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Regulation of the Spatial Development of Territories based on the Evaluation of Labor Resources in the Region

Irina Vladimirovna Tsarenko, Anna Alexandrowna Urasova, Dmitry Arkadyevich Balandin, Alexander Nikolaevich Pytkin

Abstract*: Labor resources are among the most active elements that have significant impact on the socioeconomic development and define the specifics of the region and its territories. The socioeconomic sustainability of the region depends on how professionally the protection of rights and legitimate interests of workers is regulated for the development of labor resources, including personnel training and promotion of employment. The need to develop and implement new mechanisms for regulating labor resources does not raise controversy among the majority of Russian researchers. Many Russian scientists associate labor resources with the socioeconomic development of the region, since they are located in certain territories, and their efficient use is vital for the region's economy. Due to this, it can be stated that the theoretical and practical significance of the research into the socioeconomic development of the region based on the regulation of labor resources seems relevant and reasonable. In this article, the authors have made an attempt to develop a method for evaluating the impact of labor resources on the socioeconomic development of the region based on the statistical analysis.

***Index Terms*: labor resources, region, socioeconomic development, space, territory.**

I. INTRODUCTION

The development prospects of the regions in the Russian Federation directly depend on the available resources and the possibility of their optimal use in the modern economic conditions. Challenges of the competitive environment focus the state policy on changing the existing economic model towards the development of nonprimary industries, import substitution, and digitalization. Undoubtedly, this requires the development and adoption of appropriate solutions of the organization of modern workplaces in the territories, training of necessary personnel, and a clear strategic position regarding the regulation of labor resources.

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***** Correspondence Author
Irina Vladimirovna Tsarenko*, The Perm Institute of The FPS of Russia, Perm, Russia.
Anna Alexandrowna Urasova, Perm State University, Perm, Russia.
Dmitry Arkadyevich Balandin, Perm branch of IE UB RAS, Perm, Russia.
Alexander Nikolaevich Pytkin, Perm branch of IE UB RAS, Perm, Russia.

At the same time, insufficient attention is paid to the issues of the impact of labor resources on the socioeconomic development of the region, both in scientific research and management. In fact, the functions of labor resources regulation are implemented in most cases by traditional methods and are inefficient in the regions of the Russian Federation. For example, the level of the employable workforce in the Perm region decreased in 2017 compared to 2016 from 66.9 % to 65.5 %.

At the same time, this indicator increased from 66.3 % to 69.1 % over this period in the whole of the Russian Federation [1].

Theoretical and methodological aspects [2] of improving labor resources regulation in the socioeconomic development at the regional level and regulation of labor relations in corporate management [3] are insufficiently developed in scientific works [4]-[11] dealing with the problems of regulating labor resources.

II. METHODS

A. General Description

The relevance of the study of the methodological base for managing the development of agro-industrial territorial economic systems in the modern conditions within the implementation of the state policy of achieving food security and import substitution of the Russian Federation is defined by the need to develop the appropriate strategic directions and improve intra-industry and inter-industry relations based on the intraregional municipal integration.

The authors propose the following method for evaluating the development, based on the strategic approach to the development of the region in general and that of certain territories – in particular, adopted by law No. 172-FZ dated June 28, 2014 "On strategic planning in the Russian Federation".

As a rule, methods of strategic analysis are used in the toolkit of research of economic processes at the regional level [12].

The strategic analysis is traditionally used to position the objects under study (mainly at the micro level) relative to competitors (I. Ansoff [13], M. Porter [14], O. Shai [15], etc.). At the same time, some researchers (O.V. Demyanova [16],

A.R. Gilmullin [17]) use this approach to analyze various features of the operation and development of objects (at the meso level) – for example, the socioeconomic development of the region.

In addition, matrix methods of analysis can be noted [18], the most general concept of which distinguishes two most significant characteristics of the development of the object under study, and various options for the operation of these objects are differentiated according to the corresponding quadrants of the matrix based on the combination of such characteristics. Based on its results, the recommendations are developed for improving the processes determining the further development of the object.

