

Industrial policy and its impact on the development of the territory: the experience of Russian regions

Ekaterina Alexandrovna Ereemeeva^{1*}, Tatiana Viktorovna Khalilova¹, Natalya Vasilyevna Volkova¹, Julia Vladimirovna Torkunova², Zhanna Yuriyevna Kurgaeva³

¹Department of State and Municipal Administration, Institute of Management and Territorial Development, Kazan Federal University, Kazan, 420008, Russia. ²Department of Computer Science and Information Management Systems, Institute of Digital Technologies and Economics, Kazan State Power Engineering University, Kazan, 420066, Russia. ³Department of Public Administration, History, Sociology, Kazan National Research Technological University, Kazan, 420015, Russia.

Correspondence: Ekaterina Alexandrovna Ereemeeva, Department of State and Municipal Administration, Institute of Management and Territorial Development, Kazan Federal University, Kazan, 420008, Russia. eremeevaea90@gmail.com

ABSTRACT

The article attempts to study the effectiveness of industrial policy in certain regions of the Russian Federation. The study is based on an analysis of the level of industrial development and its relationship with the socio-economic situation in certain regions of the Russian Federation. As the study of scientific literature shows, the modernization of industry can lay significant foundations for the sustainable development of the territory. However, the extent of this influence varies significantly depending on the country, industry, and other factors. In this regard, it is interesting to study the experience of industrial development in separate different Russian regions, its comparison and identification of the most successful practice of industrial development, and its inclusion in the general socio-economic development of the territory. The research is based on such methods as the mathematical method for calculating standardized indicators, the method of ranking and comparative analysis of data, and the classification method. The results of studying the level of industrial development and its impact on the socio-economic state of the regions of the Russian Federation made it possible to conclude the relatively low efficiency of the regional industrial policy. The analysis showed that the industry in the regions of the Russian Federation is developing extremely slowly, unevenly, and chaotically. It was concluded that there is a need for significant development of industrial production in the future.

Keywords: Industry, Industrial policy, Region, Industry 4.0., Sustainable development

Introduction

The fourth industrial revolution and the concept of Industry 4.0 are becoming increasingly relevant in the context of globalization and digital transformation of the economy, the issues of industrial modernization. However, the transition of production to new innovative rails is important not just in itself as a way of developing the industry. It has a significant impact on the sustainable development of the territory. The positive

effect of industrial modernization is stronger and faster reflected in the economy. K.C. Lin, J.Z. Shyu, K. Ding [1] describe such positive outcomes as simplifying the design and planning of materials use, supply chains, product lifecycle management, etc. I. Irtyshcheva, M. Stehnei, N. Popadynets [2] also add to this list the simplification of procedures for approval, organization, and control in production. However, this does not negate the positive impact of the renewed industry on the social and environmental characteristics of the territory.

As noted by M. Ghobakhloo [3], the positive social and environmental effects (for example, reducing harmful emissions, improving the welfare of society, etc.) are also noticeable, but in a longer-term than the environmental effect. G. Beier, S. Niehoff, T. Ziems, B. Xue [4] identify more efficient use of resources and the transition to renewable resources as a positive environmental effect. T. Yao, Y. Wang [5] emphasizes that the less industry harms the environment, the higher such indicators as GDP per capita, the level of

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urbanization, etc. M. Ahmad, Z. Khan, M.K. Anser, G. Jabeen [6] study the relationship between industry and migration to large cities. These studies demonstrate the impact of industrial modernization on the socio-ecological situation.

Therewith, the study of scientific literature demonstrates the relevance of studying the experience of industrial modernization both in different industries and in different countries, the experience of which is significantly different. Quite a large number of works are devoted to the experience of China as one of the largest industrial powers [6-8]. Several works, such as by Y.-K. Min, S.-G. Lee, Y. Aoshima [9], G. Beier, S. Niehoff, T. Ziems, B. Xue [4] are devoted to the comparative experience of China and other countries. Individual works, for example, the work of T. Yao, Y. Wang [5] or M. Ahmad, Z. Khan, M.K. Anser, G. Jabeen [6], focus on studying not just the experience of China, but a more detailed examination of the practice of individual Chinese regions. Several works are devoted to the experience of modernization of individual industries in different countries: the automotive industry in Sweden [10], the food industry in Ukraine [2], the coal industry in China [7]. Therewith, these works quite inconsistently characterize the results of industrial transformation in different countries and industries. C. Bai, P. Dallasega, G. Orzes, J. Sarkis [11] note that the modernization of such industries as automotive, electronics, food and beverage production, as well as the textile, clothing, and footwear industries has the greatest impact on the sustainable development of the territory, which should be taken into

account when investing in the industry. In this regard, it is promising and expedient to carry out a purposeful industrial policy of the state to determine the priorities for improving production.

