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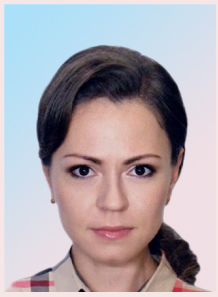
Strategic Classification of Regions According to the Level of Financial Self-Sufficiency



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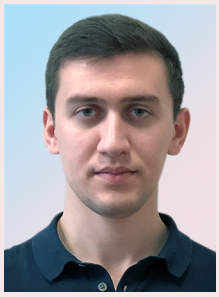

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Abstract. In the context of highly uneven regional development, subnational and federal governments are facing an extremely important task of elaborating and implementing the strategy for development of Russia's constituent entities. In this regard the research on financial self-sufficiency of regions as a driver of resource security of strategic development becomes an urgent issue. The goals of our study include building a typology of regions according to the level of financial self-sufficiency and identifying strategizing features for individual groups of regions. Cluster analysis, principal component analysis and panel data analysis are used to achieve the goals. In order to build sustainable groups, we form a system of 18 indicators of financial self-sufficiency of regions; we carry out cluster analysis on its basis; after that, we identify three groups of regions: leaders, average performers, and outsiders. This classification of regions can be considered stable, since the composition of the groups has not changed over time. We carry out the principal component analysis using our set of indicators of financial self-sufficiency and

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identify three generalizing factors that characterize the budgetary security of the regions, the potential of regional and municipal taxes, and the tax burden on the economy. We carry out modeling with the use of panel regression and analyze the influence of each factor on financial self-sufficiency in each group of regions. The resulting classification has significant scientific prospects regarding the formation of a general strategizing methodology for regions with different levels of financial self-sufficiency. The strategic classification can be used by regional authorities to form regional and sectoral development strategies.

Key words: region, strategy, classification, budget security, financial independence, regional development.

Introduction

Regional development in a federal state is very specific and multifaceted issue. Each region is a system with a set of unique features: geographical location, climatic conditions, availability of natural, human and institutional resources. Thus, it is quite natural that regions differ in terms of socio-economic development and, accordingly, the distribution of economic growth factors in them is uneven. Differentiation of socio-economic development in regions causes their difference in the level of financial self-sufficiency. In the framework of the formation of the development strategy, the level of financial self-sufficiency is a determining indicator of resource security in a region. This indicator determines the overall development of a territorial entity; therefore, in accordance with the level of budgetary security, it is possible to apply certain approaches to the development of the strategy in the regions. Consequently, studying the level of financial self-sufficiency and the importance of this factor in the formation of regional development strategies is an important research area.

The goal of the present study is to build sustainable groups of regions according to the level of their financial self-sufficiency and to identify the features of strategizing in them.

Within the framework of this goal, we formulate the following major objectives of our study:

1) to analyze approaches to the definition of financial self-sufficiency of the region;

2) to create a system of statistical indicators to assess financial self-sufficiency;

3) to analyze the dynamics of main indicators of financial self-sufficiency in federal districts and in Russia as a whole;

4) to classify the regions according to the level of financial self-sufficiency and to check the stability of the groups in time;

5) to determine the reasons for the current level of financial self-sufficiency using principal component analysis and panel data regression.

Novelty of the study consists in the development of a methodology for identifying the features of strategizing for regions with different levels of financial self-sufficiency; this will help substantiate current fiscal policy in Russia's regions in order to improve their fiscal capacity and economic security.

Achieving financial self-sufficiency of individual constituent entities is an important task for a federal state; this task is implemented through a competent fiscal policy and effective intergovernmental fiscal relations. Theoretical foundations for increasing the efficiency of interaction of budgets of different levels are analyzed in the framework of fiscal federalism that represents a vertical hierarchy of the public sector, distribution of income and expenditure between different levels of government (federal, regional, municipal) and the system

of intergovernmental transfers [1]. Scientific works link the achievement of financial self-sufficiency to fiscal decentralization – one of the main principles of fiscal federalism [2]. Classical theories of fiscal federalism highlight a number of advantages of a decentralized management system. Martinez-Vazquez and McNab [3], Oates [4], Thiessen [5], Musgrave [6] highlight an opportunity to improve the efficiency of provision of public goods as the key argument in favor of decentralization. Another advantage of fiscal decentralization is the increase in horizontal and vertical fiscal competition, which in turn can limit the size of the public sector and its predatory incentives [7]. In addition, in the presence of strong democratic institutions (transparent elections, the rule of law, and an effective parliamentary system), fiscal decentralization can improve the accountability of regional authorities and enhance the quality of administration [8]. Organizations such as the World Bank encourage decentralization as an important administration reform [9]. However, under certain conditions, fiscal decentralization can have a negative effect [10]. Excessive decentralization can lead to greater inequality in the socio-economic development of regions, because competitive advantages are distributed unevenly form the start, and because initially strong regions accumulate significant wealth. Therefore, the absence of a centralized equalizing policy can lead poor regions to bankruptcy [11]. Therefore, achieving financial self-sufficiency should be backed by strategic development that takes into account national and regional values, interests and priorities [12] and ensures effective interaction between federal and subnational governments.

