

Ensuring the sustainability of the regional industrial system through the innovative development of agriculture and food industry

*Anna A. Urasova**, *Ludmila V. Glezman*, and *Evgeniy V. Sheheglov*

Institute of Economics, Ural Branch of the Russian Academy of Sciences, Perm Branch, Perm, Russia

Abstract. Classification analysis in relation to territories of the same type, or objects with similar characteristics and properties, taking into account industry specifics, is becoming increasingly relevant in modern scientific discourse. This paper reveals the issues of the possibility of developing unified approaches to the management of the sectors of agriculture and the food industry from the standpoint of the uniformity and unidirectional development of a number of constituent entities of the Russian Federation. For this purpose, the authors chose as the main methods of classification analysis and analysis of time series, the synthesis of which made it possible to carry out calculations on the materials of the industrial region of the Russian Federation - the Perm Territory. The authors' toolkit is based on a classification analysis, which reflected the inversely proportional relationship between the volumes of innovative technologies being introduced and the volumes of output in the studied industries of the Perm Territory.

1 Introduction

The regions of the Russian Federation, adhering to the trajectory of a balanced development of the economy, taking into account the influence of national priorities and strategic objectives, have recently reflected a growing trend in the totality of trends stabilizing the industry. The territories in which an industry framework has developed as a center of economic development, based on a developed industrial basis, are under close research attention [1]. This is due to the fact that traditionally industrial territories provide an increase in the added value and technological potentials of the territories [2]. The scientific discourse contains a significant number of works that reveal the problems of implementing and improving industrial strategies of sectoral plans [3], highlighting the most relevant methods and tools for distributing and ranking subjects of Russia according to various criteria [4], issues of analyzing and evaluating social trends in certain territories with signs of mono-profile and industrial character of development [5].

The scientific community faces several urgent tasks related to the development of methods for overcoming various kinds of regional differentiation (socio-economic, technological, etc.) [6], analysis and assessment in the distribution of incomes of the

* Corresponding author: annaalexandrowna@mail.ru

population [7], diagnostics of significant factors that determine the incomes of the population [8]. Significance and regional popularity have been gained by developments containing specific solutions to equalize incomes of the population [9] in the implementation of regional management decisions and the development of key scenarios for the development of territories [10] in the context of the implementation of the national priorities of the Russian Federation.

In scientific research on this topic, a significant place is given to various kinds of digital masonry analysis of analytical data containing both initial and synthetic indicators. It is regularly observed quantitative data that can become the basis for qualitative analysis and the development of strategic priorities for any territory. Relatively weak from this position is the process of quantification of conditions and factors that significantly affect regional and sectoral policy. That is why an approach based on indicative planning and development scenarios is being replicated at the national level, which also includes qualitative characteristics of the development of individual industries in the territories. Based on the existence of a number of approaches to the analysis and assessment of the industrial development of the regions of the Russian Federation, both in research practice and in the practice of direct regional management, there is a need to develop an approach that can group territories in a certain way, which entails the use of unified management practices, taking into account the whole set of special characteristics of the objects under study.

Such complexly structured research tasks are aimed at expanding and implementing analysis and evaluation tools that, based on the use of a number of indicators, can identify promising industries, the activation of which can bring the region to a new qualitative level of development. As part of this work, the authors made an attempt to typify the territories of the industrial region of the Perm Territory in the context of focusing on innovation in the process of implementing national priorities in the industrial sector, based on data from agriculture and the food industry, as industries that accumulate a significant amount of resources and are focused on preserving the sustainability characteristics of the regional economy development.

2 Materials and methods

The data used in the study were compiled by regional sources, the sample of which was determined using a multilevel scope of indicators. Based on the hierarchical structure of the scope several options for data sampling were chosen: 1) a tabular method with manual layout; 2) passport method with an automated method for collecting data layout. This combination of data collection methods allowed the authors to consider sectoral and territorial data, on the one hand, on the other hand, meso and micro-level data (regional indicators and data on enterprises) are presented in the work.

As a result, the data were selected for 300 industrial enterprises of the Perm Territory in the context of 25 industrialized territories in dynamics for the period 2018-2020. For data processing, methods of coefficient and statistical analysis were chosen, which made it possible to assess the homogeneity of the industrial territories of the region.

The data obtained as a result of the study can be used by municipal and regional authorities in the process of forming industrial policy.

