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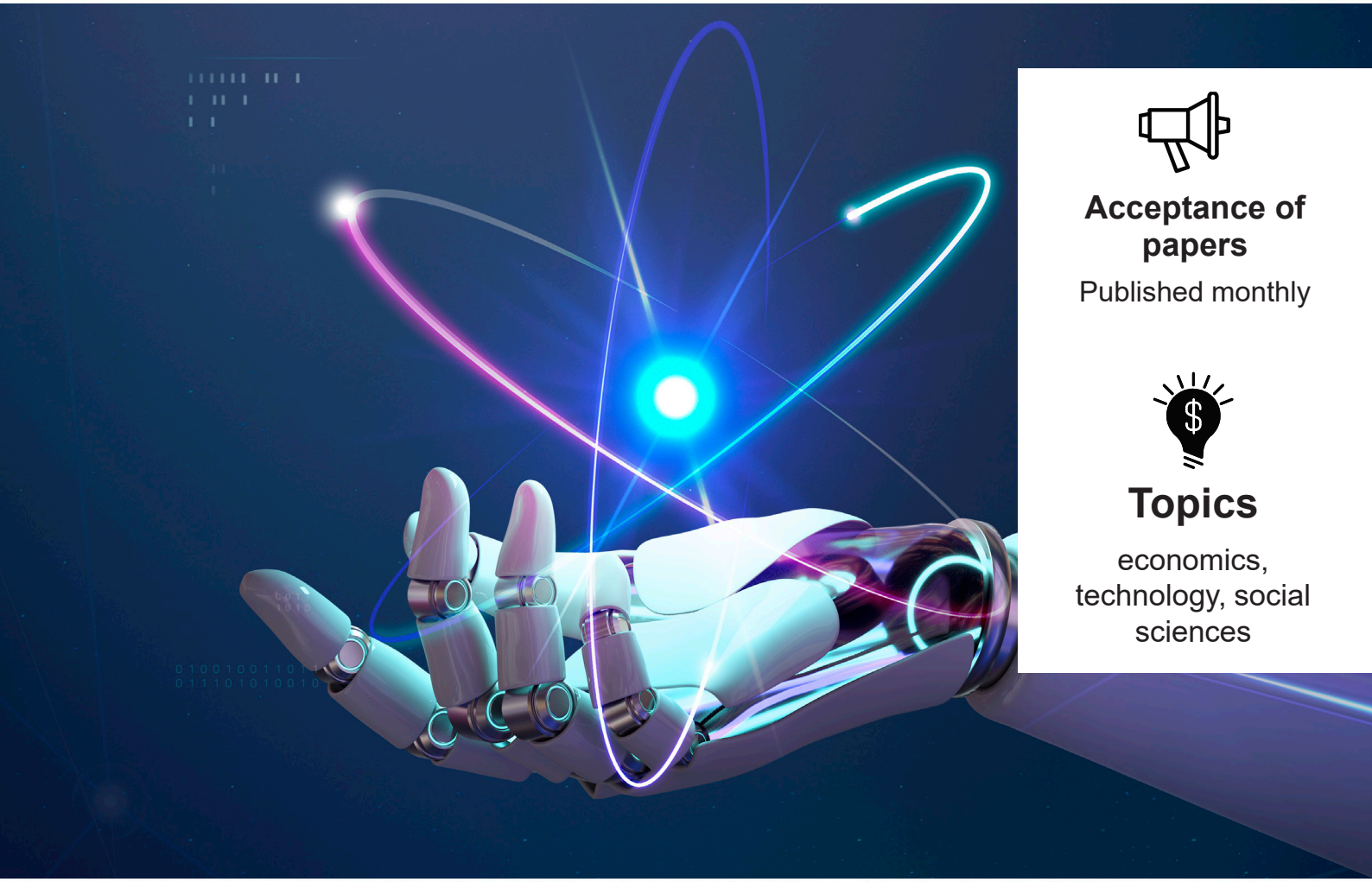

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SCIENTIFIC BASIS FOR THE CLASSIFICATION OF TERRITORIES AND THE APPLICATION OF CORRECTION COEFFICIENTS

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Abstract: The article justifies the need to group regions by socio-economic risk profile and apply correction coefficients in financing. Regional differences in poverty, unemployment, per capita income and coverage of social payments were analyzed in 2021–2024, and a cluster analysis was conducted based on 2024 indicators. As a result, the regions were divided into three groups: low-risk, medium-risk and high-risk regions.