In connection with such a significant difference in the experience of industrial development in different industries and different countries, the study of the level of industrial development separately in the Russian Federation becomes relevant. In this study, an attempt is made to analyze how the industry is developing and modernizing in some regions of the Russian Federation and how this is related to the general state of the economy and society of these territories. The results of such a study will determine the effectiveness of regional industrial policy in the Russian Federation, the ways of its further improvement, and prospects for development.

Materials and Methods

Individual regions of the Russian Federation were selected as the objects of the study. The effectiveness of their state industrial policy was evaluated based on the following methodology.

Initially, the main indicators for evaluating the effectiveness of industrial policy were identified. The indicators were grouped into 6 thematic groups (Table 1).

Table 1. Indicators of the analysis of industrial development in the regions of the Russian Federation

Indicator group	Indicators	Brief description
1. Group of material and technical indicators	1.1. The cost of fixed assets of industry per capita	Allows evaluating production assets and the effectiveness of their use
	1.2. The degree of depreciation of fixed assets of the industry	
	1.3. Return on total assets	
	2.1. Share of innovative activity of enterprises	
	2.2. The share of shipped innovative products in the total volume of shipped products of industrial enterprises	
2. Group of innovative indicators	2.3. Share of expenditures on technological innovations in total investment in industry	It shows the extent to which industrial enterprises in the region are involved in the process of innovative development
	2.4. The number of personnel engaged in research and development, per 1 thousand employed in industry	
	2.5. The number of scientific organizations per 10 thousand employed in industry	
	3.1. Return on assets of industrial organizations	
3. Group of financial and economic indicators	3.2. Internal research and development costs	Shows the financial result of the industry and its significance for the overall state of the economy of the territory
	3.3. Share of manufacturing industries in GRP	
	3.4. Share of mineral extraction in GRP	
	4.1. The share of production and industrial personnel in the total number of employees in the region's economy	
4. Group of personnel indicators	5.1. Railway track density at the end of the year per 10,000 km ²	Demonstrates the impact of industry on the labor market in the regions
	5.2. Density of paved public roads per 1,000 km ²	
	5.3. Territory of SEZ, PZ, industrial and technoparks with free space and ready-made infrastructure facilities (gas, electricity, water, sewage)	
5. Group of infrastructure indicators		Shows the extent to which industry influences the development of the region's infrastructure
6. Group of investment indicators	6.1. Volume of investment in fixed capital of industry per capita	Characterizes the impact of industry on attracting investment to the region

The study used indicators that allowed comparing the level of industrial development with the social and economic indicators of regional development. Most of the selected indicators are

relative. Such a choice made it possible not only to evaluate the policies of individual regions but also to conduct a comparative

analysis of them to identify the most interesting and effective experience in implementing industrial policy.

It should be noted that the paper considered the indicators in dynamics for 2014-2018 [12]. They revealed some internal trends in the regional industrial sector.

Since the selected indicators differ from each other in units of measurement, standardized indicators were calculated at the second stage of the study for each region of the Russian Federation based on the "Pattern" method according to formula 1:

$$X^*_{ij} = \frac{X_{ij}}{X^{\max}_{ij}}, \tag{1}$$

where X^*_{ij} – the standardized i-th indicator of the j-th region; X_{ij} – the value of the i-th indicator of the j-th region; X^{\max}_{ij} – the maximum value of the i-th indicator among the regions.

This method of calculation also made it possible to compare the indicators of different regions with each other, which was necessary for a comparative analysis of their experience.

The resulting standardized indicators were then used to calculate the assessment for each thematic block separately and the comprehensive assessment of the development of industrial policy in each region (formula 2):

$$I_{ij} = \frac{\sum X^*_{ij}}{n} \tag{2}$$

where I_{ij} – a comprehensive assessment of the development of industrial policy in each region of the Russian Federation, X^*_{ij} – the standardized i-th indicator of the j-th region, n – the number of thematic blocks used in the calculation.

This method allowed taking into account all the selected thematic blocks of indicators. Therewith the use of the average value allowed taking into account equally the degree of development of each group of indicators, which are interdependent and cannot significantly affect the industry separately from each other.