Financial potential plays an important role in assessing financial self-sufficiency of a region [13]. This indicator is often used for assessing the investment attractiveness of a region. In particular, such a method for assessing the investment potential is used by Expert-RA rating agency. In the methodology for assessing investment attractiveness of a region, financial potential characterizes the volume of the tax base, profitability of enterprises, and people's incomes [13]. Having reviewed domestic scientific works, we distinguish a number of definitions of financial potential of a region. For example, V.N. Leksin and A.N. Shvetsov define financial potential as the total capacity of the region's own financial resources [15]. This definition characterizes the region's finances as a resource for development, but does not reveal in detail the components of the indicator. According to A.G. Atayev, financial potential is "total financial opportunities that are converted into financial resources"[1]. Y.A. Bulatova defines financial potential as a resource base for the implementation of regional development strategy: "It is a set of financial resources accumulated, attracted and formed as a result of economic activity; these resources are at the disposal of economic agents and promote the achievement of strategic goals of socio-economic development of the region" [16].

Research methodology

To achieve the goals and objectives of the study, we used various methods of analysis such as cluster analysis, principal component analysis (hereinafter –PCA), and panel data analysis.

We used cluster analysis to implement the main idea, i.e. to build stable groups of regions.

Cluster analysis is used in historical, marketing, medical, philological, and economic

[1] Ataeva A.G. *Mekhanizm formirovaniya finansovoi samostoyatel'nosti munitsipal'nykh obrazovanii: dis. ... kand. ekon. nauk : 08.00.10. 2011* [The Mechanism to Form Financial Self-Sufficiency of Municipalities: Candidate of Sciences (Economics) Dissertation]. 411 p.

research. The popularity of cluster analysis methods in economic research is due to the strengthening of differentiation processes in socio-economic development, and also due to the interdependence of political and economic processes.

Having reviewed Russian scientific works, we prove that the methods we use are effective and the results we obtain are substantiated [17].

Foreign researchers use cluster analysis methods extensively as well. A. Repkine [18] identifies clusters of Asian countries on the basis of a set of economic indicators. F. Krontaler groups German regions into clusters and determines their level of economic potential [19].

Cluster analysis is a method of classification analysis. The main purpose of this method is to arrange a set of objects into homogeneous groups (clusters). Within each cluster, there should be "similar" objects, and the objects of other clusters should be as distinct as possible. The advantage of cluster analysis is that it allows us to group the objects according to a number of features, rather than a single feature.

The sustainability of the typological groups of regions implies that their composition remains the same over time. In our study, the clustering of regions was carried out in the period from 2008 to 2015.

In order to work out recommendations related to the strategy for development of each group of regions, it is necessary to find out the reasons for the corresponding level of financial self-sufficiency. Thus, with the help of the principal component analysis, the space of financial self-sufficiency factors under consideration can be narrowed down to a small number of generalizing factors.

"The principal components are new auxiliary variables whose values are linear combinations of the initial variables, and these values are calculated after the principal component analysis has been conducted"[2]. The principal components are interpreted according to the following scheme: the direction of the impact of variables on the increase in the values of latent factors is determined [20].

During the final stage of the analysis, panel regression on the main components is constructed. Panel data (hereinafter – PD) are two-dimensional arrays. One of the dimensions is "spatial", by economic units (i=1,...N), the other is time dimension (t=1,...T). PD have two indices (i, t), where the index i refers to the same economic unit [21].

PD have an important advantage over, for example, a single time series or a single sample. It consists in the fact that "panel data take into account and analyze individual differences between sample units; in particular, they explain why a particular sample unit behaves differently at different time intervals" [22].

PD allow us to obtain more effective assessments. This is possible because PD is characterized by a large number of observations, which increases the number of degrees of freedom and reduces the multicollinearity of factors by taking into account individual differences [23, 24].

As a result, we obtained the values of principal components for each region for the analyzed time period of 2008–2015 within each cluster and constructed a panel regression. We use the indicator "Ratio of gratuitous receipts to own income" as a dependent variable; it fully characterizes the level of financial self-sufficiency.

[2] Bulatova Yu.I. Financial capacity of the region: content and structures. *Vestnik Sankt-Peterburgskogo universiteta=Saint Petersburg University Bulletin,* 2010, no. 3, pp. 94-97. (In Russian).

Research results

1. Forming a system of indicators for the research.

In order to classify regions into stable typological groups, a system of indicators was proposed. It is based on the following assumptions: a key opportunity for the region to achieve financial self-sufficiency consists in the amount of financial capacity components in the region and the conditions conducive to enhancing financial capacity in the form of tax revenues. As a result, a system of indicators was formed, which includes 30 indicators (see *Appendix*).

We conducted a multicollinearity test and eliminated correlated variables (correlation coefficient is above 0.8); thus, the following indicators remain available:

– the share of tax revenues in the consolidated budget system (hereinafter – CBS) of the Russian Federation, in % (X1);

– the amount of subsidies to equalize budget security (hereinafter – SEBS) relative to tax revenues, in % (X2);

– the level of coverage of the costs of Russia's CBS by its tax revenues, in % (X3);

– the level of coverage of the costs of Russia's CBS by its gratuitous receipts (X4);

– the level of coverage of expenses of the consolidated budget by its tax and non-tax revenues, in % (X5);

– the ratio of gratuitous receipts to the income of Russia's CBS (X6);

– employment rate (X7);

– the share of overdue accounts payable (X8);

– the share of population with incomes below the subsistence level, in % (X9);

– the level of taxation of turnover of organizations (X10);

– the level of taxation of assets of organizations (X11);

– total regional tax burden, % of GRP (X12);

– tax burden of the stage of production – the share of "other taxes on production" in GRP (X13);

– potential of individual property tax (X14);

– potential of transport tax (X15);

– potential of land tax (X16);

– the number of small enterprises, including micro-enterprises (X17);

– the number of enterprises and organizations in the calendar year (X18).

