Potential Growth of Added Value in the Conditions of Technical and Technological Renewal of the Region's Industries

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Abstract. The central problem of long-term economic growth according to increase in gross added value of the region are changes in technologies and structure of economy of production systems of territories. Effective use of the available resources and their reorientation to create new types of products, competitive in national and global markets, is possible only in the conditions of technical process and innovative development. Technical and technology updating is considered by authors in terms of potential of the available resources accumulated gross added value, with their subsequent transformation into capital-labor ratio and labor productivity. At the same time, gross added value appears in two aspects: as investment potential of development and as financial result of activity of all economic system of the region. As an object of research Krasnoyarsk Region consisting of 6 macro districts and 61 territories is provided. An object of research were processes of technical and technology updating of production systems of territories with an exit to the metrics estimating quality and efficiency of transformation. Their indicative form allows to position territories and macro districts on use of the available resources. In general, the research has analytical character and directed to development of regional policy on increase in technological effectiveness of structure of the economy giving it big stability in the conditions of the changing markets.

1. Introduction
The competitiveness of economy in many respects is defined by those products and services which are made in regions of the Russian Federation. With respect thereto the capital-labor ratio and labor productivity creating new consumer value of products and services due to technical and technology improvement of production and the introduced research decisions is considered by one of significant factors of its growth.

2. Relevance of the research
Currently, added value is most often associated with the chains of its creation both at the level of local and global markets, which allow optimizing its composition and working out the effectiveness of partner networks. But behind this concept today is the goal of increasing labor productivity, high rates of which can be obtained provided that high added value is achieved [1]. The theoretical foundations of added value (newly created) were formed in the works of the classics of economic science A. Smith, D. Ricardo, J.B. Say, JB Clarke [2,3]. Added value in the concept of surplus value is created by employees and distributed between them and the owners of capital.
The development of theories has led to the emergence of various concepts of value added, based on maximizing income. Their applied aspects are focused on the development of new mechanisms for financial management and assessment of business competitiveness. At the same time, there remains the problem of determining the place and role of labor productivity in the system of not only specific production, but also the industry, their base areas, significant factors and indicators of the analysis of its dynamics for the purpose of subsequent forecasting and management [4]. There is a confusion of the concepts of labor productivity, productivity of the production system of an enterprise, which is part of a certain type of economic activity, productivity of the economic system of a region or territory [5]. This makes it difficult to find management solutions in priority areas of economic development. At each stage of the formation of added value, it is necessary to analyze its state and sources of accumulation.

3. Research problem
The statement of the research problem aims to characterize the growth potential of added value in the macro districts of the Krasnoyarsk Region due to the intensification of investment activity in the technical and technological renovation of production, the growth of their capital-labor ratio and labor productivity.

4. Methodology
The object of research is 6 macro districts of Krasnoyarsk Region: Southern, Northern, Priangarsky, Eastern, Western, Central, 61 territory.

The subject of the research is the process of forming metrics of influence on GVA of territories and macro districts of the region.

The information base of the study was made up of statistical materials from Krasnoyarsk stat and the Automated information system of monitoring of municipal units (AIS MMO) of the Ministry of Economy and Regional Development of Krasnoyarsk Region.

Research period: 2015-2018.

The study was carried out in the context of the following stages:
1. Characteristic of gross added value across territories of the region
2. The analysis of structural elements of gross added value across territories of the region
3. The analysis of a condition of fixed assets and activity of investment processes on their updating
4. Potential of sources of reproduction of fixed assets of territories
5. Characteristic of a capital-labor ratio and labor productivity across territories and macro districts of the region
6. Comparative analysis of influence of investments on processes of updating of a technical and technology condition of production systems
7. Forming of metrics of efficiency of technical and technology updating of economy of territories.

Assessment of the impact of a capital-labor ratio and labor productivity on economy of territories

5. Research result
As metrics (indicators) of a state and effectiveness of an economic system of macro districts are used: investments into fixed capital (Ifc) to the cost of the fixed assets (FA) – Ifc/FA, investments into fixed capital to the financial result (FR) – Ifc/FR, investments into fixed capital to the gross added value (GAV) – Ifc/GAV, capital-labor ratio (CL) to investments into fixed capital – CL/Ifc, the labor productivity (LP) to investments into fixed capital – Ifc/LP, labor productivity to a capital-labor ratio – LP/CL and gross added value to labor productivity and a capital-labor ratio – GAV/LP/CL.