The regions were ranked and classified at the final stage of the study, based on the results of a comprehensive assessment of the development of industrial policy. The region with the highest score was assigned a rank of 1, while the region with the lowest score was assigned a rank of 14. The regions were also divided into 3 groups according to the level of development and effectiveness of the industrial policy. The distribution was carried out as follows:

- 0.0-0.4 – stagnant (low efficiency of industrial policy);
- 0.4-0.6 – median (average efficiency of industrial policy);
- 0.6-1.0 leading (propulsive) (high efficiency of industrial policy).

Results and Discussion

Based on the results of the study, we obtained the following results.

Regional estimates for each block of indicators for the period 2014-2018 were relatively stable, which can be seen in the example of the first group of material and technical indicators of industry (**Figure 1**).

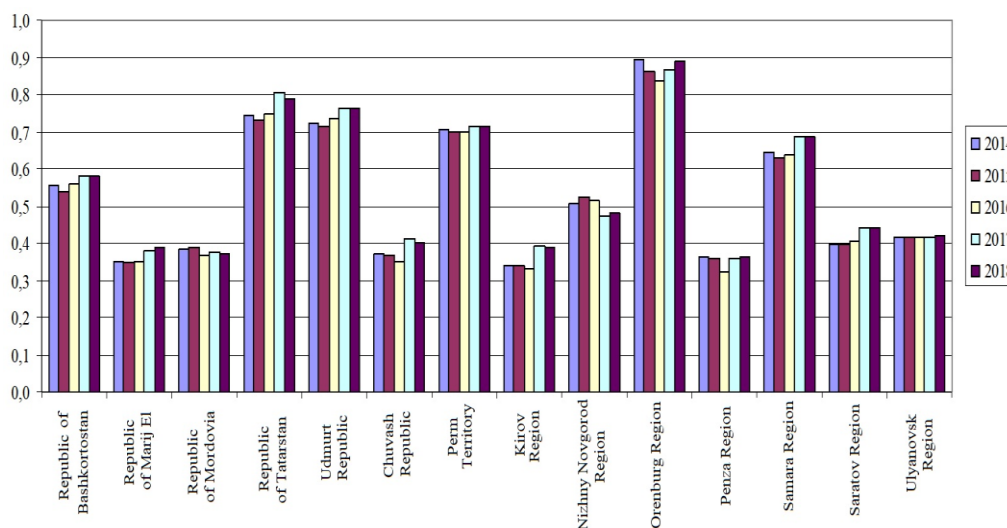


Figure 1. Results of the assessment of the regions of the Russian Federation for 2014-2018 by the group of material and technical indicators

As can be seen in **Figure 1**, the change in the regional estimates is insignificant. It practically does not affect the ratio of the results of the regions. That is, the rank position of the regions from the most successful to the least developed territories

remains from year to year. On the one hand, this demonstrates stability in the industrial sector, but on the other hand, it indicates the absence of significant progressive changes. It can also be noted that in none of the regions there is a stable trend of growth or reduction in the assessment of material and

technical equipment. This also shows that the impact of such changes on the development of the industry is not so high. Similar results were obtained for the remaining thematic groups of indicators.

We also conducted a comparative analysis of the indicators of different thematic groups for each region for each year separately. Let us present the results of this analysis in the example of 2018 (Figure 2).

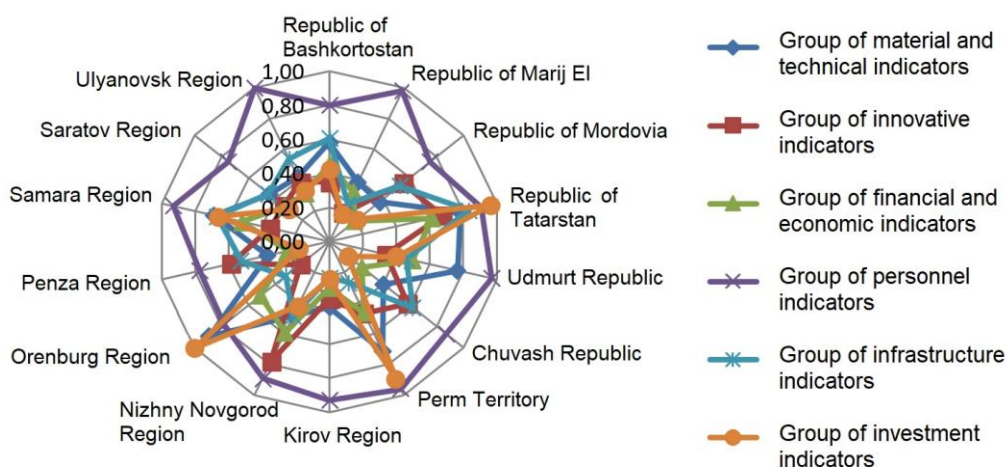


Figure 2. Results of comparison of estimates of different groups of indicators of the regions of the Russian Federation for 2018