This system of indicators allows us to analyze the strengths and weaknesses of Russia's constituent entities through interregional comparisons and monitoring for individual regions.

The study has revealed a high degree of regional differences in the indicators of financial self-sufficiency under consideration. To study the variation of the analyzed indicators we used mean and median values, variation coefficient, maximum and minimum values *(Tab. 1)*.

The national average level of coverage of the costs of Russia's CBS by its tax revenues as a whole is 61.4%. The variation coefficient equal to 28.2% reflects the degree of uniformity of the population under consideration. If the variation is greater than 33%, then the average value is considered fictitious and cannot be trusted. According to the indicator "Coverage of the costs of Russia's CBS by its gratuitous receipts", we note a high degree of heterogeneity of Russian regions; the variation coefficient amounted to 63.6% in 2015. The average value of 27.7% does not reflect the real national level in Russia, because there are regions that cover more than half of their expenses with the help of gratuitous receipts. Such regions include, first of all, those within the North Caucasian

Table 1. Degree of regional differences in the analyzed indicators of financial self-sufficiency

	Coverage of the costs of Russia's CBS by its tax revenues, in %	Coverage of the costs of Russia's CBS by its gratuitous receipts	Amount of SEBS relative to tax revenues, in %
Average value	61.4	27.7	29.2
Median	66.4	23.1	7.6
Variation coefficient	28.2	63.6	177.8
Maximum	96.5	82.5	251.6
Minimum	12.8	2.4	0
Source: own compilation.			

Federal District. The maximum value of the analyzed indicator – 82.5% – is observed in the Chechen Republic. The next indicator – the amount of SEBS relative to tax revenues – has the strongest variation, which is 177.8%. Such regions as the Moscow, Leningrad, Yaroslavl, Samara, Sverdlovsk, Tyumen, Sakhalin oblasts and the Republic of Tatarstan have a zero amount of SEBS. At the same time, Kamchatka Krai, the republics of Tuva, Dagestan, Ingushetia, and Karachay-Cherkess, Chechen and Altai republics have a very high amount of SEBS relative to taxes; it is more than 100%. The maximum value is 251.6% in the Republic of Tuva.

Next, let us analyze the dynamics of the main indicators of financial self-sufficiency. The share of tax revenues in Russia's CBS for 2008–2015 increased from 70.8 to 74.4% in Russia as a whole *(Fig. 1)*. At the same time, it should be noted that the minimum share of taxes in the revenues of Russia's CBS was observed in 2009 (63.64%), which is due to a sharp economic downturn caused by the global financial crisis.

The shares of tax revenues of CBS in the Ural and Central federal districts significantly exceed the national average – 80 and 84%, respectively. Since 2012, the share of tax revenues in the Northwestern Federal District increased from 74 to 79% and also exceeded the national average level.

The lowest share of tax revenues of CBS – 36% – is observed in the North Caucasian Federal District; it is more than two times lower than the national average.

The extent to which the expenses of Russia's CBS were covered by its tax revenues in 2008–2015 had unstable dynamics: it fell by 10% (from 70.18 to 60.28%) in the period after a recession in the crisis year of 2009; then there was an annual growth to the pre-crisis level (69.52%) till 2012; then – the next decline – to 67.75% in 2013 and after that – the subsequent growth (by 5.35%) to 73.1% in 2015 *(Fig. 2)*.

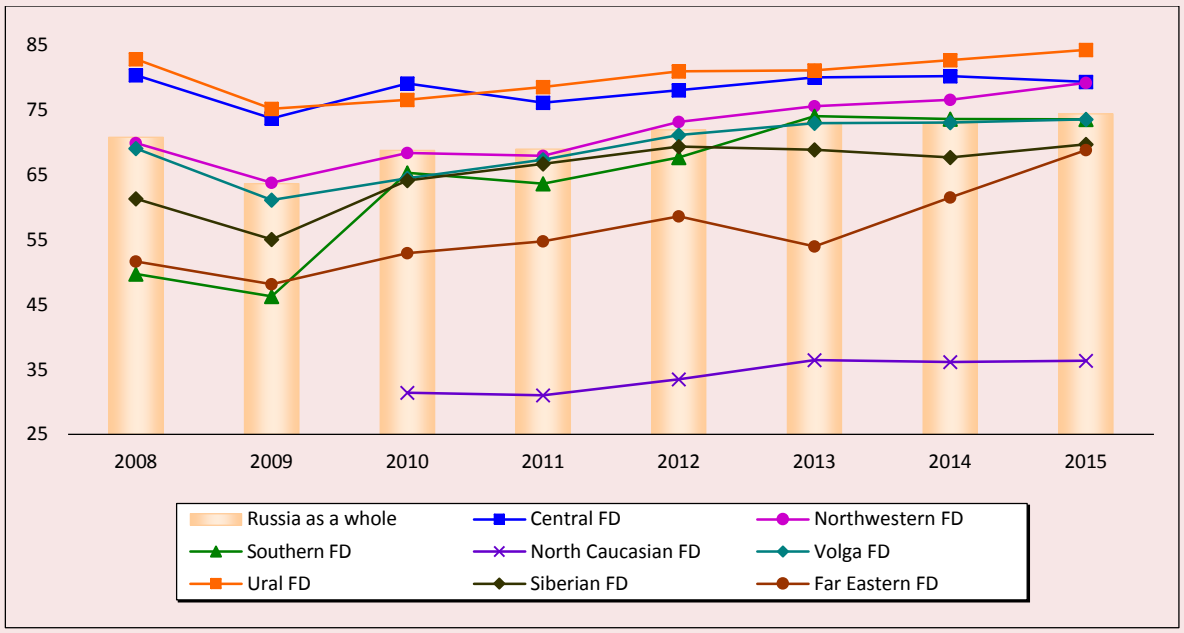
According to the data as of 2015, the highest coverage of expenses of CBS by its tax revenues is observed in the Central and Ural federal districts – 81.9 and 83.7%, respectively.