Key words: coefficient, territorial classification, cluster analysis, social risk.

INTRODUCTION

Socio-economic disparities between regions indicate that a single approach to the distribution of state resources is not effective. Because the population, poverty level, unemployment, incomes, infrastructure conditions, and service costs vary significantly across regions. Therefore, the classification of regions and the application of correction coefficients are an important scientific basis for the distribution of resources based on real needs and existing conditions.

Adjustment coefficients allow for the integration of demographic, economic, and social differences between regions into financial calculations. This increases the accuracy, fairness, and targeting of the formula-based financing system. Taking into account additional costs and risks, especially in remote, poorly developed, or high-need regions, increases the effectiveness of public policy.

In this context, the categorization of territories and the application of correction coefficients are not just technical calculation tools, but also an important financial mechanism that serves to alleviate territorial inequality, increase budget efficiency, and target resource allocation. This article scientifically highlights the theoretical and practical foundations of this approach.

REVIEW OF RELEVANT LITERATURE

Professor Robin Boadway (Canada) developed the fundamental principles of categorization of regions in inter-budgetary relations. He introduced the concept of “horizontal inequality” into science. He believes that when residents of different regions pay the same amount of taxes, they should receive the same amount of social services from the state. Boadway proposes categorizing regions according to their “fiscal capacity” and “expenditure needs.” He developed a methodology to calculate “equalization grants” for regions with low capacity. This theory is currently the basis of the budget systems of Germany, Australia, and Canada.

Anwar Shah (World Bank expert) studied the practical and methodological foundations of using coefficients in classifying regions. The researcher proved that it is necessary to classify regions not simply as “rich” or “poor”, but based on their objective characteristics (demography, geography, level of urbanization).

Local scientist, Professor T. Malikov studied the specific aspects of economic development of regions and management of financial resources in the conditions of Uzbekistan. In his work, the scientist scientifically substantiated the system of “regulatory taxes” and “incentive coefficients” to strengthen the revenue base of local budgets.

RESEARCH METHODOLOGY

Four indicators were selected for 2024: poverty rate, unemployment rate, total income per capita, and number of pension and social benefit recipients per 1,000 population. The indicators were normalized using z-score and K-means cluster analysis (k=3) was applied.

The purpose of clustering is to provide an empirical basis for normative categorization. This method is widely used in modern territorial policy research and is suitable for risk-based budgeting (Table 1).

Table 1. Change in poverty rate, 2021–2024

Area	2021 poverty, %	2024 poverty, %	Change, percentage points
Syrdarya region	30.5	11.3	-19.2
Tashkent region	22.7	8	-14.7
Samarkand region	18.2	7.5	-10.7
Republic of Karakalpakstan	20.8	10.8	-10
Andijan region	19.3	9.5	-9.8
Jizzakh region	21.1	11.8	-9.3
Kashkadarya region	17.9	9.6	-8.3
Khorezm region	19.9	11.9	-8
Namangan region	14.1	7.6	-6.5
Bukhara region	14.5	8.7	-5.8
Surkhandarya region	13.3	9.3	-4
Tashkent city	8.1	7.3	-0.8
Navoi region	4.7	5.7	1
Fergana region	3.9	8.6	4.7

This table reflects the changes in the poverty rate across regions of Uzbekistan in 2021–2024. According to the table, the poverty rate has decreased significantly in most regions. The largest positive change was observed in Syrdarya region, where this indicator decreased from 30.5 percent to 11.3 percent, or by 19.2 percentage points. A significant decrease in the poverty rate was also recorded in Tashkent region, Samarkand region, the Republic of Karakalpakstan, Andijan and Jizzakh regions. This indicates that measures to increase employment, expand sources of income, and provide social support in these regions have had a certain effect.

At the same time, the table also shows that in some regions the poverty rate has not decreased, but rather increased. In particular, in Navoi region the indicator has increased by 1.0 percentage points, and in Fergana region by 4.7 percentage points. In Tashkent city, the change is relatively small, and the poverty rate has decreased by only 0.8 percentage points. These results indicate that socio-economic processes are not the same between regions and that poverty reduction policies need to be implemented on the basis of a differentiated approach based on regional characteristics.