The graph in Figure 2 shows a significant difference in the estimates of different blocks in each of the considered regions. Several groups of indicators can be considered more developed in each region. This fact can be considered as a positive result, that is, the presence of a significant level of industrial development and its impact on the socio-economic development of the territory, at least in a separate direction. However, if we take into account the fact that the development of industry and policy in this direction is complex, then this kind of result should be considered as not the most promising. The graph in Figure 2 clearly shows that only in one region – the Republic of Tatarstan, all estimates are higher than 0.6, that is, they can be considered as an effective result of industrial development. In another region – the Nizhny Novgorod region – the estimates of all groups of indicators are higher than 0.4, that is, at least, they reflect at least the average level of

efficiency of industrial policy in certain areas. There are estimates of individual groups below 0.4 in all the other 12 regions, that is, showing a low result of industrial development and, accordingly, a low level of efficiency of industrial policy in individual blocks.

If we conduct a comparative analysis of similar results for the two years from 2014 to 2017, we can see that the ratio of regional estimates is almost unchanged. This is a logical consequence of the fact that the estimates of the regions for each group of indicators remained fairly stable and practically did not change from year to year.

Next, we turn to the results of a comprehensive assessment of the development of industrial policy in the regions of the Russian Federation. They are summarized and presented graphically below (Figure 3).

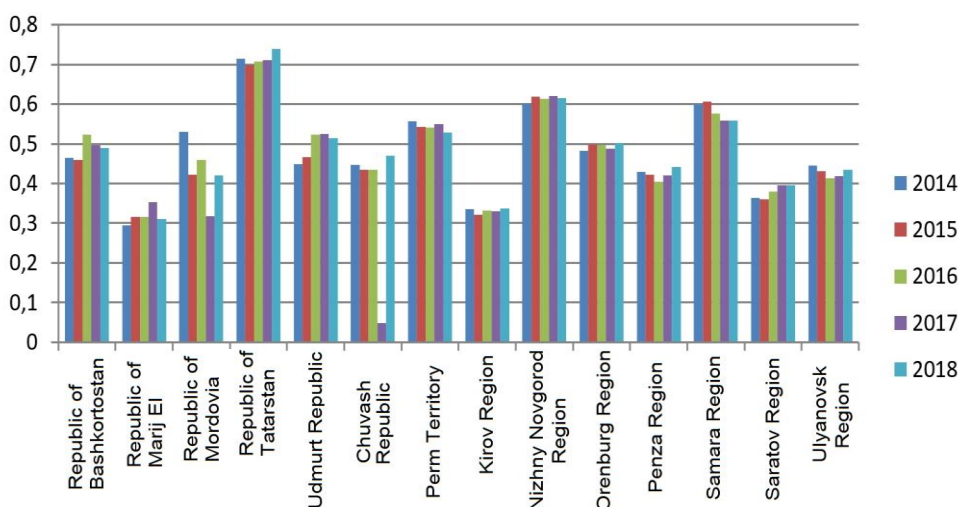


Figure 3. Comprehensive assessment of the implementation of industrial policy in the regions of the Russian Federation for the period 2014-2018

The same conclusions can be drawn for the integrated assessment of regions as for the assessments for individual thematic groups of indicators. Thus, **Figure 3** clearly shows that the rating of each region practically does not change from year to year, its fluctuations do not have a general trend, the ratio of ratings (ranks) of different regions remains almost unchanged. This conclusion is also confirmed by the data from **Table 2**.