B. Block Diagram

The most popular matrix methods for analyzing economic processes are provided in Table I.

Table I. Advantages and disadvantages of the matrix methods of strategic analysis

Matrix name	Advantages	Disadvantages
Ansoff matrix	Visual structuring, presentation of complex and diverse market factors. Ease of use.	Unilateral focus on growth. Limitation to the two, although most important, characteristics (product and market) is difficult if there are other significant characteristics.
BCG matrix	Abstract structuring and visual presentation of strategic problems. Suitability as a model for generating strategies. Ease of use. The market share and its growth rate are determined at low cost.	Evaluation is made using two criteria only, while other factors are abandoned. The place of an object in the middle position is impossible to accurately estimate when using a matrix with four fields.
McKinsey matrix	Differentiated evaluation of the object.	Determining model factors requires a lot of information. Factors are difficult to analyze. Different users may have different evaluation of the object.

It is proposed to use a modified Shell/DPM matrix to assess the impact of labor resources on the socioeconomic development of the region [19].

This tool was initially used to regulate the relationship between the cash surplus and its deficit, taking the phase of the life cycle of the object under study into account (redistribution of finance from the money-generating business sector to the business sector with a higher return potential) [20]-[22].

The undoubted advantage of this matrix is the ability to evaluate the balance between two groups of interdependent phenomena and processes, a wide range of possible strategic positions (nine), and the consideration of dynamic indicators.

At the same time, some aspects should be noted that are characteristic of most matrix methods and are their drawbacks:

– the two-dimensional nature of the matrix model, while the socioeconomic processes are much more complicated;

– the prevalence of quantitative evaluation criteria; and

– leveling the action of external factors, which necessitates using additional analytical procedures.

Based on the goals and objectives of this study, the authors believe that the proposed matrix can be used as a tool to assess the impact of the labor market on the region's economy, because it will allow to do the following:

– identify significant relationships and the nature of the interaction between the selected parameters;

– include a large number of indicators of the socioeconomic development of the region in the calculations of integral indicators;

– explore the dynamics of changes in the obtained integral indicators; and

– classify the analyzed objects, highlighting about nine competitive positions.

As such, the author proposes to modify the classic version of the Shell/DPM matrix in this study, having considered the following areas of interrelated processes:

1) development of labor resources in the region (Y axis); and

2) socioeconomic development of the region (X axis).

Let us consider each group of processes, having defined a set of indicators that measure them.

The following indicators are proposed for measuring labor resources development processes (Table II):

Table II. Indicators of the labor resources development in the region (Y axis)

Natural flow (subgroup A)	Migration flow (subgroup B)	Social flow (subgroup C)
Population (thous. people) (a_1)	Dynamics of those arrived/departed (%), of which	Total employed (thous. people) (c_1)
Labor force (thous. people) (a_2)	– within Russia (%) (b_1)	Total unemployed (thous. people) (c_2)

People not included in the labor force (thous. people) (a_3)	– within the region (%) (b_2)	Number of unemployed registered with state employment service agencies (thous. people) (c_3)
Population under the employable age (per thous. people, people) (a_4)	– interregional (%) (b_3)	Employment rate (%) (c_4)
Life expectancy at birth, years (a_5)	– international (%) (b_4)	Number of employees per pensioner (average per year; people) (c_5)
Natural growth, decline (-) of the population (%) (a_6)	Migration growth, decline (-) of the population (per 10,000 people, people) (b_5)	Demand in employees, people; load of unemployed population per an advertised vacancy, people (c_6)

The level of the labor resources development in the region (U_t) is the integral indicator along the Y axis.

The following indicators are proposed to measure the processes of socioeconomic development of the region (Table III):

Table III. Indicators of the socioeconomic development of the region (X axis).

