Abstract — The article provides a methodical approach to estimating competitiveness of regional industries that determines the competitiveness integral index including individual indexes of short-term and long-term competitiveness. The indexes are estimated basing on four indicators: functionality, systematicity, proactivity and integrity. The method has been approbated on 11 industries of Volgograd Oblast. The study revealed that the most competitive industry of 2010-2017 was “Processing” because it has the highest competitiveness integral index of 20.5-27.5 p. Three outsider industries with competitiveness integral index within 0.2-0.7 p. range are “Hotels and Restaurants”, “Healthcare and Social Services”, “Education”. Most industries have their indexes in-between leading and outsider ones. The values of their competitiveness integral indexes are within 2.0-15.5 p. range. These industries include “Transport and Communication”, “Power, Gas and Water Production and Supply”, “Agriculture, Hunting and Forestry”, “Real Estate Operations, Renting and Services”, “Mining” and “Construction”. Basing on the estimation results, we propose to maintain and develop a differentiated structure of main Volgograd Oblast industries. The authors conclude that the method used for the analysis can be applied for estimating competitiveness of industries of any region.

Keywords — competitiveness, region, Volgograd Oblast, industry, integral index, estimation

I. INTRODUCTION

Competitiveness is an essential requirement for existence and development of a modern business system. Currently, Russian economy objectively needs universal methodological tools that would enable public authorities to estimate competitiveness of business systems of various levels and work out an efficient national strategy for regional development based on competitive advantages.

II. MATERIALS AND METHODS (MODEL)

The methodological ground for estimating competitiveness of regional industries has been developed basing on company management methodology by I. Adizes. For competitiveness of Volgograd Oblast industries, the competitiveness integral index has been calculated, which includes four individual indexes of short-term and long-term competitiveness estimated basing on four indicators: functionality, systematicity, proactivity and integrity (Table 1).

Integral and individual competitiveness indexes for Volgograd Oblast industries are estimated as the geometric mean of the product of the indicators comprising these indexes.
TABLE I. COMPETITIVE INDICATORS OF REGIONAL INDUSTRIES

| Indicator                     | Estimation                                           |
|-------------------------------|------------------------------------------------------|
| 1. Individual short-term competitiveness index |                                                     |
| 1.1. Functionality indicator   | Industrial structure of Volgograd Oblast business turnover depending on economic activity type |
| 1.2. Systematicity indicator   | Industrial structure of Volgograd Oblast business turnover depending on economic activity type per 1000 people working in the industry |
| 2. Individual long-term competitiveness index |                                                     |
| 2.1. Proactivity indicator     | Industrial structure of investments in capital stock of Volgograd Oblast companies depending on economic activity type |
| 2.2. Integrity indicator       | Industrial structure of Volgograd Oblast companies and organizations depending on economic activity type |

III. RESULTS AND DISCUSSION

The indicators of competitiveness of regional industries are relative ratios of regional economic values and indicate competitive advantages (or lack thereof) of a certain industry. For their estimation, we have used official statistical data for 2010-2018 provided by the Federal State Statistics Service. The 11 industries chosen for analysis represent economic activities types in accordance with the classification provided by Russian Classification of Economic Activities.

Basing on the collected results, we have calculated individual short-term (Table 2) and long-term (Table 3) competitiveness indexes.

TABLE II. VOLGOGRAD OBLAST DYNAMICS OF INDIVIDUAL SHORT-TERM COMPETITIVENESS INDEX BY ECONOMIC ACTIVITY TYPE IN 2010-2017