Analysis and results. Although the decline in poverty rates in 2021–2024 has a nationwide trend, regional differences remain. For example, in Khorezm, poverty decreased from 19.9 percent to 11.9 percent between 2021 and 2024, and in Syrdarya from 30.5 percent to 11.3 percent, but these regions still remain in the high-risk group [6].

Cluster analysis divided the regions into three categories in 2024. Cluster 1 included regions with relatively high income and low risk profile (Bukhara, Fergana, Tashkent region, etc.), Cluster 2 included regions with very low risk and high income (Navoi, Tashkent city), and Cluster 3 included regions with high risk (Republic of Karakalpakstan, Jizzakh, Kashkadarya, Surkhandarya, Syrdarya, Khorezm). This result indicates the need to set the coefficients on a categorical basis, rather than a uniform basis (Table 2).

Table 2. Clustering results for 2024

Area	Cluster
Andijan region	1
Bukhara region	1
Fergana region	1

Namangan region	1
Samarkand region	1
Tashkent region	1
Navoi region	2
Tashkent city	2
Jizzakh region	3
Kashkadarya region	3
Republic of Karakalpakstan	3
Syrdarya region	3
Surkhandarya region	3
Khorezm region	3

Therefore, the coefficient is not a subjective preference, but a budgetary reflection of the regional risk profile. If the coefficients are revised every two or three years, they become a dynamic management instrument, not a static one (Figure 1).

