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Research and analysis of imperfect competition in the Russian labor market and its projected development

KEYWORDS
imperfect competition model; social and labor relations; labor market segmentation; employment; negative socio-economic phenomena; features of competitive processes; competitive environment components; competition development; government regulation; competitive behavior; competitive conditions

ABSTRACT

Introduction. The relevance of the study lies in the fact that the spreading negative socio-economic phenomena of the Russian labor market, such as poverty of the working population, inequality in the income distribution, etc., intercept the reproduction of the labor force, reducing its quality and introducing undesirable structural changes. The reasons for the manifestation of negative socio-economic phenomena in the Russian labor market are based on the principles of imperfect competition in social and labor relations. Specifically, the social and labor relations of labor market subjects have no mutually beneficial basis and are most often aimed at satisfying the economic interests of the employers and infringing on the socio-economic interests of the employees, as well as the fact that the employees are required to have the manpower quality specifications that they lack or the employees have the manpower quality specifications that are not demanded by the employer, i.e. the labor market. The aim of the study is the quantitative assessment of the manifestation degree of imperfect competition in the Russian labor market with the possibility of predicting its spread to social and labor relations, with the subsequent development of conceptual solutions to regulate the imperfect competition in the Russian labor market.

Materials and Methods. A set of methods of statistical and mathematical research is used for the purposes of this study. Mathematical modeling of imperfect competition is carried out by methods of probabilistic and vector analysis. The empirical study of imperfect competition is carried out by the method of statistical observation.

Results. The result of mathematical modeling and statistical research of imperfect competition is the conclusion about the cyclical development of competition in the Russian labor market, where the cyclical change occurred in 2008 and 2016 and was largely determined by the general trend of the country's economic development and the ongoing crisis phenomena. Relatively sustainable development of competition is observed pertaining to a territorial feature, since there is almost no change in segment groups as a result of cyclical development of competition, which can be successfully interpreted as inertia (stagnation) in the development of competition. The set of measures taken by the state for the development of competitive processes in social and labor relations and regulation of the competitive environment in the Russian labor market is characterized by its insignificant impact on the segment structure and features of competitive processes and components of the competitive environment, as well as by the ineffectiveness of the implemented measures for government regulation.

Discussion and Conclusion. The preservation and spread of the influence of the imperfect competitive processes and imperfect competitive conditions for the specified features and components are predicted in the Russian labor market. The use of quantitative indicators of imperfect competition is one of the methods for the performance evaluation of state regulation of imperfect competition in the Russian labor market.

INTRODUCTION

In the modern Russian labor market, social and labor relations are accompanied by negative social and economic phenomena. One group of negative phenomena includes the poverty of the working population, inequality in the income distribution, discrimination in wages, shadow forms of labor and employment remuneration, illegal and interregional migration, and labor exploitation. Another group of phenomena includes the shortage or excess of personnel. These factors determine the imperfect nature of competition in the Russian labor market [24].

The imperfection of competition in the Russian labor market manifests itself in the fact that the social and labor relations of labor market subjects have no mutually beneficial basis and are aimed mostly at satisfying the economic interests of the employers and infringing on the social and economic interests of the employees. Moreover, the employees are required to have the manpower quality specifications that they lack or the employees have the manpower quality specifications that are not demanded by the employer, i.e. the labor market [8, 19].

An analysis of the current imperfect competitive situation in social and labor relations showed that the features of competitive behavior of the employees and the employers in the labor market became aspects of manifestation of negative socio-economic phenomena in the labor market, namely, the infringement of social rights and guarantees of the employees, deterioration of working conditions of the latter. At the same time, the conditions for the competitive presence of the employees in the labor market, namely, the discrepancy between the professional and qualification level of employees, the lack of the necessary manpower in the labor market are the aspects of negative socio-economic phenomena of the labor market [1; 13].

Quantitative analysis and assessment of the degree of the imperfect competition manifestation in social and labor relations in the Russian labor market are among the most effective methods for assessment of the impact of competitive factors on the Russian labor market. In this regard, a relevant scientific argument is the construction of a mathematical model able to describe the imperfect competition in the labor market, quantitatively expressing the patterns and features of its manifestation and factor influence on the Russian labor market.