During 2008–2015, the financial stability of the Northwestern Federal District was significantly strengthened – the degree of coverage of expenses of its CBS by its tax revenues increased by 10% – from 67.93 to 78% – and exceeded the national average.

In the Southern Federal District, the extent of coverage of expenses of CBS by its tax revenues increased significantly. Having declined (by 7%) to a minimum (43.52%) in the crisis year of 2009, the coverage of expenses by tax revenues increased in subsequent years by 15% – to 68.2% in 2015.

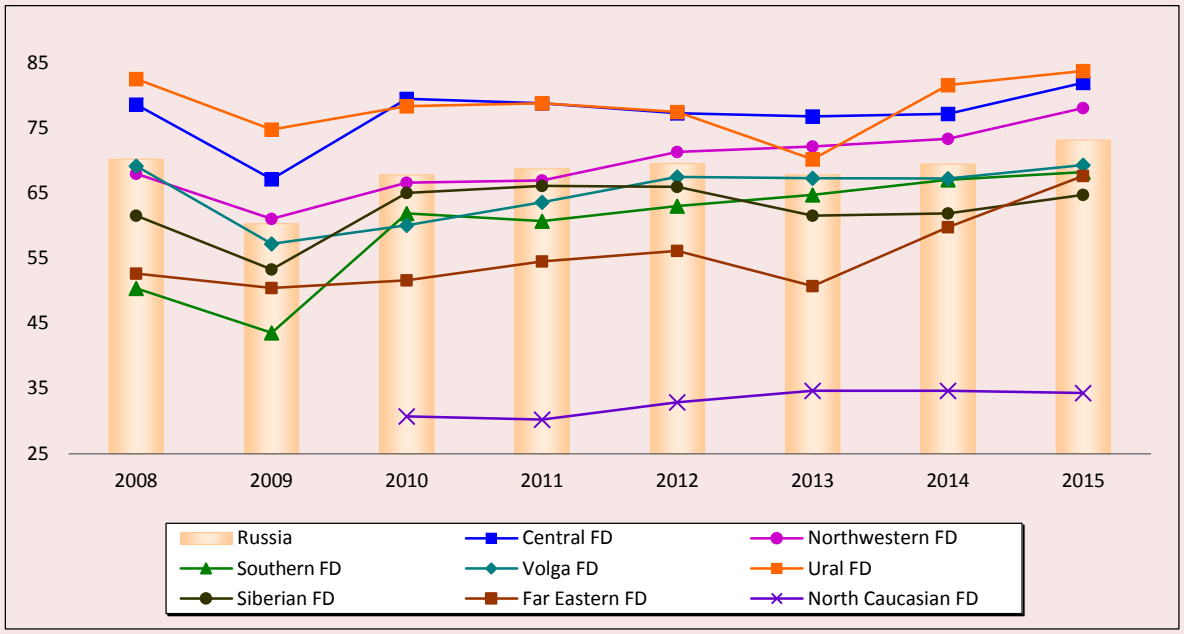
The coverage of expenses of CBS by tax revenues in the Siberian and Volga federal districts is slightly lower than the national average – 64.7% and 69.3% against 73%, respectively. It is only in 2015 that the Far Eastern Federal District joined this group of regions.

Figure 1. The share of tax revenues in Russia's CBS, %



Source: Treasury of the Russian Federation. Consolidated budgets of constituent entities of the Russian Federation and budgets of territorial state extra-budgetary funds. Available at: http://www.roskazna.ru/ispolnenie-byudzhetov/konsolidirovannye-byudzhety-subektov/

Figure 2. The extent of coverage of expenses of Russia's CBS by its tax revenues, %



Source: Treasury of the Russian Federation. Consolidated budgets of constituent entities of the Russian Federation and budgets of territorial state extra-budgetary funds. Available at: http://www.roskazna.ru/ispolnenie-byudzhetov/konsolidirovannye-byudzhety-subektov/

The degree of coverage of expenses of CBS by its tax revenues in the North Caucasus Federal District remains low. Despite the increase in this indicator from 30.74% in 2008 to 34.3% in 2015, this indicator is more than two times lower than the national average.

In 2008–2015, the extent of coverage of expenses of Russia's CBS by its tax and non-tax revenues increased from 78.59% to 80.44%, which led to a reduction in the level of coverage of CBS expenses by its gratuitous receipts from 19.25% to 17.75%, respectively.

The highest level of coverage of CBS expenses by tax and non-tax revenues is observed in the Central (91.64%), Ural (90.1%) and Northwestern (86.39%) federal districts. The level of coverage of CBS costs by gratuitous receipts in these regions is minimal: 11.59%, 9.21% and 12%, respectively.

About 3/4 of CBS expenses is covered by tax and non-tax revenues in the Volga, Far Eastern and Southern federal districts.