The GAV loudspeaker on macro districts of the region it is provided in table 1. The GAV greatest values make Northern and Central macro district of Krasnoyarsk Region. At the same time, dynamics of its change different: from negative gains and acute fluctuations in the Northern macro district to smoother decrease/growth in Central. In general, for the considered period growth of GAV took place in Southern (107.4%) and East (108.8%) macro districts.
Table 1. Dynamics of GVA change by macro districts of Krasnoyarsk Region in 2015-2018.

| Macro districts | Measure values, million rubles. | Growth rate, % | Average annual growth rate, % |
|-----------------|---------------------------------|----------------|------------------------------|
|                 | 2015 | 2016 | 2017 | 2018 | 2015 | 2016 | 2017 | 2018 | 2015 | 2016 | 2017 | 2018 |
| Southern        |      |      |      |      |      |      |      |      |      |      |      |      |
| on average      | 1450 | 1253 | 642  |      |      |      |      |      |      |      |      |      |
| in total        | 5509 | 3885 | 4081 | 5004 | -    | 1    | 2    | 1    |    1 | 1    | 1    | 1    |
| Northern        |      |      |      |      |      |      |      |      |      |      |      |      |
| on average      | 2723 | 1734 | 9622 |      |      |      |      |      |      |      |      |      |
| in total        | 6041 | 5258 | 4961 | 5250 | 9    | 9    | 9    | 9    | 9    | 7    | 9    | 9    |
| Priangarsky     |      |      |      |      |      |      |      |      |      |      |      |      |
| on average      | 2253 | 3433 | 3314 | 4441 | 1    | 4    | 7    | 1    | 4    | 1    | 9    | 9    |
| Central         |      |      |      |      |      |      |      |      |      |      |      |      |
| on average      |      |      |      |      |      |      |      |      |      |      |      |      |

The main structural elements of GVA are the wage fund, depreciation deductions and profit [4]. This structure of the GVA allows us to consider it as an investment resource aimed at supporting life and human development, compensating for the physical deterioration of fixed assets and business development. The more a territory accumulates profits, the more opportunities it has to spend on investment programs to support the technical and technological level of production systems. The more the wage fund accumulates in the territory, the more opportunities appear to support the development of human potential and the growth of its quality in the context of production renewal.

According to the results of 2018, the Northern macro district had the highest share of profit in the
GVA structure - 65.4% (Table 2). The Central macro district was distinguished by the balance of the GVA elemental structure: the wage fund and profit had approximately the same share (40%).

Table 2. GVA structure of macro regions of Krasnoyarsk Region in 2018.

| Macro districts | Wage fund thousand rubles | Depreciation charges thousand rubles | Profit thousand rubles | GAV thousand rubles |
|----------------|--------------------------|--------------------------------------|------------------------|---------------------|
| Southern MD    | 15893359                 | 1719443.00                           | 482729.0               | 1809533800         |
| %              | 87.8                     | 9.5                                  | 2.6                   | 100                |
| Northern MD    | 121950167.0              | 78693715.0                           | 299811007.0           | 458686094.6        |
| %              | 26.6                     | 17.1                                 | 65.4                  | 100                |
| Priangarsky MD | 41189055.9               | 16659811.00                          | 2250413.00            | 100197297.4        |
| %              | 41.1                     | 16.6                                 | 2.2                   | 100                |
| Eastern MD     | 25482078.6               | 1977602.00                           | 2172975               | 29828597.6         |
| %              | 85.4                     | 6.6                                  | 7.3                   | 100                |
| Western MD     | 38010863.0               | 7361948.00                           | 8121742               | 52509326.4         |
| %              | 72.4                     | 13.1                                 | 14.5                  | 100                |
| Central MD     | 188450921.0              | 80379821                             | 175535549             | 444151335.659      |
| %              | 42.4                     | 18.1                                 | 39.5                  | 100                |

As a result of the analysis, clusters of territories of macro districts with different typology of the elemental structure were identified and their relationship with GVA was established.

Elemental structure of gross added value of territories in 2015-2018 is presented in Figures 1 and 2. Each territory from the point of view of GVA is classified by its elemental composition for each period of time.

Figure 1. GAV structure of the territories of Krasnoyarsk Region by elements in 2015-2018, %.
Figure 2. The structure of economic added value of municipalities of Krasnoyarsk Region in 2018, %.

Each territory in terms of gross added value is classified according to its elemental composition for each period of time. The average values of the shares of depreciation deductions, the payroll fund, and profit within the clusters of territories for 2018 are presented in Table 3.

Table 3. Average values of GVA structural elements used in differentiation of territories in 2018, %.

| Specific weight | Clusters | Clusters | Clusters | Clusters | Clusters | Clusters | Clusters |
|----------------|----------|----------|----------|----------|----------|----------|----------|
| Wages          | 96.30    | 22.40    | 3.63     | 14.48    | 54.40    | 27.36    | 71.82    |
| Depreciation   | 158.0    | 42.33    | 14.50    | 30.48    | 35.21    | 63.39    | 10.69    |
| Profit         | 154.3    | 35.27    | 81.87    | 55.04    | 10.39    | 9.25     | 17.49    |

Clusters are created as follows:
- the first: loss;
- the second: wages is low, depreciation - average, profit - average;
- the third: wages is low, depreciation - low, profit - high;
- the fourth: wages is low, depreciation - average, profit - high;
- the fifth: wages is high, depreciation - average, profit – low;
- the sixth: wages is average, depreciation - high, profit – low;
- the seventh: wages is high, depreciation - low, profit – low.

The clustering was based on allocation for every period of the analysis of clusters anew based on maximum difference between observations.

Distribution of territories on the allocated clusters is provided in Table 4.