3 Discussion of the results

One of the industrialized regions of the Russian Federation is the Perm Territory, which can be characterized as industrial, diversified, old industrial. These characteristics are based on significantly developed industries, to a greater extent, determining all other spheres of

society. A number of industries have signs of competitiveness at the national and international level. The municipal formations that are part of the Perm Territory are significantly differentiated according to the criterion of the level of development of certain industries. Accordingly, the level of development of these territories is directly related to the stability, competitiveness of the largest industrial enterprises, their ability to effectively adapt to changing conditions.

A logical research question in this context is the problem of finding and developing priorities in regulating the existing industrial policy that would most effectively contribute to structural transformation under the pressure of the conditions of sanctions, digitalization, import substitution, etc.

Thus, the task set allows us to proceed to the metric analysis of the available quantitative data collected in the context of industries and industrial complexes of the Perm Territory. In particular, the key metrics are distributed depending on the affiliation to the industry on the time horizon of 2018-2020. Based on the processing of this mass of indicators, we calculated the shares of each of the designated industries in the total volume of industrial production in the region, which determined their classification position, on the basis of which the most/least "profitable" industries were diagnosed.

At the first stage of calculations the following indicators were determined:

- Number of enterprises in the i-th industry in the period 2018-2020;
- The share of enterprises in the i-th industry in the period 2018-2020, %.

The graphical representation of the calculations is shown in Figure 1 and Table 1.

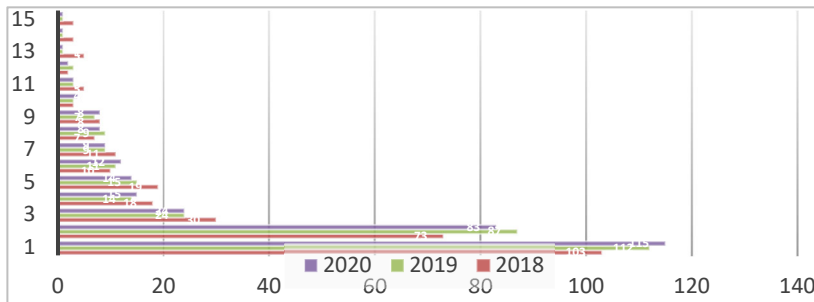


Fig. 1. Distribution of industrial enterprises by industry in the industrial system of the region for the period of 2018-2020.

Table 1. Designations to Figure 1: names of industries of the Perm Territory.

1	Manufacturing industries
2	Wholesale and retail trade; repair of motor vehicles and motorcycles
3	Construction
4	Provision of electricity, gas and steam; air conditioning
5	Mining
6	Professional, scientific and technical activities
7	Transport and storage
8	Water supply; wastewater disposal, organization of collection and disposal of waste, activities for the elimination of pollution
9	Agriculture, forestry, hunting, fishing and fish farming
10	Activities in the field of information and communication
11	Activities in the field of health and social services
12	Real estate activities
13	Financial and insurance activities
14	Activities administrative and related additional services
15	Activities of hotels and catering establishments

At the second stage of calculations an analysis of industrial enterprises in terms of profit level was performed (Figure 2).

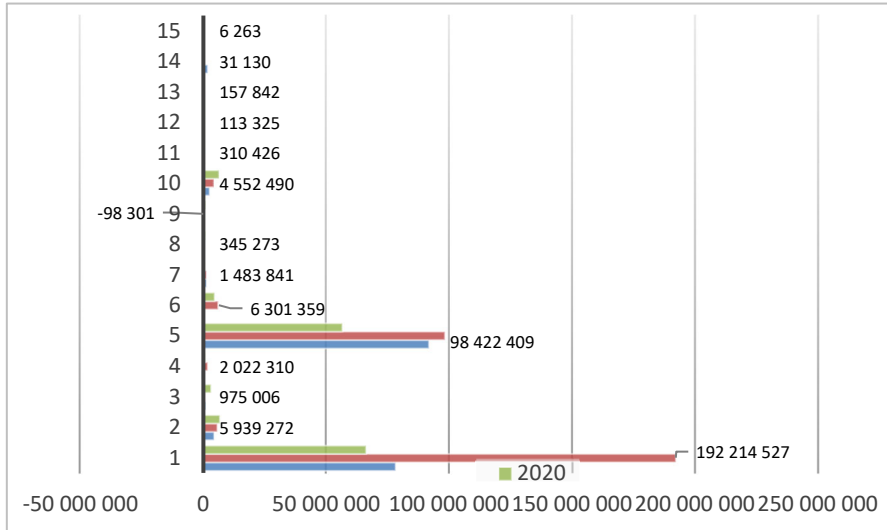


Fig. 2. Distribution of industrial enterprises by industry in the industrial system of the region in terms of profit for the period of 2018-2020.

