 10.17323/demreview.v8i2.12783
21. Kapeliushnikov R. I. Is economic inequality a universal evil? *Voprosy ekonomiki*. 2019;(4):91–106. (In Russ.). DOI: 10.32609/0042–8736–2019–4–91–106
22. Ksenofontov A. A., Kamaletdinov A. Sh., Trifonov I. V., Trifonov P. V., Cherepovskaya N. A. Using Russian Federation taxes information and analytical system to monitor economic condition of the manufacturing industry. *IOP Conference Series: Materials Science and Engineering*. 2020:828:012014. DOI: 10.1088/1757–899X/828/1/012014
23. Ksenofontov A., Kamaletdinov A. Financial management of social and economic systems. *Vestnik universiteta (Gosudarstvennyi universitet upravleniya)*. 2017;(3):120–1127. (In Russ.).
24. Glushchenko K. P. On the issue of application of the Gini coefficient and other inequality indices. *Voprosy statistiki*. 2016;(2):71–80. (In Russ.).
25. Salmina A. A. Comparative analysis of inequality indicators: Characteristics and applications. *Obshchestvo i ekonomika = Society and Economy*. 2019;(7):35–58. (In Russ.). DOI: 10.31857/S 020736760005832–4

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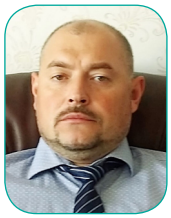

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