Human development (subgroup D)	**Economic development (subgroup E)**	**Development of public relations (subgroup G)**
Average wages, rub. (d_1)	Gross regional product, at current basic prices: total, mln rub. (e_1)	Graduated skilled workers and employees, thous. people (g_1)
Level of per capita monetary incomes of the population, rub. (d_2)	Volume of produced and shipped goods, performed works and services, mln rub. (e_2)	Graduated mid-level specialists, thous. people (g_2)
Population with incomes below the subsistence minimum, % (d_3)	Fixed assets, mln rub. (e_3)	Graduated specialists with higher education, thous. people (g_3)
Per capita consumer spending per month, rub. (d_4)	Investments in fixed capital per capita, rub. (e_4)	Level of occupational morbidity and injuries at work, (per 10,000 people, people) (g_4)

Accordingly, the level of socioeconomic development of the region (U_r) is an integral indicator along the X axis.

When selecting indicators that measure the labor resources development in the region and the socioeconomic development of the region, the authors proceeded from the criterion of the availability of official statistics.

As such, the original matrix will be as follows (Fig.1).

Development of labor resources in the region			
high	3.1. Labor surplus type	3.2. Polarized type	3.3. Leader type
average	2.1. Asymmetrical type	2.2. Moderate type	2.3. Overtaking type
low	1.1. Outsider type	1.2. Problem type	1.3. Labor deficit type
	low	**average**	**high**

Socioeconomic development of the region

Fig. 1. Shell/DPM matrix for assessing the impact of labor resources on the socioeconomic development of the region

The proposed matrix assumes the following ideal typical groups of objects under study (regions of the Russian Federation):

1.1. The outsider type is characteristic of regions with unfavorable socioeconomic conditions and a high degree of socioeconomic depression; low level of socioeconomic development, and low susceptibility to the regulatory impact on labor resources.

1.2. The problem type of regions is described by favorable socioeconomic conditions and a stable level of socioeconomic development, while there is a low level of realization of human potential and low activity of the regulatory impact on the development of labor resources.

1.3. The regions with extremely favorable socioeconomic conditions and a high level of socioeconomic development can be attributed to labor deficit regions, mainly due to the extensive extractive development of the region, with the prevalence of low-skilled labor and the lack of regulatory impact on the development of labor resources.

2.1. The asymmetric type of regions is described by a focal way of implementing the labor potential in conditions of a low level of socioeconomic development.

2.2. The moderate type is characteristic of the developed regions with favorable socioeconomic conditions and an appropriate level of development of labor resources, the turnover of which secures the demands of the region for human resources.

2.3. The overtaking type is explained by the high socioeconomic development of the region, favorable conditions against the background of a shortage of its labor resources and weak training system, which leads to a policy of attracting workers and specialists from other regions.

3.1. The labor surplus type of the regions is described by a high labor potential and a well-developed system of training highly qualified specialists, but due to the low socioeconomic level of development, the labor resources find their application and are used outside this territory.

3.2. The polarized type is characteristic of regions with a highly developed system of training highly qualified personnel and high personnel potential against the background of a moderate socioeconomic development of the territory, which partly focuses labor resources for implementation outside the region.

3.3. The leadership type is characteristic of the regions with a high level of socioeconomic development, favorable conditions for the implementation of labor reserves, a developed system of personnel training, and significant resource potential, which allows activating and maintaining the turnover of labor resources in the region.

C. Flow chart

The authors consider it appropriate to use the following method for evaluating the impact of labor resources on the socioeconomic development of the regions of the Russian Federation in this study (Fig. 2).

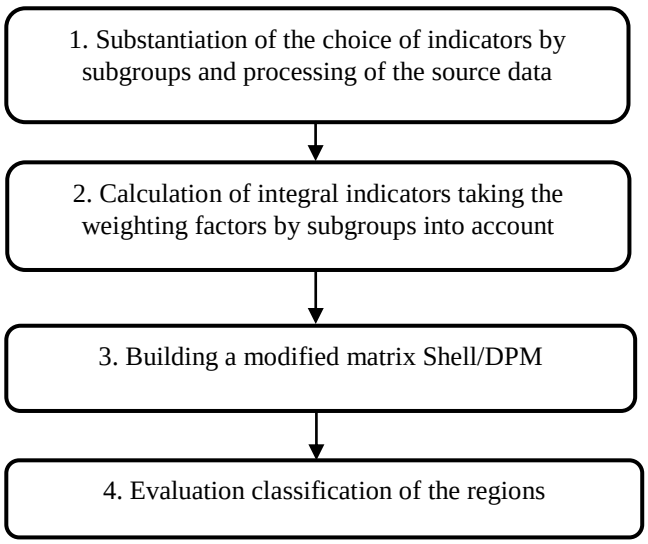

Fig. 2. Method for evaluating the impact of labor resources on the socioeconomic development of the region