The results obtained of the performed analytical procedures allow us to draw the following conclusions. First, an analysis of the sectoral structure and quantitative composition of industrial enterprises in the Perm Territory showed that about 10 largest enterprises belong to agriculture and the food industry. Accordingly, the main share of economic entities in the designated industries are small and medium-sized enterprises that have a shorter life cycle and are more sensitive to the impact of various kinds of external influences. This is also confirmed by the steady negative dynamics of the profits of these enterprises. Without additional state support, the development of agriculture and the food industry in the Perm Territory has an extremely low potential.

To classify industries in the Perm Territory and interpret their level in terms of productivity, we propose to calculate and evaluate the coefficient of high productivity of industries (K), which is a synthetic indicator calculated by comparing the total volume of enterprises with high-performance jobs and the total revenue of enterprises in the industry (equation 1).

$$K = A/B, \quad (1)$$

where A – percentage of enterprises in the industry in which high-performance jobs have been created out of the total number of industrial enterprises, %;

B – percentage of industry enterprises' revenues from the total revenues of industrial enterprises, %.

We will note that jobs that involve the use of innovative and digital technologies are meant by high-performance jobs. The innovative production cycle directly depends on the coverage of these places by the divisions of enterprises. Accordingly, the higher the number of such jobs, the higher the level of innovation of the enterprise.

Tables 2 and 3 present the results of calculating the coefficient of high productivity of industries (K) of the industry of the Perm Territory.

Table 2. The results of calculating the share of enterprises that create high-performance jobs in the context of industries in the Perm Territory.

Industry name	A
Oil and gas	3.2%
Chemical	19.0%
Metallurgical	12.7%
Engineering	30.2%
Pulp and paper	3.2%
<i>Food industry and agriculture</i>	<i>19.0%</i>
Light	1.6%
Construction	9.5%
Pharmaceutical	1.6%
Total	100.0%

Table 3. The results of calculating the coefficient of high productivity of industries in the Perm Territory.

Industry name	K
Oil and gas	0.05
Chemical	0.94
Metallurgical	2.43
Engineering	6.43
Pulp and paper	1.92
<i>Food industry and agriculture</i>	<i>5.94</i>
Light	2.44
Construction	4.02
Pharmaceutical	7.81
Total revenue of enterprises of all industries	1

Depending on the number of high-performance jobs created, it is possible to group industries in the Perm Territory. Thus, the leading industries in the creation of highly productive jobs in the Perm Territory include machine building, oil and gas, metallurgy, agriculture and the food industry.

Thus, the calculation and evaluation of the coefficient of high productivity of industries in the Perm Territory made it possible to identify the leading industries in innovative development: engineering, pharmaceutical, construction, agriculture, and the food industry. It is obvious that in the context of innovative development, industries that occupy relatively low positions in the traditional format of development become priority. This indicates a shift in the vector of development of industrial potential and the formation of new priorities for the development of the industrial system of the region.

According to the results obtained, it can be stated that to maintain sustainability as a key feature, the industrial system of the region seeks to adapt to new challenges. This happens by building up industrial potential and expanding regional priorities at the expense of industries that were not previously advanced. On the example of the Perm Territory, it was revealed that in order to maintain the stability of the socio-economic system of the region, the priority is the development of agriculture and the food industry, primarily due to the growth of innovativeness of these industries. This format of development can overcome the negative trends in these industries due to the transition of medium-sized enterprises to the group of large and largest ones, the creation of highly productive jobs, an increase in the innovation cycle at enterprises, etc.

4 Conclusions

The study made it possible to compare the data of the sectoral and innovative development of the industrial system of the Perm Territory. As a summary, we present the following theses:

- Intense impact of new economic factors on a national and global scale, necessitates the determination of appropriate priorities for the development of the industrial system of the regions;
- The key direction of expanding the potential for the development of the industrial system of the region is innovative, in the entire set of information and digital technologies;
- The innovative direction of development is focused on maintaining the stability of the industrial system of the region;
- During the study period, the agriculture and food industry of the Perm Territory are characterized by negative development dynamics, a short life cycle of enterprises and a high level of dependence on state funding;
- In terms of the level of innovative development and the potential for its growth, agriculture and the food industry are among the most promising industries for ensuring the sustainability of the industrial system of the Perm Territory.

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