| Industry                                      | 2010   | 2011   | 2012   | 2013   | 2014   |
|-----------------------------------------------|--------|--------|--------|--------|--------|
| 1. Agriculture, Hunting and Forestry          | 1.28   | 1.51   | 1.66   | 1.60   | 1.74   |
| 2. Mining                                     | 13.31  | 4.24   | 4.38   | 5.47   | 4.95   |
| 3. Processing                                 | 31.04  | 38.57  | 38.43  | 34.69  | 35.92  |
| 4. Power, Gas and Water Production and Supply | 15.77  | 18.70  | 17.36  | 15.99  | 14.11  |
| 5. Construction                               | 3.07   | 3.44   | 3.61   | 3.41   | 3.55   |
| 6. Wholesale and Retail Trade, Repair of Vehicles, Motorcycles, Appliances and Personal Items | 9.78   | 14.15  | 15.10  | 14.14  | 13.92  |
| 7. Hotels and Restaurants                      | 0.46   | 0.46   | 0.40   | 0.26   | 0.27   |
| 8. Transport and Communication                | 3.46   | 4.20   | 4.12   | 3.65   | 3.12   |
| 9. Real Estate Operations, Renting and Services | 2.13   | 2.60   | 2.86   | 8.32   | 11.42  |
| 10. Education                                 | 0.09   | 0.11   | 0.10   | 0.11   | 0.10   |
| 11. Healthcare and Social Services            | 0.03   | 0.07   | 0.07   | 0.13   | 0.11   |

TABLE III. VOLGOGRAD OBLAST DYNAMICS OF INDIVIDUAL LONG-TERM COMPETITIVENESS INDEX BY ECONOMIC ACTIVITY TYPE IN 2010-2017

| Industry                                      | Year   |
|-----------------------------------------------|--------|
| 1. Agriculture, Hunting and Forestry          | 1.87   |
| 2. Mining                                     | 4.50   |
| 3. Processing                                 | 37.82  |
| 4. Power, Gas and Water Production and Supply | 14.29  |
| 5. Construction                               | 3.99   |
| 6. Wholesale and Retail Trade, Repair of Vehicles, Motorcycles, Appliances and Personal Items | 12.21  |
| 7. Hotels and Restaurants                      | 0.21   |
| 8. Transport and Communication                | 3.04   |
| 9. Real Estate Operations, Renting and Services | 12.41  |
| 10. Education                                 | 0.10   |
| 11. Healthcare and Social Services            | 0.11   |

The distribution of industries by short- and long-term competitiveness indexes has different structure. If we analyze the general tendencies of short-term competitiveness, we can divide the industries into three groups.

The first group are leading industries – “Processing” (an outstanding leader) “Power, Gas and Water Production and Supply”, “Wholesale and Retail Trade...” having the highest values of short-term competitiveness. The second group are outsiders including “Healthcare and Social Services”, “Education”, “Hotels and Restaurants”; for these industries, short-term competitiveness indicators are within a narrow range comprising at most 2% of leading industries’ competitiveness rate. Finally, the largest group is comprised of industries with short-term competitiveness indicators in a wide range of 15-50% of leading industries’ competitiveness: “Mining”, “Transport and Communication”, «Construction», “Real Estate...”, “Agriculture, Hunting and Forestry”.

TABLE III. VOLGOGRAD OBLAST DYNAMICS OF INDIVIDUAL LONG-TERM COMPETITIVENESS INDEX BY ECONOMIC ACTIVITY TYPE IN 2010-2017

| Industry                                      | Year   |
|-----------------------------------------------|--------|
| 1. Agriculture, Hunting and Forestry          | 6.05   |
| 2. Mining                                     | 1.11   |
| 3. Processing                                 | 13.44  |
| 4. Power, Gas and Water Production and Supply | 3.62   |
| 5. Construction                               | 5.26   |
| 6. Wholesale and Retail Trade, Repair of Vehicles, Motorcycles, Appliances and Personal Items | 11.17  |
| 7. Hotels and Restaurants                      | 0.76   |
| 8. Transport and Communication                | 12.99  |
| 9. Real Estate Operations, Renting and Services | 19.59  |
| 10. Education                                 | 2.56   |
| 11. Healthcare and Social Services            | 3.13   |
It is worth noting the following changes in individual short-term competitiveness indexes:

- A rapid decline of “Mining” index from 13.31 p. in 2010 to 4.24 p. in 2011 and its further insignificant raise up to 4.89 p. in 2017;

- A stable growth of “Real Estate” index from 2.13 p. in 2010 to 2.86 p. in 2013, followed by a rapid increase to 8.32 p. in 2014, stable growth to 14.33 p. in 2016 and rapid decline to 1.20 p. in 2017.