Significant progress in ensuring the financial sustainability of CBS took place in the Southern FD. The extent of covering the expenses of CBS by tax and non-tax revenues after the crisis year of 2009 increased 1.5-fold from 49.24% (minimum value) to 73.61% in 2015, while the dependence of CBS on gratuitous receipts decreased more than twofold – from 44.8% to 19.17%, respectively.

In the Siberian Federal District, significant changes in the level of coverage of CBS expenses by its tax and non-tax revenues, as well as gratuitous receipts, were observed in 2008–2015. The maximum level of coverage of expenses by gratuitous receipts corresponds to the crisis year of 2009 – 35.27%; in the same year, the minimum level of coverage of expenses by tax and non-tax revenues was observed – 60.51%.

More than half of expenses of CBS in the North Caucasian Federal District are covered by gratuitous receipts: in 2010–2015, the extent of coverage decreased from 62.54% to 56.77%. At the same time, the level of coverage of CBS expenses by tax and non-tax revenues increased from 35.28 to 37.45%.

Statistical analysis of financial self-sufficiency of the regions shows a high differentiation of the regions according to the indicators under consideration. In this regard, the approaches to the formation of development strategies for each region, depending on the level of financial and resource security should be different. Cluster analysis allows us to identify groups of regions with different levels of financial self-sufficiency.

2. Results of the cluster analysis.

To build sustainable groups, cluster analysis uses k-means clustering. In the framework of the first experiment on the formation of stable groups, we decided to divide the set of regions into three groups. The plot of k-means illustrates the mean values for the selected indicators within each cluster. It can be noted that when divided into three classes, the means have virtually no coincidence. However, in Figure 4, we can see that as the number of clusters to be split increases to four, the averages match. This indicates a fuzzy classification.

The cluster analysis was carried out in a system of 18 indicators characterizing the financial self-sufficiency of regions of the Russian Federation for the 2008–2015 period. Thus, according to the level of financial self-sufficiency, the regions are distributed as follows:

- leaders – the first cluster;
- average performers – the second cluster;
- outsiders – the third cluster.

Stable groups were formed during the cluster analysis. This means that the leaders, average performers and outsiders have maintained their level of financial self-sufficiency. The average percentage of discrepancy between the

Figure 3. Plot of means for each cluster taking into account the division into three groups

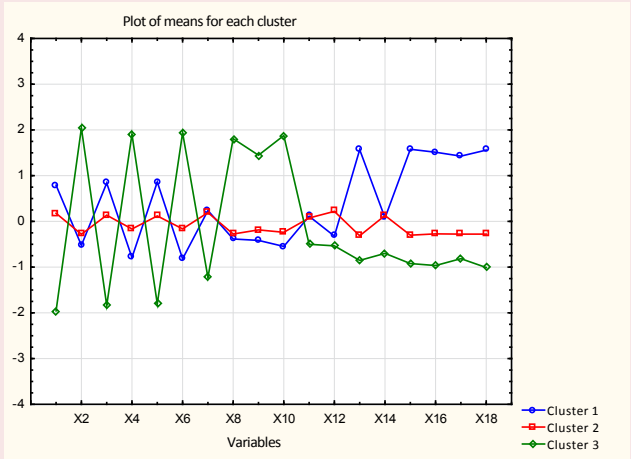
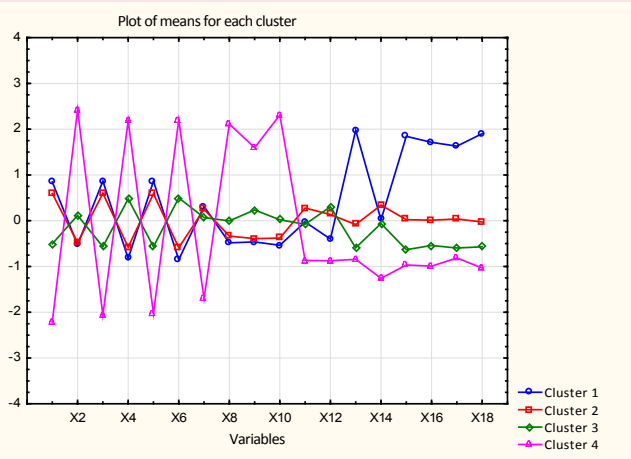


Figure 4. Plot of means for each cluster taking into account the division into four groups



classifications observed in 2008 and 2015 is 6.4%, which is an acceptable value in the formation of stable groups.

In the course of the comparative analysis of the discrepancy, we can distinguish a number of regions that have moved from one cluster to another. Thus, the Voronezh, Leningrad and Irkutsk oblasts moved from the second cluster to the first; the Republic of Adygea moved from the third cluster to the second. In the regions under consideration, there is a tendency toward improving the indicators of financial self-sufficiency, which certainly indicates the economic development of these regions. There are also examples of deterioration of the economic situation in the period under review: Kamchatka Krai moved from the second cluster to the third.