Table 2. Results of ranking regions by the level of efficiency of state industrial policy for 2014-2018

	2014	2015	2016	2017	2018
Republic of Bashkortostan	7	7	6	6	7
Republic of Marij El	14	14	14	11	14
Republic of Mordovia	5	10	8	13	11
Republic of Tatarstan	1	1	1	1	1
Udmurt Republic	8	6	5	5	5
Chuvash Republic	9	8	9	14	8
Perm Territory	4	4	4	4	4
Kirov Region	13	13	13	12	13
Nizhny Novgorod Region	2	2	2	2	2
Orenburg Region	6	5	7	7	6
Penza Region	11	11	11	8	9
Samara Region	3	3	3	3	3
Saratov Region	12	12	12	10	12
Ulyanovsk Region	10	9	10	9	10

As can be seen from **Table 2**, a significant change in the comprehensive assessment, which affected a significant change in the rank of the region, is inherent only in the republics of Mordovia, Udmurtia, and Chuvashia. Separately, it should be noted that Tatarstan has become the leading region in the comprehensive assessment of the implementation of industrial policy, which is a consequence of the conclusion about the effectiveness of industrial development for each block. However, it is worth noting that the average final score of this region is only 0.71, which is more than a quarter lower than the maximum possible. This indicates significant prospects for the development of industry in the Republic of Tatarstan and the need to continue to pursue an active industrial policy in this subject of the Russian Federation. It is also possible to distinguish the Nizhny Novgorod region, where all the ratings of the thematic blocks were not lower than the average level. Due to the significant development of individual industry indicators, the comprehensive assessment of this region is also high, in contrast to other regions.

Conclusion

According to the results of the comprehensive assessment, the regions of the Russian Federation considered were distributed as follows according to the level of effectiveness of the implementation of industrial policy (**Table 3**).

Table 3. Distribution of regions of the Russian Federation by the level of efficiency of industrial policy

	Stagnant (low efficiency of industrial policy)	Median (average efficiency of industrial policy)	Leading (propulsive) (high efficiency of industrial policy)
Republic of Bashkortostan		2014-2018	
Republic of Marij El	2014-2018		
Republic of Mordovia	2017	2014-2016 2018	
Republic of Tatarstan			2014-2018
Udmurt Republic		2014-2018	
Chuvash Republic	2017	2014-2016 2018	
Perm Territory		2014-2018	
Kirov Region	2014-2018		
Nizhny Novgorod Region			2014-2018
Orenburg Region		2014-2018	
Penza Region		2014-2018	

Based on the results of the analysis, as well as the conclusions in **Table 3**, we can talk about the following results of the study:

1. The level of development of industrial policy in the regions of the Russian Federation is still quite far from the maximum possible. Even in the leading region, the rating is almost more than 25% lower than the potential one. This indicates significant prospects and the need for further development and improvement of regional industrial policy, even in the leading regions – the Republic of Tatarstan and the Nizhny Novgorod Region.
2. The insufficiently high level of efficiency of industrial policy can be explained by the fact that the development of industry in different areas (personnel, innovation, investment, etc.) differs significantly from each other. The lag in the development of one segment hinders the development of the industry as a whole and creates a barrier to improving the effectiveness of the industrial policy of the region.
3. The level of industrial development in the regions of the Russian Federation remains almost unchanged. It was not possible to identify significant rates of industrial development in any of the considered regions. If we take into account the fact that even the leading regions are still far from the highest assessments of industrial development, then the absence of significant changes in the efficiency of industrial policy is unfavorable even for them.

Such conclusions about the problems of industrial policy in certain regions of the Russian Federation make it necessary to develop recommendations for the development of industry and improving the efficiency of this area of state activity. It is worth noting that the recommendations for each region should be developed taking into account its specifics and be focused on

compensating for the weakest aspects of industrial production. If we refer to the most general trends characteristic of most of the regions considered, we can note the problem of slow modernization of production, its obsolescence, depreciation of funds, and limited introduction of innovations in the industry. In this regard, as well as taking into account the global trends of industrial modernization based on the concept of Industry 4.0, the following proposals will be relevant for the considered regions and their sustainable development. It is necessary to reduce the degree of depreciation of fixed assets. In our opinion, in this direction it is necessary to withdraw the old equipment from circulation, which has served its service life many times, to introduce penalties for the use of completely worn-out fixed assets of the industry, to use the mechanism of accelerated depreciation. To accelerate modernization, it is necessary to develop a system of grant support for industrial innovations, and involve business associations in the process of selecting winners of grant competitions. The transition to the "innovation track" can also be facilitated by replicating within industrial enterprises, regions, and the country as a whole, effective practices for the implementation of innovative projects by universities and research institutions, identifying demand from enterprises in the real sector of the economy for breakthrough research and development of these institutions. Thus, the study of the level of industrial development and the effectiveness of the implementation of industrial policy in certain regions of Russia revealed some general trends in this area and offered some recommendations for improving the effectiveness of industrial policy at the level of the subjects of the Russian Federation.

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