

Dynamic Approach to Monitoring the Competitiveness of Non-Public Engineering Companies in the Region Under New Industrialization

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Abstract—The paper is devoted to the study of the problem of systematic assessment of the competitiveness of non-public machine-building enterprises with territorial integrity. In the context of the neo-industrial transformation processes, the implementation of the strategic objectives of sustainable competitive development of the existing regional machine-building complexes requires the organization of permanent operational monitoring of the dynamics of changes in the competitive status of enterprises with limited possibilities for collecting baseline information. A dynamic approach to the monitoring of competitiveness is considered as an important innovative component of the modern value-oriented management of the industry's technological development in the economic space of the region. Based on modern scientific principles of the theory of competition and strategic management, the authors set forth a methodological basis for a dynamic method for assessing the competitive status of business entities and substantiate the expediency of using it in organizing the monitoring of competitiveness of territorial and industry structures. Using the regional cluster of machine-building enterprises as members of the Union of the Machine-Building Enterprises of Sverdlovsk Region, NP, as an example, an analysis of the dynamics of the competitive status of enterprises has been carried out, the main sources of formation of their competitive advantages have been identified, the content of subsequent monitoring steps aimed at combining the meso-economic and microeconomic levels of competitiveness research as a factor in the development of the digital economy has been determined.

Keywords—*competitiveness, competitive status, monitoring, dynamic approach, machine-building enterprises of the region*

I. INTRODUCTION

Under the new industrial society, the problem of managing the competitiveness of enterprises, including a quantitative assessment of its current level, is being actualized. This assessment, on the one hand, is a “barometer”, reflecting the relevance of optimizing business processes, and, on the other hand, a “compass”, which shows in which direction to look for reserves to improve the competitive position of enterprises. The assessment task is the starting point for the development of measures to improve competitiveness, and, at the same time, the criterion of the effectiveness of these measures, which necessitates continuous monitoring of the competitive status of enterprises as an innovative component of value-oriented management of technological development in the digital economy. The organization of monitoring the enterprise competitiveness acquires particular importance at the regional level, due to the increasing role of the regions in building innovative industry and intersectoral clusters based on the capabilities of breakthrough technologies of the new industrial society, effective mechanisms of state industrial policy.

II. LITERATURE REVIEW

In world and domestic practice, various approaches are applied to assessing the competitive development of economic entities, including: methods based on market value analysis [1], operational [2], product [3], matrix [4], and dynamic [5] methods. Many of them imply an assessment of indicators “in statics”, have significant limitations, and are focused on using a large array of source data that are not always available in

existing statistics. At the same time, if leading analysts of many investment funds and rating agencies subject any information on financial and economic activities to a detailed analysis in relation to large companies, then a quantitative analysis of the competitive positions of non-public companies (which is the absolute majority of domestic enterprises) is conducted quite rarely.

III. RESEARCH METHODOLOGY

The purpose of the study is to substantiate the dynamic approach to monitoring the competitive status of non-public engineering enterprises as elements of regional and sectoral structures. The object of assessment and comparison are machine-building enterprises, members of the Union of the Machine-Building Enterprises of Sverdlovsk Region, NP.

The basis of the methodological foundation of the research is the achievement of scientific thought in the field of the theory of competition and strategic management [6, 7, 8]. The authors share the point of view of Yu.V. Taranukha about the need to analyze competition as the unity of the organizational system and dynamic process, under which the competitiveness of an enterprise is the ability to redistribute the value created by all competitors in its favor. In case of the organizational structure, it is the abilities, not the resources that are the sources of the competitive advantages of an enterprise, which form its competitiveness in the internal and external environment in accordance with the development strategy [9]. The high speed of technological and organizational innovations makes it necessary to adjust traditional models for assessing the competitive status of enterprises [10, 11, 12]. In particular, the competitive status of an enterprise is increasingly determined by its dynamic abilities, manifested in proactive management decisions on the transformation of difficult-to-simulate resources based on timely recognition of weak market signals [13], as well as the institutional mechanism [14, 15].

The proposed approach at its core has an assessment of indicators in the dynamics based on a well-defined mathematical apparatus, ensuring maximum accuracy of the results obtained and wide possibilities for analytic processing of competitiveness indicators of enterprises with a sectoral and territorial community, based on the existing statistical reporting [16].

Three methodological principles underlie a dynamic method for assessing the competitive status of an enterprise, namely:

- defining key economic indicators of the business entity;
- comparative assessment of key indicators in comparison with competitors;
- analysis of time series of competitiveness indicators.