Table 4. Classification of municipalities by the elemental composition of GVA in 2018.

| Cluster | Characteristic |
|---------|----------------|
| Cluster 1 | Municipal unit: Evenkiskovsky area |
| Cluster 2 | 9 municipal units: Cities: Achinsk, Nazarovo, Areas: Emelyanovsky, Yeniseisky, Kanskiy, Krasnoturansky, Novosolovsky, Rybinsk, Uzhursky |
| Cluster 3 | 7 municipal units |

Clusters are created as follows:
- the first: loss;
- the second: wages is low, depreciation - average, profit - average;
- the third: wages is low, depreciation - low, profit - high;
- the fourth: wages is low, depreciation - average, profit - high;
- the fifth: wages is high, depreciation - average, profit – low;
- the sixth: wages is average, depreciation - high, profit – low;
- the seventh: wages is high, depreciation - low, profit – low.

The clustering was based on allocation for every period of the analysis of clusters anew based on maximum difference between observations.

Distribution of territories on the allocated clusters is provided in Table 4.
Cluster 3
Characteristic: Cities: Divnogorsk, Norilsk
Areas: Motyginsky, Severo-Yeniseisky
4 municipal units:
Cluster 4
Areas: Abansky, Bolsheuluysky, Nazarovsky, Sukhobuzimsky, Turukhansky, Uyarsky, Sharypovsky
8 municipal units:
Cluster 5
Areas: Birilyussky, Bolshemurtinsky, Dzerzhinsky, Ermakovsky, Idrinsky, Kazachinsky, Minusinsky, Partizansky
13 municipal units: settlement. Kedroviy
Cluster 6
Cities: Krasnoyarsk, Sosnovoborsk
Areas: Berezovsky, Bogotolsky, Boguchansky, Irbeysky, Kezhemsky, Kozulsy, Kuraginsky, Nizhneingashsky, Taimyrsky, Shushensky
16 municipal units:
Cluster 7
Cities: Bogotol, Borodino, Yeniseisk, Kansk, Lesosibirsk, Minusinsk, Sharypovo
Areas: Achinsky, Balakhtinsky, Ilansky, Karatuzsky, Mansky, Pirovsky, Sayansky, Taseevsky, Tyukhtetsy

The carried-out cluster analysis of element structure of GAV across territories allowed to draw the following conclusions:
- the element structure is mobile, than emergence of new clusters (a cluster 7 in 2018) and also changes of borders of a cluster 4 is caused.
- allocation of typical clusters demonstrates availability of regularities in forming of GAV. (Repeating on structure) clusters 1,2,3,5,6 became the general.

Distribution of territories on clusters and growth rates of GAV is given in figure 3.

**Figure 3.** Territories of macro districts of Krasnoyarsk Region in 2018 depending on growth rates GAV, units.

The interrelation of structure of forming of GAV and growth rates of an indicator across territories revealed the following opportunities of a clustering (Table 5-7).

**Table 5.** Classification of municipalities that showed a decrease in GVA for 2015-2018.

| Cluster | Characteristic |
|---------|---------------|
| Cluster 1 | 1 municipal unit: Evenkisky area |
| Cluster | Characteristic |
|---------|----------------|
| Cluster 1 | 5 municipal units: City of Achinsk, Areas: Kansk, Krasnoturansky, Novoselovsky, Uzhursky |
| Cluster 2 | 3 municipal units: Divnogorsk, Norilsk, Severo-Yeniseisky |
| Cluster 3 | 3 municipal units: Areas: Bolsheuluysky, Nazarovskiy, Turukhansky |
| Cluster 4 | 1 municipal unit: Idrinsky area |
| Cluster 5 | 4 municipal units: Areas: Zacharsky, Igra, Turukhansky, Yetukhtensky |
| Cluster 6 | 3 municipal units: Areas: Bolsheuluysky, Nazarovskiy, Turukhansky |
| Cluster 7 | 10 municipal units: Areas: Balakhtinsky, Ilansky, Karatuzsky, Mansky, Sayansky, Taseevsky, Tyukhtetsky |

**Table 6.** Classification of the territories of Krasnoyarsk Region which showed growth of GAV to 2 times for 2015-2018.

| Cluster | Characteristic |
|---------|----------------|
| Cluster 1 | 1 municipal unit: Rybinsky district |
| Cluster 2 | 1 municipal unit: Motygin district |
| Cluster 3 | 3 municipal units: Areas: Abansky, Sukhobuzimsky, Uyarsky |
| Cluster 4 | 7 municipal units: Areas: Birilyussky, Bolshemurtinsky, Dzerzhinsky, Ermakovsky, Kazachinsky, Minusinsk, Partizansky |
| Cluster 5 | 3 municipal units: Areas: Birilyussky, Bolshemurtinsky, Dzerzhinsky, Ermakovsky, Kazachinsky, Minusinsk, Partizansky |
| Cluster 6 | 6 municipal units: Areas: Berezovsky, Boguchansky, Kuraginsky |
| Cluster 7 | Cities: Yeniseisk, Lesosibirsk, Minusinsk, Sharypovo, Areas: Achinsk, Pirovsky |