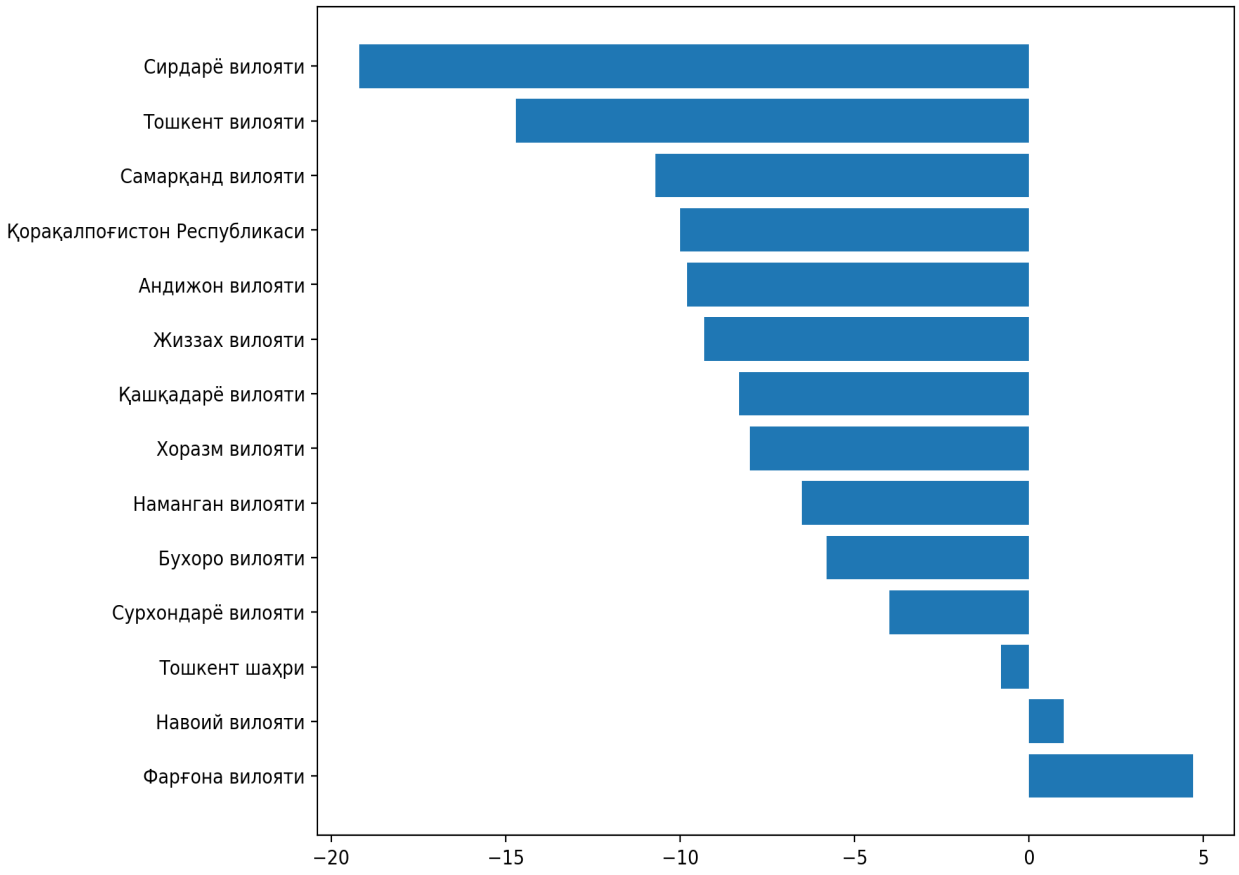

Figure 1. Change in poverty rate

This figure shows the changes in poverty rates by region in percentage points over the period 2021–2024. As can be seen from the figure, poverty rates have decreased in most regions, with the largest positive change recorded in Syrdarya region. Significant reductions were also observed in Tashkent region, Samarkand region, the Republic of Karakalpakstan, Andijan and Jizzakh regions. This indicates that measures to increase incomes, ensure employment, and provide social support in these regions have had a certain effect.

At the same time, the figure shows that in some regions the poverty rate has not decreased, but has even increased. In particular, in Navoi region the indicator has increased slightly, while in Fergana region the increase was relatively higher. In Tashkent city, the change has shown an almost stable state. These results indicate that socio-economic processes are not the same between regions and justify the need to implement poverty reduction policies based on a differentiated approach based on territorial characteristics (Figure 2).