D. Algorithm

The groups of indicators reflecting the processes of the labor resources and socioeconomic development of the region are selected at the first stage.

Two integral indicators are calculated at the second stage of application of this method:

1) Level of the labor resources development in the region *(U_t).*

$$U_t = (a_1 + \cdots a_n)k_a += (b_1 + \cdots b_m)k_b += (c_1 + \cdots c_l)k_c \quad (1),$$

where

$a_1 \ldots a_n$ is the total average share of the indicator of the region for the period under review in the general indicator for the Volga Federal District in subgroup A ($a_n = \frac{a_n}{A}$) (2),

$b_1 \ldots b_m$ is the total average share of the indicator of the region for the period under review in the general indicator for the selected set of objects in subgroup B ($b_m = \frac{b_m}{B}$) (3),

$c_1 \ldots c_l$ is the total average share of the indicator of the region for the period under review in the general indicator for the selected set of objects in subgroup C ($c_l = \frac{c_l}{C}$) (4),

n, m, l are the number of indicators in the corresponding subgroup,

k_a, k_b, k_c are the weights in subgroups A, B, C, and

A, B, C are the total indicators for the respective subgroups.

2) Level of the socioeconomic development of the region (U_r),

$$U_r = (d_1 + \cdots d_n)k_d + (e_1 + \cdots e_m)k_e + (g_1 + \cdots g_l)k_g \quad (5),$$

where

$d_1 \ldots d_n$ is the total average share of the indicator of the region for the period under review in the general indicator for the selected set of objects in subgroup

$$D(d_n = \frac{d_n}{D}), \quad (6),$$

$e_1 \dots e_m$ is the total average share of the indicator of the region for the period under review in the general indicator for the selected set of objects in subgroup

$$E\ (e_n = \frac{e_n}{E}), \quad (7),$$

$g_1 \dots g_l$ is the total average share of the indicator of the region for the period under review in the general indicator for the selected set of objects in subgroup

$$G\ (g_n = \frac{g_n}{G}), \quad (8),$$

k_d, k_e, k_g are the weights in subgroups D, E, G,
n, m, l are the number of indicators in the corresponding subgroup,
k_d, k_e, k_l are the weights in subgroups A, B, C, and
D, E, G are the total indicators for the respective subgroups.
Each subgroup of indicators is assigned a weight based on the application of the Kemeny median method (Table IV).

Table IV. Weight in subgroups of integral indicators.

Name of the indicator	Subgroup name/weight (k)	Subgroup name/weight (k)	Subgroup name/weight (k)
U_r	Human development (subgroup D)/0.35	Economic development (subgroup E)/0.45	Development of public relations (subgroup G)/0.2
U_t	Natural flow (subgroup A)/0.5	Migration flow (subgroup B)/0.15	Social flow (subgroup C)/0.35

A modified Shell/DPM matrix is built to assess the impact of labor resources on the socioeconomic development of the region at the third stage.
It is supposed to consider the regions on the chosen set of objects in accordance with the classification suggested in the figure at the fourth stage.
The proposed methodological tools for assessing the impact of labor resources on the socioeconomic development of the region allow the following:
firstly, using the required amount of the source data over time;
secondly, assigning and changing weights in the subgroups of integral indicators depending on their importance; and
thirdly, evaluating the country's regions by nine types, the list of which is sufficient to determine the areas for improving the socioeconomic development of the region;

III. RESULTS

Since different indicators of the socioeconomic development and turnover of labor resources in different regions can demonstrate multidirectional trends, an assessment of their mutual influence becomes relevant, taking a wide range of characteristics in a single coordinate system into account. This kind of assessment allows determining the most significant priorities of socioeconomic development and, accordingly, substantiating the most relevant areas of the labor turnover regulation.