**Table 7.** Classification of the territories which showed growth of GAV more than 2 times for 2015-2018.

| Cluster | Characteristic |
|---------|----------------|
| Cluster 1 | - |
| Cluster 2 | 3 municipal units: City of Nazarovo, Areas: Emelyanovsky, Yeniseisky |
| Cluster 3 | - |
Cluster | Characteristic
--- | ---
3 | 1 municipal unit: Sharypovsky area
4 | 1 municipal unit: Idrinsky area
5 | 6 municipal units:
  - City of Sosnovoborsk
  - Areas: Bogotolsky, Kezhemsky, Kozulsky, Nizhneingashsky, Taimyrsky
6 | -
7 | -

Territories of growth of GAV in groups with structure:
- partially a cluster 2 (profit and depreciation in the amount more than 77%),
- partially a cluster 4 (profit and depreciation in the amount more than 85%),
- cluster 5 (wages - high, depreciation - average, profit – low);
- cluster 6 (depreciation prevails, profit is insignificant);
- cluster 7 (wages to the detriment of other elements considerably prevails).
- Apparently reduction of GAV happens on territories with structure:
  - cluster 1 (loss),
  - partially a cluster 2 (profit and depreciation in the amount more than 77%),
  - cluster 3 (a high profit share to the detriment of other elements),
  - partially a cluster 4 (profit and depreciation in the amount more than 85%),
  - cluster 6 (depreciation prevails, profit is insignificant);.
  - cluster 7 (wages considerably prevails).

Territories where in structure of GAV there is a loss, did not show the positive growth of GAV (a cluster 1), as well as territories where in structure profit to the detriment of other elements considerably prevails (a cluster 3). Territories where the average share of depreciation at a low share of wages is added to high profit, are characterized both by decrease, and growth of GAV (a cluster 4). Redistribution of GAV for benefit of a bigger share of wages at high total profit and depreciation (a cluster 2) does not allow to characterize unambiguously to the GAV loudspeaker.

Mainly growth of GAV is shown by territories where the profit share is low (to 10%), and the total size of wages and depreciation is up to 90% (clusters 5 and 6). However, the low profit share in itself does not characterize the territory as growing: so, in the 7th cluster a wages share more than 70% (profit small), but a low share of depreciation. Got to this cluster as the growing territories, and territories with the decreasing size GAV.

Thus, the high profit share does not speak about the potential of growth of GAV. Growth becomes more probable when profit is redistributed in advantage both depreciation, and wages. However, the obvious prevalence of wages also does the prospects of growth of GAV ambiguous.

The carried-out analysis confirms need of achievement of balance, element structure of GAV. The «skew» towards profit, or profit and amortization, or solely wages does not guarantee growth. In addition, the growth of GVA is impossible with a low share of wages, the human factor is no less important technological and entrepreneurial. Only a balanced combination of wages, depreciation (for the most part) and profits (for the least part) create opportunities for further development.

Research of GAV which structure contains profit and depreciation allow to estimate it as own investment resource of business of the territory. The analysis of statistics of investments showed that they were followed by input/leaving of fixed assets by types of economic activity, led in some cases to negative average annual rates of a growth/gain. Most actively, processes were implemented in the extracting and fulfilling industries, partially, transport and construction. So, for example, in the Central macro district – the region manufacturing center, so in Krasnoyarsk excess of input over leaving of
fixed assets made 3.49 rub, in Balakhtinsky district – 15.65 rub, and Bolshemurtinsky district – 7.59 rub. High volumes of input of fixed assets in the processing industries are confirmed in Achinsk – 107.45 rub and Uzhursky district – 476.91 rub. In the extracting industries of northern territories excess of input of fixed assets over leaving made in 2015 in Norilsk 159.07 rub, and in Turukhansky district – 202.64 rub, having decreased by 2018 to 91.87 rub and 54.83 rub respectively.

Effectiveness of investment processes in terms of realization of their reproduction functions it was estimated based on metrics (indicator) of the investments into fixed capital falling on 1 ruble of cost of fixed assets (Table 8).

Table 8. Comparative assessment of degree of wear of fixed assets and allocated for its wages Ifc in macro districts of Krasnoyarsk Region in 2018.

| Macro regions     | Depreciation of FC, % | Ifc/FC value | average rate, % | annual growth |
|-------------------|-----------------------|--------------|-----------------|---------------|
| Central           | 45.2                  | 0.16         | 100.4           |               |
| Western           | 51.2                  | 0.10         | 104.2           |               |
| Eastern           | 63.2                  | 0.10         | 91.8            |               |
| Northern          | 37.01                 | 0.33         | 85.6            |               |
| Priangarsky       | 43.6                  | 0.19         | 80.4            |               |
| Southern          | 61.8                  | 0.07         | 81.6            |               |

More than half of the fixed assets are out of service life in the Southern macro district. Productions in Minusinsky, for 74.4% - in Idrinsky district are completely worn-out, for 59.7% of Karatuzsky and 58.4% Shushensky areas and demand replacement of the equipment. Own resources and the saved-up depreciation charges (by 4 times bigger when financial result of the territory) are enough for development of productions on a new technology basis, however it does not occur.

In the Priangarsky macro region the situation with wear rather equal (43.6%), in Kezhemsky district fixed assets new, their wear makes only 3.13%. In the Northern macro district the Taimyrsky area (6.3%) belongs to such territory.