The highest average annual growth rate of individual short-term competitiveness is demonstrated by “Healthcare” (28.2%, i.e. increase from 0.03 p. in 2010 to 0.16 p. in 2017) and “Transport and Communication” (18.28%, i.e. increase from 3.46 p. in 2010 to 11.20 p. in 2017). The biggest decrease is demonstrated by “Hotels and Restaurants” index from 3.88 p. in 2017) and “Processing” (4.85%, i.e. increase from 13.44 p. in 2010 to 18.72 p. in 2017). The biggest decrease is demonstrated by the following industries: “Real Estate Operations” from 19.59 to 7.48 p. (average annual growth rate -12.85%); “Healthcare” from 3.13 to 2.14 p. (average annual growth rate -5.28%); “Construction” from 5.26 to 3.89 p. (average annual growth rate -4.2%).

The final period of the analyzed span demonstrates that tendencies related to short- and long-term competitiveness coincide. For instance, in 2017 the most competitive industries in the short-term perspective were “Processing”, “Power, Gas and Water Production and Supply” and “Wholesale and Retail”, while the most competitive ones in the long-term perspective were “Processing”, “Transport and Communication”, “Wholesale and Retail…”, “Real Estate Operations…”.

Comparison between individual indexes of the same industries reveals several specifics. For “Power, Gas and Water Production and Supply”, “Wholesale and Retail…”, “Transport and Communication”, the short-term competitiveness index in 2017 was respectively 39.54%, 28.65% and 28.32% of the maximal value of the same index for “Processing”, while long-term competitiveness indexes of the same industries comprised respectively 16.34%, 57.73% and 76.33% of the maximal value of the same index for “Processing”.

Thus, in case of “Power, Gas and Water Production and Supply” industry the management is aimed at achieving short-term results. Companies and organizations belonging to this industry have high performance indicators reflecting their efforts on satisfying customers' demands and demonstrating efficient spending and cost-saving production.

On the contrary, activities reflecting long-term efficiency, ability to adapt by proactive changes, as well as indicators of international interaction and cooperation with the industry demonstrating its internal stability, are less explicit in “Power, Gas and Water Production and Supply”.

It must be further noted that industry leaders with highest short-term and long-term competitiveness may differ. In this case we compare not individual indexes in different periods but the distribution of industries by individual indexes.

These dependencies demonstrate that the range of values of individual short-term and long-term competitiveness differ significantly. While all industries have their individual short-term indexes ranging from zero to (39.5-39.6) points, individual long-term indexes vary from zero to (18-19) points.
Thus, the contribution to formation of integral competitiveness index is more than two times higher in case of short-term indexes than long-term indexes.

This result enables us to conclude that integral competitiveness under these conditions of regional development is more influenced by indicators affecting short-term competitive advantages, i.e. functionality and systematicity indicators.

Competitiveness integral index is the most important for comparative analysis of industrial competitiveness (Table 4).

General dynamics of integral index for all industries have several specific features. For instance, the obvious regional leader for the analyzed period is “Processing”, with its integral competitiveness of 20.5-27.5 p. Three outsider industries with competitiveness integral index within 0.2-0.7 p. range are “Hotels and Restaurants”, “Healthcare and Social Services”, “Education”. Most industries have their indexes in-between leading and outsider ones. The values of their competitiveness integral indexes are within 2.0-15.5 p. range. These industries include “Transport and Communication”, “Wholesale and Retail…”, “Power, Gas and Water Production and Supply”, “Agriculture, Hunting and Forestry”, “Real Estate Operations, Renting and Services”, “Mining” and “Construction”. Meanwhile, “Agriculture, Hunting and Forestry” demonstrated stable decline as “Transport and Communication” rapidly improved its positions in 2017, going from the 5th place in 2016 to the 2nd place in 2017.