The methodological tools for evaluating the impact of labor resources on the socioeconomic development of the region were tested using the data of the Perm region and the regions of the Volga Federal District.

Indicators that measure the development of the region's labor resources and socioeconomic development in the regions of the Volga Federal District were selected at the first stage. The indicators were selected proceeding from the criterion of the availability of official statistics for 2012 – 2016, which were the single basis for evaluating the regions of the Volga Federal District. The calculations were based on the official data from the Federal State Statistics Service.

This allowed to find final indicators for subgroups A – G at the second stage of the method application (Tables V, VI). The integral indicators were found using the following formulas:

Table V. Final indicators of the development of labor resources in the regions of the Volga Federal District by subgroups (Y axis) (found using formulas 2 – 4)

Region of Russia	Final indicator for subgroup A (0.5)	Final indicator for subgroup B (0.15)	Final indicator for subgroup C (0.35)
Republic of Bashkortostan	0.275595	0.278286	0.508154
Republic of Mari El	0.246332	0.268857	0.38198
Republic of Mordovia	0.21102	0.242571	0.356045
Republic of Tatarstan	0.236091	0.29	0.426989
Republic of Udmurtia	0.315902	0.309714	0.410786
Chuvash Republic	0.252091	0.258	0.431632
Perm region	0.243635	0.251714	0.40769

Kirov region	0.249914	0.278886	0.480228
Nizhny Novgorod region	0.203202	0.242	0.457017
Orenburg region	0.225412	0.297143	0.386504
Penza region	0.19834	0.231429	0.587537
Samara Region	0.205526	0.270857	0.44918
Saratov region	0.248547	0.300286	0.425988
Ulyanovsk region	0.213971	0.292571	0.323088

It can be seen from the table that the indicators of the subgroups are heterogeneous in the regions of the Volga Federal District.

For example, the Republics of Udmurtia and Bashkortostan stand out among the regions with the greatest dynamics in the "Natural flow" subgroup. The lowest values are in the Penza and Nizhny Novgorod regions, as well as the Republic of Mordovia.

Table VI. Final indicators of the socioeconomic development of the regions in the Volga Federal District by subgroups (X axis)[1]

Region of Russia	Final indicator for subgroup D (0.35)	Final indicator for subgroup E (0.45)	Final indicator for subgroup G (0.2)
Republic of Bashkortostan	0.096679	0.318577	0.122969
Republic of Mari El	0.097835	0.187526	0.030488
Republic of Mordovia	0.089509	0.213504	0.035808
Republic of Tatarstan	0.093889	0.617565	0.121641
Republic of Udmurtia	0.084904	0.217905	0.046366
Chuvash Republic	0.089412	0.163274	0.046978
Perm region	0.103085	0.349598	0.091112
Kirov region	0.087216	0.152371	0.049625
Nizhny Novgorod region	0.092638	0.305479	0.081624
Orenburg region	0.088677	0.352535	0.070437
Penza region	0.087338	0.202691	0.037745
Samara Region	0.101248	0.36607	0.107745
Saratov region	0.0907	0.208045	0.071341
Ulyanovsk region	0.08727	0.207765	0.086116

The Saratov and Orenburg regions and the Republic of Udmurtia received the highest values. The lowest values are in the Penza region and the Republic of Mordovia.

The highest positions in the "Social flow" subgroup are in the Penza and Kirov regions, as well as the Republic of Bashkortostan. The lowest values were in the Ulyanovsk region and the Republic of Mordovia.

The greatest dynamics in the "Human development" subgroup are observed in the Perm region and the Samara region. The lowest values are in the Republic of Udmurtia, as well as the Kirov and Penza regions.

The Republic of Tatarstan stands out in the "Economic development" subgroup. Besides, the Republic of Bashkortostan, the Perm region and the Samara region also have good positions. The worst values are in the Kirov region, the Chuvash Republic and the Republic of Mari El.