The conceptual aspect of the application of statistical and mathematical analysis methods to competition modeling is that the concept of "competition" is characterized by the relativity of its manifestation; therefore, the use of the probabilistic method (p) of competition modeling is substantiated. The use of probabilistic analysis methods most fully renders possible to reflect the essence of the concept of competition, but at the same time, the use of continuous analysis methods makes it difficult to model social processes of static nature. In this regard, it is proposed to model the competition by probabilistic models using discrete analysis methods.

The results of mathematical modeling and statistical research of imperfect competition are the conclusions about its impact on social and labor relations, as well as its development forecast until 2025.
MATERIALS AND METHODS

Mathematical modeling of labor market competition involves the use of a complex of methods of probabilistic, vector, and static-dynamic analysis in correlation (in the system). The application of a systematic approach to mathematical modeling is due to the epistemological complexity of the economic category of "competition", the essence of which is revealed conceptually by the categorical structure: the concepts of "competitive environment" and "competitive conditions", as well as the concepts of "competitive processes" and "competitive behavior"; and the dialectics of the trilogy of the concepts of "competition", "competitive advantage" and "competitiveness" [3; 4].

The mathematical model describing the competitive environment of subjects' presence in the labor market is the vector function of a random argument:

$$\vec{K} = \{p(x); q(y); g(z)\};$$

$$p(x) = \{p_1(x); p_2(x); p_3(x)\},$$

$$q(y) = \{q_1(y); q_2(y); q_3(y); q_4(y)\},$$

$$g(z) = \{g_1(z); g_2(z); g_3(z)\}$$

where $p_i(x)$ — health, $q_j(y)$ — education, $g_k(z)$ — labor mobility, where the argument of the vector function is the probabilities of elementary events considered by districts of the Russian Federation by groups of regions and given for a calendar time interval (development cycle).

The mathematical model describing competitive processes in the labor market is the vector function of a random argument: $\vec{K} = \{p(t); q(t); g(t)\}$, where $p(t)$ — social guarantees and labor rights, $q(t)$ — government regulation; $g(t)$ — content, condition and labor protection.

$$\begin{align*}
&x_i = \xi_i(t) \\
y_j = \sigma_j(t) \text{ and} \\
z_k = \delta_k(t)
\end{align*}$$

where the argument of the random function is $t$ — time, and the value of the argument is a random variable $(x_i, y_j, z_k)$, considered at the moment (or for a period) of calendar time and given by the group of districts of the Russian Federation, and the elements of the transition array are the probabilities of transitions of elementary random events considered at the moment (or for a period) of calendar time and given by the group of districts of the Russian Federation.

The results of mathematical modeling of the competitive environment (competitive conditions) of the labor market are the systems of analytical indicators characterizing the competitive environment and competitiveness, their graphical interpretation, obtaining a competitiveness rating and mapping of the regional labor markets (the regions of the Russian Federation). At the same time, the results of mathematical modeling of the competitive processes (competitive behavior) are the systems of analytical indicators that describe competitive processes and competitive advantages, their graphical interpretation (graphs of states of competitive processes), and the competition development forecasting by extrapolation of the revealed trend.
The practical application of the results of statistical and mathematical competition modeling is manifested in the prediction of the development of competitive situations in the Russian labor market, in the assessment of competitive advantages and competitiveness of labor market actors, as well as in building theoretical and empirical models of competition (ranking and mapping of competitiveness, establishing standards or determinants of competitiveness, development of strategies for competitive behavior and description of competitive behavior models) [20].

The primary stage of the algorithm of empirical research and analysis of competition in the labor market is the research and analysis of the cyclical development of competition, the secondary stage is the research and analysis of the homogeneity of competition development in the considered population, and the third stage is the statistical and mathematical modeling of competition, which involves the mathematical analysis of indicators of competitive states.

Statistical and mathematical research of imperfect competition in the Russian labor market involves the analysis of a system of statistical indicators grouped into two groups – the indicators describing the course of competitive processes in the system of social and labor relations and indicators characterizing the competitive environment in the Russian labor market [6].

The mathematical model of imperfect competition in social and labor relations can be represented by a system of probabilistic indicators of the competitive behavior of the employees describing, first, the state of compliance with respect to "social guarantees and labor rights" of the employees, including the following indicators: the probability of social protection of this part of the economically active population; the probability of unemployment of this part of the economically active population; the probability of participation of this part of the economically active population in labor disputes; the probability of participation of this part of the economically active population in strikes.