The highest average annual growth rate of competitiveness integral index is demonstrated by “Healthcare and Social Services” (10.2%, i.e. increase from 0.3 p. in 2010 to 0.59 p. in 2017) and “Transport and Communication” (9.49%, i.e. increase from 6.7 p. in 2010 to 12.65 p. in 2017). The biggest decline is demonstrated by the following industries: “Hotels and Restaurants” from 0.59 to 0.26 p. (average annual growth rate -11.05%); “Real Estate” – from 6.46 to 2.99 p. (average annual growth rate -10.42%); “Construction” – from 4.02 to 2.39 p. (average annual growth rate -7.12%).

### TABLE IV. VOLGOGRAD OBLAST COMPETITIVENESS INTEGRAL INDEX BY ECONOMIC ACTIVITY TYPE IN 2010-2017

| Industry | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------|------|------|------|------|------|
| 1. Agriculture, Hunting and Forestry | 2.78 | 2.64 | 2.79 | 2.74 | 2.40 |
| 2. Mining | 3.84 | 2.12 | 2.33 | 2.48 | 2.36 |
| 3. Processing | 20.42 | 23.59 | 24.15 | 24.10 | 27.43 |
| 4. Power, Gas and Water Production and Supply | 7.55 | 9.01 | 8.61 | 8.30 | 7.04 |
| 5. Construction | 4.02 | 3.93 | 4.08 | 4.24 | 3.33 |
| 6. Wholesale and Retail Trade, Repair of Vehicles, Motorcycles, Appliances and Personal Items | 10.45 | 12.08 | 15.36 | 14.77 | 13.35 |
| 7. Hotels and Restaurants | 0.59 | 0.61 | 0.47 | 0.41 | 0.39 |
| 8. Transport and Communication | 6.70 | 7.53 | 7.00 | 6.62 | 5.87 |
| 9. Real Estate Operations, Renting and Services | 6.46 | 6.64 | 7.23 | 10.96 | 11.75 |
| 10. Education | 0.48 | 0.56 | 0.54 | 0.58 | 0.57 |
| 11. Healthcare and Social Services | 0.30 | 0.40 | 0.43 | 0.55 | 0.41 |

### TABLE V. AVERAGE ANNUAL GROWTH RATE OF THE VOLGOGRAD OBLAST COMPETITIVENESS INTEGRAL INDEX BY ECONOMIC ACTIVITY TYPE IN 2010-2017

| Industry | 2015 | 2016 | 2017 | Average annual growth rate, % |
|----------|------|------|------|-------------------------------|
| 1. Agriculture, Hunting and Forestry | 2.30 | 2.81 | 3.42 | 3.02 |
| 2. Mining | 2.04 | 2.17 | 2.40 | -6.50 |
| 3. Processing | 27.60 | 25.66 | 27.21 | 4.19 |
| 4. Power, Gas and Water Production and Supply | 6.65 | 7.56 | 6.92 | -1.25 |
| 5. Construction | 2.96 | 3.10 | 2.39 | -7.12 |
| 6. Wholesale and Retail Trade, Repair of Vehicles, Motorcycles, Appliances and Personal Items | 10.55 | 11.08 | 11.07 | 0.82 |
| 7. Hotels and Restaurants | 0.46 | 0.42 | 0.26 | -11.05 |
| 8. Transport and Communication | 6.49 | 6.64 | 12.65 | 9.49 |
| 9. Real Estate Operations, Renting and Services | 12.58 | 13.47 | 2.99 | -10.42 |
| 10. Education | 0.49 | 0.49 | 0.62 | 3.95 |
| 11. Healthcare and Social Services | 0.42 | 0.50 | 0.59 | 10.20 |