Difficult situation with technical condition of productions in Eastern macro district. At average degree of wear of fixed assets – 63.2% high values in Partizansky (92.8%) and Sayansky (82.3%) areas. Similar situation in Achinsky (100%) and Birilyussky district (81.5%). Small wear in Achinsky (12.0%) and Nazarovsky areas (28.2%).

In the Central macro district, despite the average level of wear (45.2%), technical condition of potential production of territories a miscellaneous: on three quarters the equipment in Krasnoyarsk, on a third - in Sosnovoborsky (27.0%), by Mansky (35%) and Sukhobuzimsky (38%) areas, half – in Berezovsky (44.3%) and Emelyanovsky (47.8%) areas is worn out.

Investment resources of territories are enough for wages from 7 to 33% of cost of fixed assets.

High potential of expansion of productions in Northern (0.33rub/rub), Priangarsky (0.19rub/rub) and Central (0.16rub/rub) macro districts. In the Western, Eastern and Southern macro districts such opportunities are limited. Speed of development of these processes has positive dynamics only in the Western and Central macro district, in the others in 2015-2018 is shown by instability.

In general, investment resources do not allow predicting quality of reproduction processes in the Southern, East and Western macro district.

The research of opportunities of depreciation charges in total with a financial result, allowed to receive the following analytical results (Table 9).
Table 9. Sources of renewal of fixed assets of macro districts and territories of the Krasnoyarsk Region in 2018.

| Macro districts / territories | Depreciation charges, million rubles | Average annual growth rate (2015-2018) | For reference: FR, million rubles | Ifc, million rubles | Share of own sources in Ifc, % |
|------------------------------|-------------------------------------|----------------------------------------|---------------------------------|-----------------|-------------------------------|
| Southern MD (8)              | 1719                                | 106.9                                  | 483                             | 2525            | 87.2                          |
| Shushensky area              | 640 (37.2%)                         | 126.5                                  | 346                             | 404             | -                             |
| Northern MD (4)              | 78694                               | 133.7                                  | 29981                           | 1469            | 2.57                          |
| Turukhansky area             | 33501 (42.6%)                       | 213.6                                  | 90567                           | 4803            | -                             |
| Priangarsky MD (9)           | 16660                               | 110.3                                  | 2250                            | 3391            | 9.78                          |
| Severo-Yeniseisk area        | 6739 (40.4%)                        | 110.1                                  | -                               | 1749            | -                             |
| Eastern MD (13)              | 1978                                | 110.3                                  | 2173                            | 5560            | 74.6                          |
| Rybinsky area                | 813 (41.1%)                         | 112.4                                  | 7426                            | 959             | -                             |
| Western MD (14)              | 7362                                | 105.2                                  | 8121                            | 2625            | 58.9                          |
| Nazarovo                     | 1140 (15.5%)                        | 97.9                                   | 793                             | 1191            | -                             |
| Central MD (10)              | 80380                               | 107.2                                  | 17553                           | 8818            | 2.9                           |
| Krasnoyarsk                  | 76273 (98.6%)                       | 122.3                                  | 15117                           | 8017            | -                             |

For reference: Ifc – only investments, opening about the publication

Accumulated depreciation funds of territories exceed their financial result of activity in Southern (3.6 times) and Priangarsky (7.4 times) macro districts. In the Southern macro region, in aggregate, these two own sources account for 87.2% of Ifc, which increases its possibilities for expanded reproduction. In the Priangarsky macro-district - only 5.6% of Ifc, which confirms the use of attracted funds as an investment resource and expanding the potential for the development of existing and new industries. In the Western macro district the size of depreciation means is close to a financial result (90.6%) and is in investment resources together with it – 59%. In the Northern macro district, on the contrary, Ifc by 2.6 times increases. In both cases resources for updating of available capacities are to a greater or lesser extent created, however, presumably efficiency of return from invested funds it will be stretched in time that can affect their commissioning.

The proportionality of investments with the financial result (I fc/FR), on the one hand, serves as an indicator of the interest of business and government in the objects of the territory, on the other hand, it characterizes the riskiness of investments and the delayed prospect of their return. The territories included in the table in the second and third groups are just such (Table 10).

The investment process in the territories of the region is mostly unstable. There are many situations when, with more or less investments in the ruble of the financial result, the dynamics of the indicator «dances», passing from positive growth / growth rates to negative ones and back. There are situations when this dynamics for the period under consideration is negative. Among the territories themselves are Borodino (-225.7), Ilansky (-23.3), Irbeysky (-195.6), Partizansky (-63.9) districts.
Table 10. Distribution of territories of the region on use of own funds of economic entities for the investment purposes.