The highest rates in the subgroup "Development of public relations" are recorded in the Republics of Tatarstan and Bashkortostan, the Samara region, and the Perm region. The lowest indicators are in the Republics of Mari El and Mordovia, as well as the Penza region.

The authors calculated the integral indicators based on the final indicators by subgroups: the level of development of labor resources (U_t) and the level of socioeconomic development of the regions in the Volga Federal District (U_r) (Table VII), taking the previously introduced coefficients into account.

Table VII. Level of socioeconomic development and development of labor resources in the regions of the Volga Federal District

Region of Russia	Integral indicator by Y axis (U_t).	Integral indicator by X axis (U_r).
Republic of Bashkortostan	0.357394	0.217197
Republic of Mari El	0.297188	0.143223
Republic of Mordovia	0.266511	0.133503
Republic of Tatarstan	0.310992	0.317927
Republic of Udmurtia	0.348183	0.152102
Chuvash Republic	0.315817	0.114041
Perm region	0.302266	0.202794
Kirov region	0.33487	0.117315
Nizhny Novgorod region	0.297857	0.179814
Orenburg region	0.292554	0.206003
Penza region	0.339522	0.135867
Samara Region	0.300605	0.207717

[1] Found using Formulas 6 – 8

Saratov region	0.318412	0.146914
Ulyanovsk region	0.263952	0.138307

The authors built a modified Shell/DPM matrix to evaluate the impact of labor resources on the socioeconomic development by regions of the Volga Federal District at the third stage (Fig. 3).