The implementation of the first principle consists in the orientation of measurements on the main sources of competitive advantages of an enterprise: strategic positioning, operating efficiency, and financial condition. The essence of strategic positioning can be formulated as the implementation of activities that provide the unique nature of the use value

created. Sufficiency of the company's revenue is ensured due to strategic positioning. Operating efficiency means doing similar activities better than competitors do. It includes an assessment of the economic efficiency of performing technological operations and minimizes the expenses of production and sales. The third indicator of competitiveness is the financial condition of the company. In periods of economic instability, financial stability determines not only competitiveness, but also the viability itself, the possibility of the further functioning of the company.

Under high speed technological and institutional changes, strategic positioning, creating, maintaining and expanding sales markets, provides the possibility of realizing surplus value, operating efficiency ensures profit in the implementation process, and proper financial condition—the necessary amount of sources of financing economic activities. Thus, in the dynamic approach, the measurement of the competitive status of an enterprise can be characterized and, ultimately, reduced to an assessment of its strategic positioning, operating efficiency, and financial condition. The key indicators of these sources, respectively, are the dynamics of sales volumes, profitability of economic activities, as well as the level of liquidity. At the same time, a quantitative assessment of each of the competitiveness sources is carried out by comparing the key indicators of the analyzed company with the corresponding indicators of competitors (the second methodological principle is being implemented here).

Considering these key indicators as coefficients of strategic positioning, operating efficiency, and financial condition, respectively, it is possible to calculate the integral indicator of the competitiveness of the analyzed company:

$$K = K_I \cdot K_R \cdot K_F, \quad (1)$$

where K – coefficient of competitiveness of the analyzed enterprise;

K_I – coefficient of strategic positioning;

K_R – coefficient of operating efficiency;

K_F – coefficient of financial condition.

In accordance with the second principle, the coefficient of strategic positioning (K_I) is defined as the ratio of the index of change in revenue of the analyzed company with the change in the index of revenue for a sample of enterprises for the reporting period.

The sample refers to the set of competitors, against which the assessment of the competitiveness of the studied enterprise is carried out. At the first stage of monitoring, the sample may consist of all industry participants, which allows assessing the competitive status of an enterprise at the meso-economic level, reflecting its position in intra-industry competition. In addition, a comparison of indicators by industry samples, in accordance with the All-Russian Classification of Economic Activities (OKVED), can complement the assessment of factors and conditions of competitive interaction of an enterprise from the standpoint of inter-industry competition. At subsequent stages, the analysis of the competitive status of an enterprise is carried out at the

microeconomic level, by comparing the sources of its competitive advantages with the companies included in the sample—direct competitors, which makes it possible to concretize “the specificity of competitive practices applied with strict reference to time and place” [7, p. 371].

Revenue from the sample is calculated as the total revenue of enterprises included in the sample. Comparison with total (aggregated) values, and not with average values is due to the fact that the number of companies in the sample (and hence the average value) will vary significantly depending on the method of accounting for various organizational and legal forms, as well as the criteria for determining the affiliation of business entities that will distort the results of calculations. The aggregation rule is also applied when calculating other indicators for the sample (expenses, assets, liabilities). The coefficient of operating efficiency (K_R) is calculated as the ratio of the operating efficiency of the analyzed company and the operating efficiency of the sample of enterprises for the reporting period. At the same time, operating efficiency is determined based on the ratio of the company’s revenue to its expenses. The expenses refer to all the costs of an enterprise (including both cost price and commercial, managerial, and other expenses of the enterprise), as well as a set of mandatory payments to budgets of all levels that are not included in these cost categories. The composition of the expenses is determined in such a way that the canonical identity is fulfilled: the net profit (N) of the enterprise is the sales revenue (S), reduced by the expenses (E). Then the expenses indicator can be defined as the difference between sales revenue and net profit ($E = S - N$). The composition of expenses may vary depending on the objectives of the study and the availability of baseline data. In particular, for analyzing the competitiveness of core business, it is permissible to accept only operational costs as expenses.

The coefficient of financial condition (K_F) is defined as the ratio of the liquidity level of the analyzed enterprise to the liquidity level of the sample of enterprises at the end of the reporting period.

The liquidity levels of the analyzed enterprise and the sample of enterprises are calculated by extracting the cube root of the ratio of current assets to short-term liabilities (of the analyzed company and the sample of enterprises, respectively) at the end of the reporting period. The extraction of the cubic root for calculating the level of liquidity is required in order to reduce the coefficient of variation of the financial indicators to an acceptable level (less than 0.33). Otherwise, the greatest factor of the competitiveness coefficient will be the coefficient of financial condition, which will entail a significant decrease in the reliability of the applied model.