| Ifc/FR rub./rub. | Territories                                                                 |
|-----------------|-----------------------------------------------------------------------------|
| To 10           | Kansk (9.8), Novoselovsky (4.3), Kezhemsky (0.16), Motyginsky (0.2), Irbeisky (1.7), Uzhursky (1.7), Kirovski (0.22), Severo-Yeniseisky (0.39), Kansk (2.6), Taimyrsky (0.11), Turukhansky (0.53), Divnogorsk (0.05), Partizansky (0.23), Krasnoyarsk (0.53), Sosnovoborsk (5.4), Uyarsky (0.66), Berezovsky (3.2), Bolshemurtinsky (0.74), Emelyanovsky (3.9), Nazarovo (1.5), Minusinsky (2.4), Shushensky (1.17), Bolsheuluysky (3.8), Nazarovsky (1.8). |
| From 10 to 100   | Borodino (52.3), Balakhtinsky (26.5), Mansky (81.8), Dzerzhinsky (12.8), Karatuzsky (34.2), Krasnoturansky (14.8), Ilansky (10.0), Rybinsky (18.6), Sharypovskiy (14.8). |
| Over 100         | Nizhneingashsky (4008), Yeniseisk (314.6), Birilyussky (224.5), Bogotolsky (346.8). |

It is necessary to assume that the territories completing the activity with a positive financial result of economic entities participate in investment processes. However, they can be divided into two groups:

1) focused only on own investment resources;
2) the attracting additional investment resources, proceeding from the strategic objectives.

The analysis of own investment potential of territories which cornerstone the final financial result of economic entities is specifies on:

1) their large number has about negative results of activity and respectively lack of own investments into development of productions;
2) adequacy of the made own investments more than a quarter of subjects of the region make such decisions, but with different dynamics of their gain for the considered period.

So, in 2018 own investment potential was absent at such territories as the Sayansky, Achinsky, Kozulskey, Yeniseisky, Eveniksny, Ermakovskiy, Kuraginsky districts, the cities: Bogotol, Sharypovo, Lesosibirsk, Norilsk. Along with it, a number of territories had positive dynamics of average annual rates of its growth. Kozulsky district – 178.2%, Yeniseisky – 106.2%, Eveniksky – 526.9%, Ermakovskiy – 254.8%, Kuraginsky areas – 107%. Growth rates of own investment resources in Achinsk (-20.0), Nazarlovo (-40.5), Kezhemsk (-20.3), Motyginsky (-13.2), Kirovsk (-43.2), Turukhansky (-5.1) areas, Divnogorsk (-15.5), Krasnoyarsk (-47.0), Bolshemurtinsky (-63.5), Idrinsk (-20.3), Shushensk (-165.9) areas decreased.

GAV, creating the potential of investment opportunities of updating of fixed assets and expansion of productions, increases a capital-labor ratio and labor productivity. Comparative characteristic of these indicators across territories of the region allows to give the generalized characteristic of efficiency of the used sources (Table 11).

So, in Southern the macro district growth of a capital-labor ratio promoted an increase in labor productivity in the majority of territories: Ermakovskiy, Krasnoturansky, Idrinskiy, Kuraginsky, Karatuzsky, Shushensky districts. In the Minusinsky district the capital-labor ratio (+75%) did not provide an adequate increase in labor productivity (-1.0%). In Minusinsk (-0.3%) its decrease was reflected also on labor productivity (-0.5%).
Table 11. Comparative characteristic of CL, GAV and LP indicators by the value and rate of their growth in the Southern macro district of Krasnoyarsk Region.

| MD            | GAV, thousand rubles. | Growth rate, % | CL, rub./person | Growth rate, % | LP, rub./person | Growth rate, % |
|---------------|-----------------------|----------------|-----------------|----------------|----------------|----------------|
| Minusinsk     | 6016646.0             | 104.5          | 404.6           | 99.7           | 360.7          | 99.5           |
| Ermakovsky    | 1188665.2             | 106.8          | 600.7           | 120.2          | 328.9          | 111.1          |
| Idrinsky      | 992244.6              | 107.9          | 263.6           | 105.3          | 385.8          | 101.1          |
| Karatuzsky    | 1185976.5             | 103.9          | 520.1           | 116.6          | 396.9          | 107.7          |
| Krasnoturansky| 1026635.2             | 103.9          | 760.6           | 114.6          | 275.3          | 106.8          |
| Kuraginsky    | 1457538.4             | 101.2          | 596.0           | 107.5          | 307.7          | 99.0           |
| On average    | 2262066.7             | 107.4          | 855.5           | 114.9          | 351.9          | 107.5          |

In the Central macro district the situation is similar – in the majority of territories in response to growth of level of technical technological support, grew labor productivity (Table 12). In Sosnovoborsky and Balakhinsk districts the postponed results of investments are predicted.

Table 12. Comparative characteristic of CL, GAV and LP indicators by the value and rate of their growth in the Central macro district of Krasnoyarsk Region.