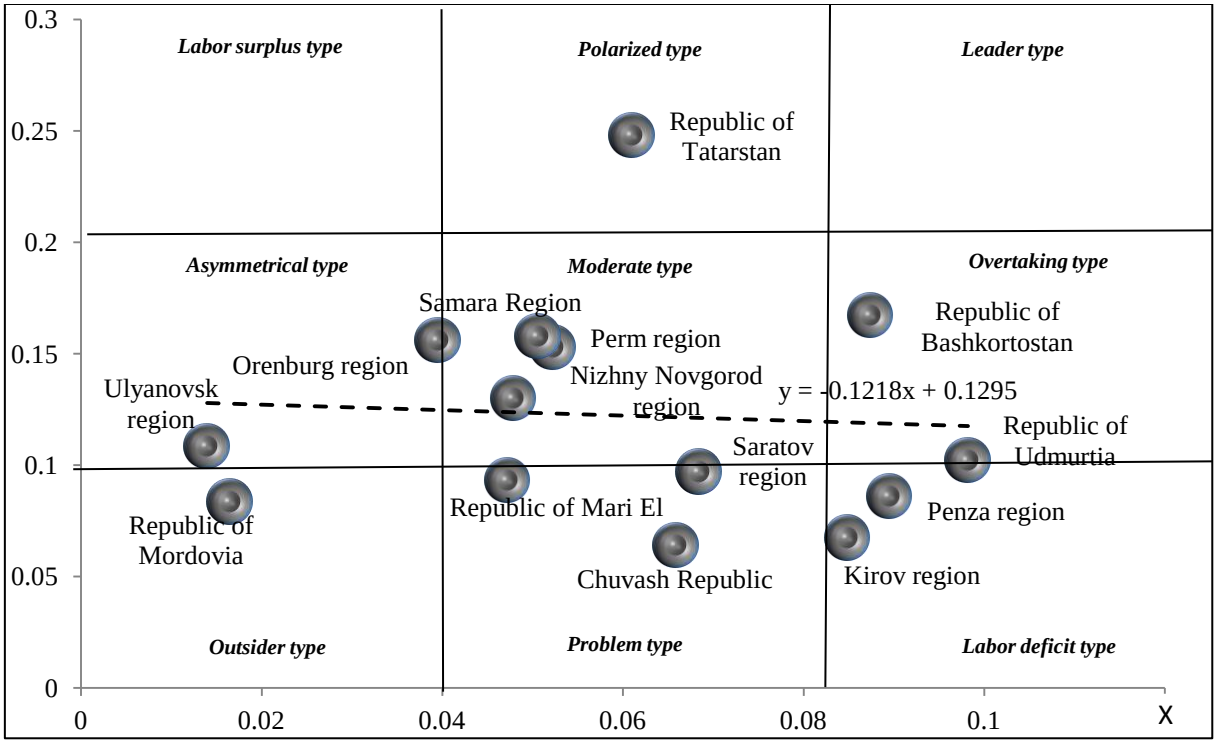

Fig. 3. Matrix for evaluating the impact of labor resources on the socioeconomic development by regions of the Volga Federal District

The trend line indicated on the assessment matrix illustrates a general reduction in the impact of labor resources on the socioeconomic development in the regions of the Volga Federal District.

It is proposed to study the regions of the Volga Federal District in accordance with the previously developed evaluation classification at the fourth stage.

The results of the matrix analysis allowed to classify the regions of the Volga Federal District in Table VIII.

Table VIII. Classification of the regions in the Volga Federal District by the level of impact of labor resources on the socioeconomic development

Evaluation type	Regions of the Volga Federal District
Outsider type	Republic of Mordovia
Problem type	Republic of Chuvashia, Republic of Mari El, Saratov region
Labor deficit type	Kirov region, Penza region, Republic of Udmurtia
Asymmetrical type	Ulyanovsk region, Orenburg region
Moderate type	Nizhny Novgorod region, Perm region, Samara region
Overtaking type	Republic of Bashkortostan
Polarized type	Republic of Tatarstan

The Republic of Mordovia belongs to the outsider type of the regions in the Volga Federal District. The depressive trends in the socioeconomic development are clearly observed in this region, accompanied by low susceptibility to the regulatory impact on labor resources.

The Republic of Chuvashia, the Republic of Mari El, and the Saratov region in the Volga Federal District belong to the problem type. The problem type of regions is described by relatively prosperous socioeconomic conditions, while there is a low level of implementation of the labor resources potential.

The Kirov and Penza regions are labor deficit ones, where the socioeconomic development is mainly carried out through the extensive development, with the prevalence of low-skilled labor. The Republic of Udmurtia can also be attributed to this group of regions by its indicators.

The focal method of implementing the labor potential prevails in the Ulyanovsk and Orenburg regions, which predetermines their belonging to an asymmetric type along with a low level of socioeconomic indicators. The moderate type is characteristic of the Nizhny Novgorod and Samara regions, as well as the Perm region. There is a high level of industrialization of the economy and the corresponding level of the labor resources development,

which contributes to the provision of basic HR needs in these regions.

Bashkortostan is the overtaking type due to the high socioeconomic development of the region and favorable conditions against the background of a shortage of its labor resources, inter alia, due to the insufficiently developed system of the personnel training, which leads to the need to attract workers and specialists from other regions to the leading sectors of the economy.

The Republic of Tatarstan belongs to the polarized type. The implementation of the socioeconomic development measures there is secured by a well-developed system of training highly qualified personnel, as well as a high personnel potential. At the same time, the trends remain of the partial focus of labor resources on implementation outside the region.

IV. CONCLUSION

This evaluation of the impact of labor resources on the socioeconomic development of the region has not detected any territories belonging to the labor surplus and leader types among the regions under study.

It can be noted that on the scale of the Russian Federation, the majority of the republics of the North Caucasus belong to the labor surplus regions, and Moscow and Saint Petersburg belong to the leader type, as they are federal cities.

As such, the methodological tools for evaluating the impact of labor resources on the socioeconomic development of the region tested by the example of regions in the Volga Federal District:

– confirm the possibility of using a large amount of the source data grouped by various criteria, as well as taking into account the dynamics for any period, with due consideration for the significance of the selected criteria;

– prove being universal, allowing to evaluate the regions of the country in accordance with the proposed classification;

– allow determining the areas of improving the socioeconomic development of the region; and

– prove their relevance in the regional administration, including in the regulation of the labor resources turnover.

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