As a result of clustering using k-means clustering, we grouped the regions into three clusters according to the level of financial self-sufficiency. The first cluster includes 16 regions that belong to resource-based regions and traditionally developed economic centers. The regions in the first cluster are characterized by a high level of budget security and high financial self-sufficiency (X1-X6). For the regions under consideration, tax revenues are the main item in the structure of revenues of the consolidated budget of the subject of the Russian Federation (CBS) (X1) and account for an average of 77.6%. The dependence of the budgets of the constituent entities on the subsidies aimed at equalizing budget security (X2) is at a low level, which indicates the high financial self-sufficiency of the regional budgets. In turn, gratuitous receipts account for 15.5% (X6) of all revenues of Russia's CBS for the group under consideration, and they cover the expenses of Russia's CBS (X4) by 14.7%, which is primarily due to the implementation of economic and social development programs in the regions. The average level of coverage of expenses of the consolidated budget of the region by tax and non-tax revenues (X5) for the first cluster is 81.2%; of which tax revenues cover 74.6% of expenses of Russia's CBS (X3). The regions of the cluster under consideration can be called economic leaders of Russia. In many ways, these subjects are the engines of growth of the country's economy as a whole. High budget security in these regions is caused, of course,

by the developed economy and the presence of competitive advantages (resources, capital, infrastructure, etc.).

The second cluster consists of 50 regions with a rather heterogeneous specialization. From the point of view of location, these regions are distributed very unevenly; thus, in this case it is very difficult to characterize them from the territorial perspective. Tax revenues (X1) account for about 67.3% of all CBS revenues, while gratuitous receipts (X6) account for 27.3% of budget revenues in the group. Considering such an indicator as the amount of SEBS relative to tax revenues (X2), we form an ambiguous opinion. On the one hand, this cluster contains regions, the value of which is minimal (Sakhalin Oblast, Yaroslavl Oblast, Kaluga Oblast); on the other hand, it has regions with subsidized budgets (Chukotka Autonomous Okrug, the Republic of Sakha, etc.). It should be noted that the probable reason why developed regions find themselves in the second cluster is a strong gap in the coverage of expenses of CBS by its tax revenues. For example, tax revenues in the Kaluga Oblast account for 68% of its expenses, while tax revenues account for about 78% of all CBS revenues. In the second cluster, the consolidated budget expenditures are covered mainly by own revenues (X5); of which tax revenues (X3) account for 62.3%. Gratuitous receipts (X4) cover 25.6% of all expenses of CBS in the second cluster. Having lower rates of economic and social development than the national average, these regions had significant production capacity in the past and belonged to the developed regions.

If the first cluster includes leaders, then the third cluster includes outsiders, or subsidized regions. The third cluster consists of eleven regions located mainly in the North Caucasian Federal District; it also contains underdeveloped agricultural regions of the Far Eastern and Siberian federal districts. A specific feature of the regions within the third cluster is the strong dependence of their economies on gratuitous receipts from the federal budget and, accordingly, the low level of budget security. Gratuitous receipts (X6) make up the bulk of revenues of CBS and account for 65.1% of the revenues. Tax revenues of CBS (X1) make only 31.3% in the group under consideration. The regions of the analyzed cluster are highly subsidized, the amount of SEBS relative to tax revenues (X2) is 137.6% on average, and in some regions, such as the Republic of Ingushetia and the Republic of Tuva, this figure exceeds tax revenues more than twice. The expenses of the consolidated budget of the regions within the second cluster are covered by gratuitous receipts (X4) by 61.8%. Tax and non-tax revenues of CBS cover 32.8% of regional budget expenditures (X5), of which tax revenues cover 29.4% (X3). The current dependence of the regions on gratuitous receipts is primarily due to their low level of economic and social development. The economy of an underdeveloped region is characterized by a state of stagnation, it has distinctive features: an undiversified sectoral structure of the industry, weak investment attractiveness, low intensity of economic activity, and weak social policy. The availability of capital and the ability to service debt for business in these conditions becomes a difficult task; in this regard, overdue accounts payable (X8) in these regions is 35.3%. This economic situation certainly affects social development in the regions of the analyzed cluster. Employment rate (X7) is below the national average (65.3%) and is 58.2%; and the share of the population with incomes below the subsistence level (X9) is almost twice as high (23.2%) as the national average.

Now let us consider those regions that had to be excluded in order to achieve more uniform results of the analysis. We excluded Moscow, Saint Petersburg, and the Moscow Oblast. It should be noted that these regions are the undisputed leaders of economic development and have a diversified economy. In this regard, the financial self-sufficiency of these regions is at a very high level.

3. The results of the principal component analysis.

The implementation of the principal component analysis on the initial set of financial self-sufficiency indicators allows us to identify three factors, the share of the explained variance of which exceeds 75%, which is a reliable result [20].

The group determining the first factor (F1) consists of indicators characterizing budget security of the regions, as well as indicators of social security *(Table 2)*. This principal component is closely related to the following indicators:

– the share of tax revenues in the consolidated budget system (hereinafter – CBS) of the Russian Federation, in % (X1);

– the amount of subsidies to equalize budget security (hereinafter – SEBS) relative to tax revenues, in % (X2);

– coverage of the costs of Russia's CBS by its tax revenues, in % (X3);

– the level of coverage of the costs of Russia's CBS by its gratuitous receipts (X4);

– the level of coverage of expenses of the consolidated budget by its tax and non-tax revenues, in % (X5);

– the ratio of gratuitous receipts to the income of Russia's CBS (X6);

– employment rate (X7);

– the share of overdue accounts payable (X8);

– the share of population with incomes below the subsistence level, in % (X9);

– the level of taxation of turnover of organizations (X10).

The second principal component (F2) includes regions that characterize the potential of regional and municipal taxes (tax resource of the region). The component under consideration is related to the following indicators:

– potential of individual property tax (X14);

– potential of transport tax (X15);

– potential of land tax (X16);

– the number of small enterprises, including micro-enterprises (X17);

– the number of enterprises and organizations in the calendar year (X18).