| MO            | GAV, thousand rubles. | Growth rate, % | CL, rub./person | Growth rate, % | LP, rub./person | Growth rate, % |
|---------------|-----------------------|----------------|-----------------|----------------|----------------|----------------|
| Divnogorsk    | 25713054              | 110.9          | 5311.5          | 102.8          | 3483.2         | 110.1          |
| Krasnoyarsk   | 394888807             | 125.8          | 3182.3          | 117.7          | 962.6          | 127.4          |
| Sosnovoborsk  | 2277054               | -62.4          | 1140.3          | 130.1          | 366.9          | -63.0          |
| Balakhinskiy  | 1745343               | 99.1           | 707.9           | 108.7          | 345.7          | 95.4           |
| Berezovsky    | 4746756               | 110.2          | 1882.6          | 116.4          | 453.5          | 112.8          |
| Bolshemurtinskiy | 3450056             | 136.3          | 2195.9          | 133.5          | 838.8          | 137.6          |
| Emelyanovsky  | 8869636               | 101.9          | 1079.0          | 106.0          | 599.0          | 104.4          |
| Mansky        | 829868                | 107.9          | 454.0           | 106.7          | 311.6          | 105.6          |
| Sukhobuzimsky | 1359398               | 97.5           | 886.8           | 112.5          | 318.2          | 107.7          |
| On average    | 49319997              | 91.9           | 1871.2          | 114.9          | 847.7          | 92.4           |

In other macro districts a situation across territories is ambiguous. So, in Eastern macro district with average values of a capital-labor ratio only a half of territories increased labor productivity, and in the Rybinski district it passed into the area of negative values (Table 13).

Table 13. Comparative characteristic of CL, GAV and LP indicators by the value and rate of their growth in the Eastern macro district of Krasnoyarsk Region in 2015-2018.

| Territories | GAV, one thousand rub | Growth rate, % | CL, thousand rub./person | Growth rate, % | LP, thousand rub | Growth rate, % |
|-------------|-----------------------|----------------|--------------------------|----------------|-----------------|----------------|
| Borodino    | 2494571.6             | 111.1          | 469.0                    | 104.6          | 468.3           | 107.8          |
| Kansk       | 6680682.1             | 103.2          | 648.9                    | 112.5          | 337.5           | 108.0          |
In the Western macro district of such territories two: city of Achinsk and Birilyussky district (Table 14). Large territories where the answer to a capital-labor ratio was much lower than expected.

Table 14. Comparative characteristic of CL, GAV and LP indicators by the value and rate of their growth in the Western macro district of Krasnoyarsk Region.

| MO                  | GAV, thousand rubles. | Growth rate, % | CL, rub./person | Growth rate, % | LP, rub./person | Growth rate, % |
|---------------------|-----------------------|----------------|-----------------|----------------|----------------|----------------|
| Achinsk             | 18789841.8            | 103.8          | 1126.7          | 110.0          | 566.1          | 100.0          |
| Bogotol             | 3083706.3             | 104.6          | 347.3           | 104.9          | 456.6          | 103.3          |
| Nazarovo            | 6270435.6             | 107.1          | 1541.8          | 108.4          | 481.5          | 112.6          |
| Sharypovo           | 2304223.7             | 96.9           | 323.9           | 105.2          | 288.7          | 104.2          |
| Achinsky            | 369371.0              | 71.7           | 3278.1          | 98.9           | 121.3          | 103.9          |
| Birilyussky         | 786754.1              | 103.2          | 489.3           | 102.1          | 341.0          | 100.3          |
| Bogotolsky          | 314665.0              | 83.1           | 7345.0          | 105.6          | 225.4          | 78.3           |
| Bolsheuluyksky      | 5799092.6             | 71.9           | 3322.0          | 109.7          | 1059.6         | 75.7           |
| Kozulsky            | 1581918.1             | 105.6          | 3447.2          | 107.5          | 506.8          | 104.9          |
| Nazarovsky          | 2463422.4             | 92.4           | 1297.6          | 104.7          | 390.3          | 95.5           |
| Novoselovsky        | 11478843.3            | 100.0          | 782.9           | 111.6          | 372.4          | 101.0          |
| Tyukhtetsky         | 444180.8              | 104.3          | 473.8           | 118.0          | 309.5          | 101.8          |
| Uzhursky            | 4503929.0             | 100.6          | 1010.0          | 110.5          | 490.4          | 98.3           |
| Sharypovsky         | 4649901.7             | 97.6           | 9286.2          | 95.6           | 837.7          | 97.4           |
| On average          | 2294507.5             | 100.7          | 811.0           | 108.0          | 395.6          | 101.4          |

In the Priangarsky macro district negative GAV is created in Boguchansky district (-6%) (Table 15). However, the existing capital-labor ratio failed to achieve high growth rates of labor productivity (+0.6%).
Table 15. Comparative characteristic of CL, GAV and LP indicators by the value and rate of their growth in the Priangarsky macro district of Krasnoyarsk Region.

| MO          | GAV, thousand rubles | Growth rate, % | CL, rub./person | Growth rate, % | LP, rub./person | Growth rate, % |
|-------------|----------------------|----------------|-----------------|----------------|----------------|----------------|
| Yeniseisk   | 136559.0             | 37.6           | 770.5           | 113.2          | 20.6           | 37.2           |
| Lesosibirsk | 113686.0             | 32.5           | 1122.4          | 107.4          | 6.8            | 31.5           |
| Boguchansky | 1025565.1            | 94.0           | 5785.4          | 225.3          | -731.4         | 100.6          |
| Yeniseisky  | 1629820.2            | 100.1          | 115.6           | 74.0           | 327.8          | 105.4          |
| Kazachinsky | 742037.2             | 106.2          | 484.0           | 109.5          | 325.2          | 113.5          |
| Kezhemsky   | 742037.2             | 106.8          | 11612.3         | 98.8           | 1715.0         | 102.1          |
| Motyginsky  | 13440547.0           | 126.7          | 1742.9          | 105.3          | 2522.2         | 122.0          |
| Pirovsky    | 23585177.9           | 106.7          | 378.1           | 105.3          | 349.9          | 99.4           |
| Severo-Yeniseisky | 552156.7        | 102.3          | 6249.6          | 112.1          | 5036.7         | 99.8           |
| On average  | 66283797.2           | 90.3           | 3140.1          | 116.7          | 1063.6         | 90.2           |