The objective function of the competitiveness coefficient can be defined as follows: the higher the K , the more competitive with respect to the sample is the analyzed enterprise.

Decomposition of the competitiveness coefficient by comparison objects in combination with the analysis of the dynamics of these indicators allows identifying the main reasons for the current level of competitiveness.

The third methodological principle of the dynamic approach is to carry out calculations and analytical assessment

not only for the reporting period, but also for past ones. The obtained time series ensure the representativeness of the data set and increase the reliability of the results of the enterprise competitiveness assessment.

IV. PRACTICAL RELEVANCE, SUGGESTIONS, AND RESULTS OF RESEARCHES

Taking into account the fact that machine building plays a key role in the gross regional product, the industry group of non-public machine-building enterprises of Sverdlovsk Region has been chosen as the object of analysis. These enterprises mainly produce non-interchangeable products, which is why they almost do not enter into direct competition among themselves. At the same time, having similar industry specifics and regional affiliation, machine builders, undoubtedly, compete for the capital of investors, government support, labor resources, and other benefits. Therefore, a comparative analysis of the main economic parameters of these enterprises has a well-defined economic content.

Calculations have been made based on annual financial reports for 2012-2017, which were obtained in accordance with the current legislation through the state statistical bodies. The selected period allowed us to analyze the dynamics of the competitiveness of enterprises in the context of the devaluation of the Russian national currency (which peaked in 2014-2015), as well as to assess the impact of the neo-industrial transformation process of the machine-building industry in the region.

The assessment of the competitive status of enterprises has been carried out using the above dynamic method for assessing competitiveness. In order to ensure greater comparability of the research results, enterprises have been classified according to the scale of their activities. The sales revenue for 2017 (excluding VAT and excise duties) has been adopted as a classification criterion. Two groups of enterprises of the regional machine-building complex have been singled out: with revenues of up to 1 billion rubles and more than 1 billion rubles.

Further, for each enterprise, the coefficients of competitiveness (K) have been calculated in comparison with the group’s competitors (with a breakdown by reporting periods). In order to implement the factor analysis for 2017, both the final competitiveness factors (K) calculated according to the expression (1), and its “component” coefficients of strategic positioning (K_I), operating efficiency (K_R), and financial condition (K_F) have been presented.

The results of the assessment of the competitive status of machine-building enterprises have been shown in tables, where enterprises are ranked by groups, in descending order of the value of the competitiveness coefficient.

TABLE 1. INDICATORS OF COMPETITIVENESS OF MACHINE-BUILDING ENTERPRISES OF SVERDLOVSK REGION

Enterprise groups	2013	2014	2015	2016
	K	K	K	K
“Large” enterprises				
Sverdlovsk Plant of Current Transformers	1.430	1.895	2.122	2.288
Ural Diesel Engine Plant	0.776	0.888	0.626	0.639
Ventprom	1.962	0.680	2.003	1.254
Uralkhimmash	0.799	1.044	0.794	0.678
Ural Locomotives	1.812	1.732	1.442	1.370
Uralgidromash	1.221	0.467	0.774	1.335
UralMashPlant	0.373	0.405	0.329	1.049
Uralelectrotyazhmash	0.892	0.722	2.193	0.939
Ural Turbine Plant	1.186	1.926	0.892	0.820
Elmash	1.388	0.395	1.205	0.956
“Medium-sized” enterprises				
Sverdlovsk Instrument Plant	1.347	1.390	1.350	0.943
Uralelectromash	1.824	1.497	1.507	1.107
Karpinsk Electrical Engineering Plant	0.961	0.701	1.470	0.852
Regional Center of Laser Technologies	1.184	0.989	1.424	1.026
Kosulinsky Abrasive Plant	1.369	0.899	0.741	0.729
Ural Compressor Plant	1.071	0.997	0.877	1.090
Uralburmash	0.714	0.596	0.503	1.334
NTEAZ Electric (Nizhnyaya Tura Electrical Equipment Plant)	0.802	1.610	1.225	1.024

TABLE 2. INDICATORS OF COMPETITIVENESS OF MACHINE-BUILDING ENTERPRISES OF SVERDLOVSK REGION.