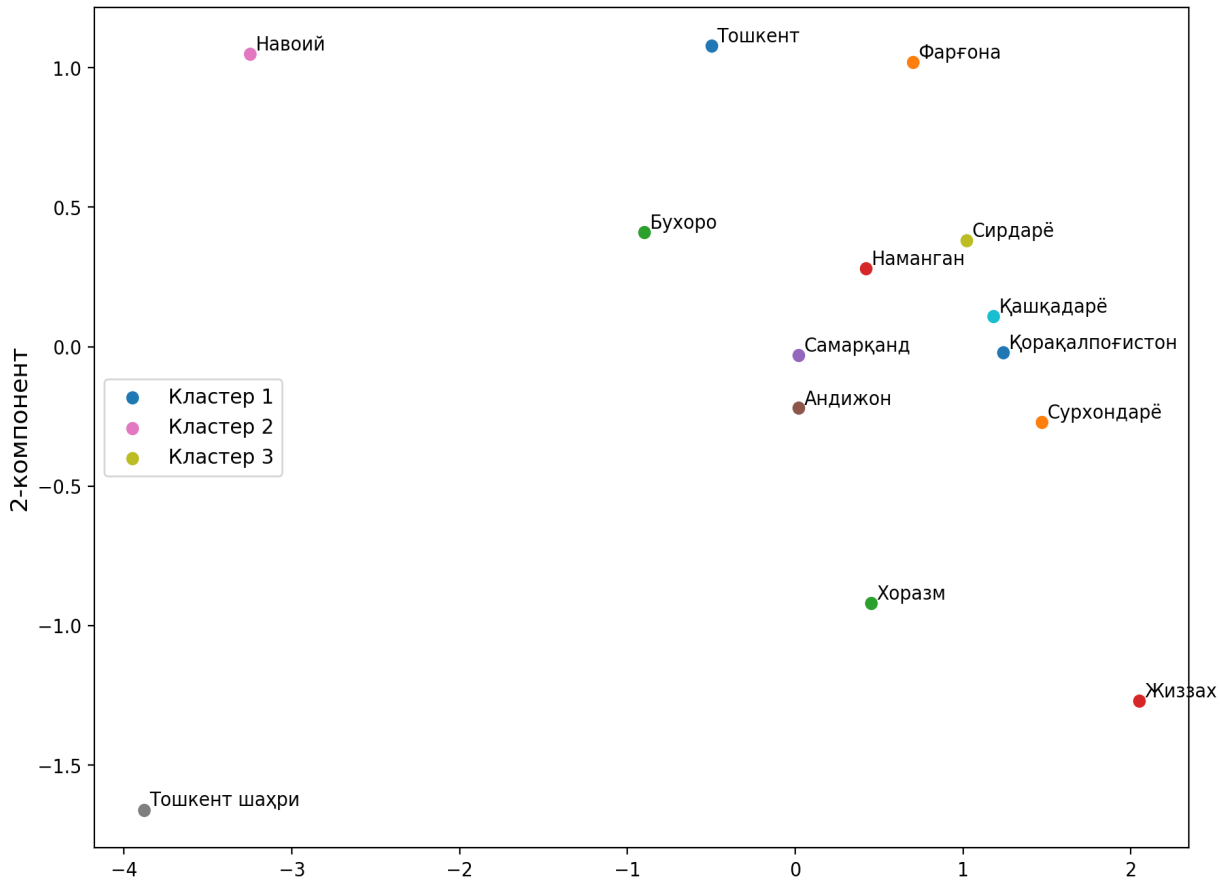

Figure 2. Social risk cluster of regions

This figure shows the results of the division of regions into clusters based on the level of social risk and their mutual similarity in 2024. As can be seen from the figure, the regions are grouped into three separate clusters, which means that they differ from each other in terms of factors related to poverty, unemployment, income and social need. In particular, the regions included in the first cluster have a relatively average or stable social risk profile, while the regions in the second cluster are characterized by distinctive socio-economic characteristics that stand out sharply from the general mass. The third cluster combines regions with relatively high or close social risk factors.

The results of this clustering scientifically substantiate the need to apply a differentiated, rather than a uniform, approach to regions. Because the same funding, the same social support, or the same management measures for regions belonging to different clusters may not produce the expected effect. Therefore, this figure shows the importance of categorizing regions, applying correction coefficients to them, and distributing social protection funds in accordance with the level of risk and characteristics of needs.

The OECD and Boadway-Shah studies emphasize that formulas and coefficients should be simple, transparent, and recalibrated over time [12; 13]. In this regard, the categorization practice in Uzbekistan is consistent with international theory, but its next step should be data-driven recalibration.

The proposed improvement is that it is appropriate to link the coefficient not only to the category of the region, but also to a composite social risk index. The index could include poverty, unemployment, child share, disability burden, rural population share, and distance to services. Such an approach would enhance regional fairness.

Recent literature suggests that structured transfers have different effects on local fiscal sustainability [14]. Therefore, a bonus-malus mechanism that takes into account fiscal effort, along with the introduction of a coefficient, could be developed (Table 3).

Table 3. Key indicators used for clustering in 2024

Area	Poverty, %	Unemployment, %	Per capita income, thousand soums	Pension recipients per 1,000 population
Republic of Karakalpakstan	10.8	5.8	18277.5	133.62
Andijan region	9.5	5.4	24081	135.1
Bukhara region	8.7	5.4	29918.8	145.99
Jizzakh region	11.8	5.8	20126.2	118.42
Kashkadarya region	9.6	5.9	19914.8	129.36
Navoi region	5.7	4.9	38499.1	157.26
Namangan region	7.6	5.6	18558.2	127.13
Samarkand region	7.5	5.4	21236.5	126.6
Surkhandarya region	9.3	5.9	19431.5	121.23
Syrdarya region	11.3	5.9	20181.6	142.45
Tashkent region	8	5.7	26276.2	146.14
Fergana region	8.6	6	19588.9	138.25
Khorezm region	11.9	5.4	26338.7	136.25
Tashkent city	7.3	4.5	62305.1	141.9

This table reflects the composition of the main indicators used to classify regions into social risk clusters in 2024 and is the empirical basis for the above clustering results. The table presents indicators such as poverty rate, unemployment, per capita income, and the number of benefits and pensioners per 1,000 inhabitants, which made it possible to identify similarities and differences between the socio-economic situation and risk profile of the regions. In this sense, the clusters in the figure are not formed randomly, but based on the mutual harmony and differences of the indicators in this table.

Analysis of the table data shows that in some regions, poverty and unemployment are higher, and per capita income is relatively low, which has led to their convergence with higher social risk groups. In other regions, high income levels, wide coverage of social payments, or relatively low unemployment have led to their separation as a separate cluster. Thus, this table scientifically substantiates the need for a comprehensive approach to categorizing regions, that is, making decisions based not on a single indicator, but on a set of several socio-economic indicators (Figure 3).