Generalizing analysis results and for the purpose of efficiency evaluation of processes of technical and technology improvement of production systems of the territories directed to growth of GAV, we will define metrics (indicators) measuring its level which is based on comparative estimates. According to us, it is necessary to distinguish:
- state metrics;
- efficiency/development metrics.

GAV and Ifc treat metrics (indicators) measuring a flow of resources of a production system in technical and technology updating. The efficiency of using resources for the consecutive growth of GAV is defined by use of a chain of the metrics estimating a contribution of investments into fixed capital to growth of GAV and CL (Ifc/GAV, Ifc/FV), their return in the form of growth of a capital-labor ratio and labor productivity (CL/Ifc, LP/Ifc), influence of a capital-labor ratio on labor productivity (LP/CL) and their cumulative return in the form of growth of GAV (GAV/LP/CL).

Metrics of a condition of production systems of territories are provided in table 16.

Table 16. Characteristics of the dynamics of the processes of technical and technological renewal of the production systems of the territories of the region according to the average annual growth rates for 2015-2018, %.

| Macro districts | GAV | Ifc | CL | LP |
|-----------------|-----|-----|----|----|
| Southern (8)    | 107.4 | 93.7 | 114.9 | 107.5 |
| Northern (4)    | 17.6   | 105.6 | 135.4 | 47.1  |
| Priangarsky (9) | 90.4   | 88.1   | 116.8 | 90.2  |
| Eastern (13)    | 100.8  | 94.2   | 108.7  | 101.3 |
| Western (14)    | 95.9   | 109.7  | 106.4  | 101.1 |
| Central (10)    | 94.0   | 112.0  | 112.7  | 93.7  |

Relative characteristic of metrics gives more evident picture of changes in economy of territories of the region (Table 17).
Table 17. Influence of technical and technology improvement of production systems of macro districts on the growth potential of GVA, %.

| Macro districts | Ifc/GA | Ifc/CL | CL/Ifc | LP/Ifc | LP/CL | GAV/LP/CL |
|-----------------|--------|--------|--------|--------|-------|------------|
| Southern        | 0.872  | 0.815  | 1.226  | 1.147  | 0.935 | 114.8 times |
| Northern        | 6.0    | 0.780  | 1.282  | 0.446  | 0.348 | 50.6 times |
| Priangarsky     | 0.974  | 0.754  | 1.326  | 1.024  | 0.772 | 117.1      |
| East            | 0.934  | 0.867  | 1.154  | 1.075  | 0.932 | 108.1      |
| Western         | 1.145  | 1.032  | 0.969  | 0.921  | 0.950 | 100.9      |
| Central         | 1.191  | 0.994  | 1.006  | 0.836  | 0.831 | 113.1      |

6. Conclusion
Characterizing the territories along the entire chain of presented dependencies, we note the following:

1. In the Southern macro district, the contribution of investments to the formation of GVA and CL was adequate, as was the response to them. The capital-labor ratio, as well as labor productivity, increased, but not all of its potential showed itself (0.935). However, despite this, GVA increased by 114.8%. There is potential for further growth.

2. In the Northern macro district where there is a large concentration of extractive industries, 6 rubles of investment funds were invested for each ruble of GVA, which at this stage ensured an increase in capital-labor ratio (1.282). However, there was no adequate return on labor productivity at this stage (0.348). The growth potential is estimated at 50 times.

3. In the Priangarsky macro district the return on investment is high, labor productivity is growing more slowly, but this does not prevent the assessment of the efficiency of the production system of the territories as significant (117.1%).

4. In the Eastern macro district the situation is similar, the production system of the territories has the potential for GVA growth - 108.1%.

5. The Western macro district responded to the investments made (1.145 rubles/rubles) with a decrease in capital-labor ratio and labor productivity. Moreover, the increase in the first indicator over the second provided a very small increase in GVA (0.9%). In general, the efficiency of the technical and technological development processes is assessed as low.

6. In the Central macro district, along with the Southern there is a high return on invested capital. The excess of capital-labor ratio over labor productivity made it possible to reach the growth of GVA at the level of 13.1%. However, the results obtained suggest higher growth rates in the subsequent period.

In general, the study made possible to obtain an analytical database deployed in the region’s space for solving and adjusting management tasks.

The use of the apparatus of metrics (indicators) has proven its practical feasibility. A comparative analysis with its use made it possible to characterize the state and dynamics of changes in the production systems of the territories of the region, to identify new tasks for finding the potential for economic development, to determine the directions for improving the mechanisms of regional policy.

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