The third principal component (F3), which can be called "Tax burden on the economy", is closely related to the following indicators:

– the level of taxation of assets of organizations (X11);

– total regional tax burden, % of GRP (X12);

– tax burden of the stage of production (X13).

Table 2. The groups of indicators that are closely associated with the converted main components

Groups corresponding to principal components	Initial indicators included in the group
I	X1, X2, X3, X4, X5, X6, X7, X8, X9, X10
II	X14, X15, X16, X18
III	X11, X12, X13
Source: own compilation on the basis of the factor loading matrix.	

The values of each component were found for each region of the Russian Federation for the 2008–2015 period.

The results of panel regression modeling to identify the reasons for the corresponding level of financial self-sufficiency can be reflected in the form of a summary table *(Tab. 3)*. The Table presents the results of panel regression with fixed effects, because the specification test with the use of the Hausman test supports this model [24].

The model with fixed effects is used if the analyzed sample is actually a general population, as in our case (for the analysis we use almost all regions of Russia). Unobservable variables that do not change over time (geographical conditions, economic specialization of the region, etc.) are simulated by including a fixed effect in the model. In this regard, before estimating the regression equation, the time-mean value is subtracted from each variable and the usual least squares method is subsequently used.

The explained variable (Y) is the ratio of gratuitous receipts to own revenues of Russia's CBS. This indicator characterizes the financial self-sufficiency of the region best of all, since the share of gratuitous receipts shows how much the regional budget depends on the federal budget.

In accordance with the results of the panel regression modeling, the financial self-sufficiency of leader regions is positively influenced by the factor characterizing the tax resources of the region (F2). The obtained results are explained, first of all, by the economic well-being of the regions within the first cluster. As a rule, such regions have a rich tax base, which provides for a high potential of regional and local taxes. In addition, the growth of financial self-sufficiency is due to the reduction in the tax burden on the economy of the region (F3). The reduction in this factor will help concentrate more financial resources in regional budgets and use these resources for the implementation of the goals and objectives of regional strategies. The budget security factor (F1) proved insignificant for the considered group of regions. This result can be explained by the low share of gratuitous receipts in the revenue structure of Russia's CBS.

The budget security factor (F1) has the greatest impact on the financial self-sufficiency of average performers. Despite their economic potential, the considered group of regions is highly dependent on gratuitous receipts from the federal budget. Accordingly, the growth of budget security is positively associated with financial self-sufficiency. The increase in the tax resource of the region (F2) has a negative impact on the variable under consideration. For the regions of the second cluster, the importance of the potential of regional and municipal taxes is at an extremely low level,

Table 3. Panel regression results of for leaders, average performers and outsiders

	Y – ratio of gratuitous receipts to own revenues		
	Leaders	Average performers	Outsiders
F1 – Budget security	0.12	-4.0***	-34.60*
F2 – Tax resource of the region	-1.9***	1.87**	49.12**
F3 – Tax burden	1.48***	0.56	20.10**
N – number of observations (N = t×n, where t – number of years, n – number of regions)	128	400	88
Determination coefficient R^2	0.18	0.17	0.31
Source: own compilation. ***, **, * – significance at the level of 0.1%, 1% and 5%, respectively.			

the main share of CBS revenues is formed by federal taxes and gratuitous receipts. The tax burden factor (F3) is insignificant for average performers.

For outsiders, the budget security factor (F1) has a positive impact on financial self-sufficiency. The analyzed group of regions depends most on gratuitous receipts and has a rather weak economy. Budget security of these regions is formed mainly through subsidies and other intergovernmental transfers from the federal budget. As well as for average performers, for the regions of the third cluster, the factor characterizing tax resources (F2) has a negative impact on financial self-sufficiency. As in the previous case, this is primarily due to the low level of economic development of regions in the group under consideration. The tax burden factor (F3) has a negative impact on the financial self-sufficiency of outsider regions. In underdeveloped regions, when the tax burden increases, there is a major risk of the business moving into the shadow economy; this results in a decrease in tax collection. Accordingly, in order to increase financial self-sufficiency in the framework of the development strategy, it is necessary to find methods to reduce the tax burden on the economy of the region.

Discussion and conclusions

The analysis of financial self-sufficiency and the construction of a stable classification of regions can be carried out in various ways. Cluster analysis is one of the most popular methods in this regard. The main advantages of this method are as follows: it identifies the links between the objects of the population with a large volume of objects under study; and it allows us to classify objects on a number of features rather than on a single one. K-means clustering was used to build stable groups of regions according to the level of financial self-sufficiency. In order to reduce the dimension of the space of features under consideration, the principal component analysis was used, as well as the analysis of panel regressions on the selected factors in each group of regions.

The proposed classification of regions allows us to apply different approaches to the formation of development strategies for regions with a certain level of financial self-sufficiency. The development strategy for leaders will be provided by financial resources, and one of the key priorities may be to diversify the structure of the economy. Average performers should focus on their current competitive advantages in the process of elaboration and implementation of the development strategy. At the same time, outsiders should implement the strategy in conditions of severe resource constraints. Obviously, it is impossible to achieve equality between the leaders and outsiders in the near future; therefore, when elaborating a development strategy for underdeveloped regions, it is necessary to analyze the factors affecting the quality of life in them. Priorities, goals and objectives should take into account regional specifics and contribute to improving the quality of life as effectively as possible.

The formation of a strategic and sustainable classification of regions and the analysis of factors affecting the level of financial self-sufficiency allow us to prepare the basis for scientific research on the formation of certain approaches to strategizing for each group of regions. Undoubtedly, each region should have its own unique strategy; however, similar principles can be used in the development of strategic tools to improve financial self-sufficiency in different regions.