Enterprise groups	2017			
	K_R	K_I	K_F	K
“Large” enterprises				
Sverdlovsk Plant of Current Transformers	0.9 98	0.8 29	2.3 96	1.9 83
Ural Diesel Engine Plant	0.8 51	1.5 69	0.8 91	1.1 89
Ventprom	1.0 07	0.6 27	1.8 81	1.1 86
Uralkhimmash	0.9 61	1.2 54	0.9 72	1.1 71
Ural Locomotives	1.1 02	0.8 92	1.1 49	1.1 30
Uralgidromash	1.0 00	1.0 68	1.0 30	1.1 01
Uralmashplant	0.8 96	1.2 61	0.9 01	1.0 18
Uralelectrotyazhmash	0.9 90	1.0 02	0.9 93	0.9 85
Ural Turbine Plant	0.9 98	0.9 57	0.9 80	0.9 36
Elmash	0.9 63	0.8 66	0.9 66	0.8 06
“Medium-sized” enterprises				

Enterprise groups	2017			
	K_R	K_I	K_F	K
Sverdlovsk Instrument Plant	1.0 05	1.3 01	1.1 96	1.5 64
Uralelectromash	1.1 06	0.9 16	1.3 56	1.3 74
Karpinsk Electrical Engineering Plant	1.0 61	1.2 83	1.0 07	1.3 70
Regional Center of Laser Technologies	1.0 14	1.1 95	0.9 61	1.1 64
Kosulinsky Abrasive Plant	1.0 06	0.9 94	1.1 03	1.1 03
Ural Compressor Plant	1.0 32	0.9 45	0.9 51	0.9 27
Uralburmash	0.8 60	1.3 84	0.7 38	0.8 78
NTEAZ Electric (Nizhnyaya Tura Electrical Equipment Plant)	1.0 03	0.4 04	1.0 62	0.4 31

According to the results of 2017, the clear leader of the first group is Sverdlovsk Plant of Current Transformers. The main source of competitiveness of this company is its high financial sustainability ($K_F = 2.396$). The Ural Diesel Engine Plant, Ventprom, Uralkhimmash, and Ural Locomotives also demonstrate a relatively high level of competitiveness. According to the results of 2017, a number of machine-building enterprises of this group have insufficient competitive positions. In this context, measures to increase their competitiveness, including on the basis of state industrial policy mechanisms, are particularly relevant for Uralelectrotyazhmash, Ural Turbine Plant, and Elmash.

The results of the competitive status assessment of “medium-sized” machine-building enterprises have shown that the maximum coefficient of competitiveness, due in large part to the sales dynamics ($K_I = 1.301$), is observed at the Sverdlovsk Instrument Plant. In terms of balancing the sources of competitive advantages, the most stable one should recognize the competitive status of the Karpinsk Electrical Engineering Plant. The high level of Uralelectromash competitiveness is due to its significant financial stability ($K_F = 1,356$).

V. CONCLUSIONS

The calculations have confirmed the versatility and efficiency of the dynamic method, which provides a quantitative assessment of the enterprise competitive status, as well as allows monitoring of factors and sources of its competitiveness in conditions of high speed technological and organizational changes. The assessment results can be used as a basis for developing a “roadmap” of measures to increase the competitiveness of business entities, select counterparties for joint business activities, and substantiate mechanisms for state regulation of structural changes in the industry markets and in the economic space of the region.

It should be noted that it is advisable to conduct a competitive analysis of machine-building enterprises at the next stage of monitoring, conducted at the microeconomic level, in comparison with direct competitors in relevant markets, including the international aspect. Moreover, the dynamic approach can be used to predict the competitive status of

enterprises under study and repositioning their competitive advantages.

VI. RESULTS AND DISCUSSION

Dynamic monitoring of the competitiveness of non-public enterprises should be considered as an important innovative component in the management of the neo-industrial development of regional and sectoral systems. The results of the sectoral assessment at the meso-economic level can be considered for enterprises that are members of the Union of the Machine-Building Enterprises of Sverdlovsk Region, NP, as a “club good”—an information resource, which is a prerequisite for clarifying the priorities of the strategic development of the regional association in the sectoral product markets, as well as lobbying its interests in inter-sectoral competition in the region’s labor and capital markets, developing measures to implement innovative technological re-equipment projects, including on the basis of the possibilities of the digital economy. At a later stage, the competitive status of each of the interested machine-building enterprises should be assessed by comparing its key indicators with the corresponding indicators of enterprises that are direct competitors, which corresponds to the modern principles of value-oriented management of the technological development of the industry and the region [17].

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