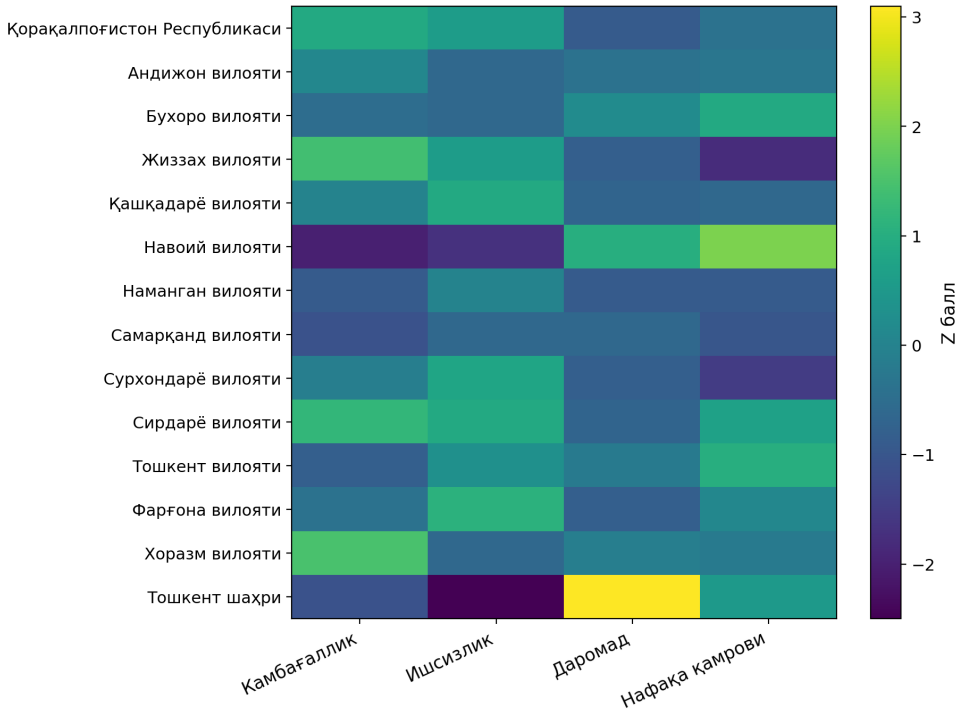

Figure 3. Social risk indicator by region

This figure shows the relative level of social risk indicators across regions in 2024, based on a standardized Z-score. The figure shows differences between regions in terms of poverty, unemployment, income, and benefit coverage, represented by colors, with positive values indicating that the indicator is above average, and negative values indicating that it is below average. In particular, some regions have relatively high poverty and unemployment rates and low income levels, indicating that they have a higher social risk burden. Conversely, regions with higher income levels and relatively low unemployment have a stronger social stability factor.

This visual analysis confirms that the socio-economic situation of regions is not the same and that it is necessary to rely on a set of indicators, rather than a single indicator, when assessing them. In this regard, the picture serves as an important analytical basis for categorizing regions, determining the level of social risk, and applying correction coefficients. This scientifically justifies the need for targeted, differentiated, and needs-based distribution of social protection funds.

CONCLUSION AND SUGGESTIONS

The results of the study showed that the use of regional classification and correction coefficients is a scientifically sound, fair and effective approach to the distribution of state resources. Although the poverty rate had a general downward trend in 2021–2024, it was found that socio-economic disparities between regions persisted. This confirms that a single standard approach to financing will not produce the same results for all regions, but rather, it is necessary to take into account regional needs and risk profiles.

Cluster analysis based on 2024 indicators allowed dividing regions into three main groups - relatively low-risk, medium-risk and high-risk categories. This result showed that regions differ significantly in terms of poverty, unemployment, per capita income and coverage of social payments. Therefore, the correction coefficient should be considered not as a subjective preference in financial distribution, but as an expression of territorial social risk and financing needs in the budget mechanism.

In this context, the main scientific conclusion of the article is that territorial categorization and coefficients serve to clarify financing formulas, strengthen targeting, and mitigate interregional inequality. In particular, periodic revision of coefficients turns them into a dynamic management instrument, not a static one. This brings state financial policy closer to modern risk-based and evidence-based management principles.

In the future, to further improve the correction coefficients, it would be advisable to link them to an expanded composite social risk index, that is, to integrate factors such as poverty, unemployment, demographic burden, disability, the share of the rural population, and the cost of accessing services. Then the categorization of regions will serve not only as a statistical grouping tool, but also as a practical financial instrument for a fair, transparent, and effective distribution of state resources.

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