It is worth noting how competitiveness integral indicators varies depending on industries in 2013-2014. For example, competitiveness of “Processing” and “Real Estate Operations…” industries increased by 13.8% and 7.2% respectively. In that period, other industries demonstrated a decrease in competitiveness, mostly “Healthcare and Social Services” and “Construction” (-24.6% and -21.5% respectively), while indicators of “Education” industry declined to a lesser extent (-1.9%).

### IV. CONCLUSION

The distribution of integral and individual competitiveness indexes of Volgograd Oblast industries differs significantly because the value of competitiveness integral index is formed by individual indexes to different extent.

According to the research results, we suggest to maintain and develop main industrial activities of Volgograd Oblast. The region needs to develop its traditional strategic industrial activities (oil exploration and refining, metallurgy, chemical production, machinery manufacturing, light industry). Deep differentiation by economic activity types is an important prerequisite for strategic stability of the regional industrial complex.

Priority projects capable to improve industrial competitiveness of Volgograd Oblast include the following segments acting as local points of growth: metallurgy; manufacturing of concrete and gypsum items; vegetable canning and processing; production of animal feeds; production of natural oils and fats; manufacturing of machinery and equipment; manufacturing of electric machinery and equipment; manufacturing of oil & gas equipment.

Processing industry is attractive for Volgograd Oblast businesses. This can be proved by availability of own raw materials base; proximity of extractive regions (Belgorod, Kursk, Rostov Oblasts); successfully developing industrial
companies belonging to Russian leading holdings and consequent efficient subcontracts with business subjects; stable growth of output in natural and money terms.

Mining industry in Volgograd Oblast is characterized by a large number of deposits. The positive dynamics of its development would create favorable business environment in the region in general influencing other industries such as oil processing, metallurgy, chemical production, production of construction materials. For these industries, availability of deposits of natural deposits in the region is one of the key factors for success. This is why active development of this industry is beneficial for the business environment. Mining industry is attractive for implementation of large investment projects aimed at deep processing of natural resources and for business development related to exploration of new deposits.

The projects with the biggest potential should be aimed at balanced development of raw materials base and processing industry; creation of wholesale and distributing (logistics) centers, including centers for storing agricultural products; development of agricultural cooperation. Volgograd Oblast is a large producer of vegetables but lacks capacities needed for their storage and processing. This is why the main objectives for improving regional industrial competitiveness are creation, renovation and modernization of businesses storing and processing fruit and vegetable products.

Transport and communication industry has several positive factors essential for regional development: favorable geographic location of the region; vast network of pipelines; developed informational and communicational infrastructure.

The key recommendations for increasing competitiveness of the analyzed Volgograd Oblast industries are: providing high-quality education adjusting to changing public demands and potential objectives of Volgograd Oblast socioeconomic development; ensuring regional environmental safety, increasing efficiency of usage, protection and regeneration of forests; developing tourism and protecting cultural and natural heritage of Volgograd Oblast; improving and developing road and transport infrastructure of Volgograd Oblast and road network of Volgograd; supporting all-encompassing and stable industrialization and innovation; creating favorable conditions for implementing commercial projects of various businesses in priority industrial and agricultural directions of regional economy; improving health condition of Volgograd Oblast population by improving quality and availability of healthcare.

The methodological approach we suggested provides a relative estimation of competitiveness of industries within a certain region. Obviously, competitiveness of an industry must be analyzed only in relation to competitiveness of other industries of this region. The values of individual and integral indexes are meaningful only within the limits of industries compared. However, this does not make the approach limited or flawed. On the contrary, this brings the approach autonomy or independence from measurement means. For each case, measurement scale is formed for the competitiveness values of the compared systems that comprise this specific combination.

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