Determining the methods for analyzing the priorities, competitive advantages and resource availability is the most important direction for those research works that form the basis for effective practical actions.

Theoretical relevance of our study lies in the fact that the regions' classification technique we propose expands current provisions of the general economic theory because it develops mechanisms for state regulation of fiscal policy of regions; the technique also expands the general theory of strategy in terms of planning, management and implementation of the strategy for the regions that differ in the level of financial self-sufficiency.

The findings and recommendations we have obtained can be used and applied in the work of executive authorities when they elaborate regional strategies and long-term development programs. The proposed tools (panel regression on the principal components) help identify strategizing features for different types of regions according to the level of financial self-sufficiency.

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Appendix

System of indicators of financial self-sufficiency of the region

Indicator	Indicator code	Goal of introducing the indicator	Calculation
The share of tax revenues in Russia's CBS, in %	X1	Characterizes the provision of the regional budget with own tax revenues	Ratio of tax revenues to all revenues of Russia's CBS
The amount of subsidies to equalize budget security (SEBS) relative to tax revenues, in %	X2	Shows the dependence of CBS on SEBS	Ratio of SEBS to the tax revenues of Russia's CBS
The level of coverage of the costs of Russia's CBS by its tax revenues, in %	X3	Reflects the degree of sufficiency of tax revenues to cover expenses of Russia's CBS	Ratio of tax revenues to expenses of Russia's CBS
The level of coverage of the costs of Russia's CBS by its gratuitous receipts	X4	Shows the importance of gratuitous receipts for the regional budget	Ratio of gratuitous receipts to the expenses of Russia's CBS
The level of coverage of expenses of the consolidated budget by its tax and non-tax revenues, in %	X5	Shows the degree of sufficiency of own revenues to cover the expenditure powers of Russia's CBS	Ratio of all income to the expenses of Russia's CBS
The ratio of gratuitous receipts to the income of Russia's CBS	X6	Characterizes the provision of the regional budget with own revenues	Ratio of gratuitous receipts to the revenues of Russia's CBS
Employment rate	X7	Characterizes the share of the population employed in the economy of the region	
The share of overdue accounts payable	X8	Shows the level of efficiency of business activity in a constituent entity of the Russian Federation	
The share of population with incomes below the subsistence level, in %	X9	Reflects the standard of living in the region	
Cash income (average per capita), rubles	X10	Characterizes the standard of living in the Russian Federation	
Investments in fixed capital per capita, thousand rubles	X11	Reflects the investment attractiveness of a constituent entity of the Russian Federation	
The volume of mineral extraction per capita, thousand rubles	X12	The importance of mining industry for a constituent entity of the Russian Federation	
Agricultural output per capita, thousand rubles	X13	The importance of agriculture for a constituent entity of the Russian Federation	
Manufacturing output per capita, thousand rubles	X14	The importance of manufacturing for a constituent entity of the Russian Federation	
Retail trade turnover per capita, thousand rubles	X15	The importance of retail trade for a constituent entity of the Russian Federation	
Employment rate in agriculture	X16	Characterizes the share of employed in agriculture in a constituent entity of the Russian Federation	

End of Appendix

Indicator	Indicator code	Goal of introducing the indicator	Calculation
Employment rate in mineral extraction	X17	Characterizes the share of employment in mining in a constituent entity of the Russian Federation	
Employment rate in manufacturing	X18	Characterizes the share of employed in manufacturing in the a constituent entity of the Russian Federation	
Employment rate in wholesale and retail trade	X19	Characterizes the share of employed in retail trade in a constituent entity of the Russian Federation	
The number of enterprises and organizations per calendar year, thousand units	X20	Assessment of entrepreneurial activity in a constituent entity of the Russian Federation	
Turnover of organizations per capita, thousand rubles	X21	Cost estimation of efficiency of business activity in a constituent entity of the Russian Federation	
Number of small enterprises, including microenterprises	X22	Assessment of the level of small business activity in a constituent entity of the Russian Federation	
Turnover of small enterprises	X23	Valuation of the effectiveness of the small business in a constituent entity of the Russian Federation	
The level of taxation of turnover of organizations	X24	Characterizes the level of tax burden on the turnover of organizations in a constituent entity of the Russian Federation	Ratio of the amount of excise and VAT revenues in Russia's CBS to the turnover of organizations
The level of taxation of assets of organizations	X25	Characterizes the level of tax burden on the assets of an organization	Ratio of the amount of property tax to the value of the property of organizations
Total regional tax burden, % of GRP	X26	Shows the level of tax burden on the economy of a constituent entity of the Russian Federation	Ratio of tax revenues of Russia's CBS to GRP
Tax burden on enterprises at the production stage	X27	Characterizes the level of tax burden on enterprises at the stage of production in the region	Ratio of other taxes on production to the GRP of a constituent entity of the Russian Federation
Potential of individual property tax	X28	Assessment of the importance of municipal tax in the economy of a constituent entity of the Russian Federation	Ratio of individual property tax to the GRP of a constituent entity of the Russian Federation
Transport tax potential	X29	Assessment of the importance of transport tax in the economy of a constituent entity of the Russian Federation	
Land tax potential	X30	Assessment of the importance of municipal tax in the economy of a constituent entity of the Russian Federation	Ratio of land tax to the GRP of of a constituent entity of the Russian Federation

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