Second, the indicators describing the state of the implemented government measures aimed at regulating social and labor relations include the indicators of the probability of employment by the enterprises with private, mixed, and foreign ownership of the employees, engaged in the formal and informal sectors of the economy; the probability of employment in the "small business" sector of the employees, engaged in the formal and informal sectors of the economy; the probability of employment in the informal sector of the economy of some employees, engaged in the formal and informal sectors of the economy; the probability of employment by public and religious enterprises of some employees, engaged in the formal and informal sectors of the economy; the probability of employment in the municipal and state sectors of some of the employees, engaged in the formal and informal sectors of the economy.

Third, the indicators describing the state of "content, conditions and labor safety" of the employees include: the probability of that some of the employed workers will work in normal working conditions; the probability of that some of the employed workers will work in difficult working conditions; the probability of that some of the employees will work in harmful and hazardous working conditions; the probability of that some of the employed workers will experience an accident followed by temporary disability; the probability of that some of the employed workers will experience a fatal accident.
Moreover, the mathematical model of imperfect competition can be represented by a system of probabilistic indicators of the conditions of presence of the employees in the Russian labor market characterizing, first, the health requirements of the employers to the employees, including the probability of that a part of the population of working age will die; the probability of that a part of the population of working age will fall ill and will be temporarily disabled; the probability of that a part of the working-age population will be healthy.

Second, the indicators characterizing the requirements of the employers in terms of education include: the probability that a part of the employed population will have a higher education; the probability of that a part of the employed population will have a secondary vocational education; the probability of that a part of the employed population will have primary vocational education; the probability of that a part of the employed population will have no vocational education.

Third, the indicators characterizing the requirements of the employers in terms of labor mobility include the following indicators: the probability of that a part of the population will be enrolled in the enterprises; the probability of that a part of the population will leave the enterprises; the probability of that a part of the population will remain employed [14].

The method of mathematical analysis of competition indicators (competitive states) involves the analysis, first, in regard to the elements of the probabilistic space, namely in relation to random variables and the probabilities of outcomes of random events. Second, in relation to the system of numerical characteristics of probability spaces (generalizing indicators) — mathematical expectations and dispersions. Thirdly, in relation to the laws of probability spaces — table of the laws of random distribution of variables. Fourth, in relation to the system of transitions of probability spaces — the array of intensities and probabilities of transitions of random events. Fifth, in relation to graphs of transitions of random events and graphs of the distribution of random variables in probability spaces — hodographs (tendencies) of random variables. Sixth, with regard to forecasts and generalizations (interpretation) of the development of elementary random events in probabilistic spaces, extrapolation of trends or distribution density, features of competitive advantage or components of competitiveness, ranking and mapping of administrative districts of the Russian Federation, development vectors or states.

**RESULTS**

The cyclicity analysis of competition development in the Russian labor market showed that the change in trends in competitive states indicators (levels of time series) of the features of competitive processes and components of the competitive environment fell on 2008 and 2016, and was largely determined by the general trend of the country’s economic development and ongoing crisis phenomena. Moreover, the critical year 2008 on the Russian labor market is due to the impact of the global financial and economic crisis, and the critical year 2016 is due to the sanctioned foreign policy pursued by Western countries in relation to Russia since 2014 [16].
The segmentation analysis of competition development in the Russian labor market showed that the distribution of the aggregate of statistical indicators by federal districts for each period of competition development was not uniform. The values of statistical indicators were in the range of 3.61–7.32 times the maximum value over the minimum value. The homogeneous conditions for competition development are observed in the following federal districts: Southern, North Caucasian, Far Eastern – Segment No. 1; Northwestern, Ural, Siberian – Segment No. 2; Central, Volga Federal Districts – Segment No. 3. At the same time, competition development is relatively stable, since the change of segment groups due to cyclical competition development observed in 2008, where the transition of the Northwestern Federal District from the first to the second segment group was noted, as well as the transition of the Volga Federal District from the second to the third segment group [17].

The noted property of the relative stability of competition development can be successfully interpreted as inertia (stagnation) in the development of competition. This state can be observed in cases of incomparability of economic, demographic, social, and other economic conditions, or in the absence of effective regulatory mechanisms of the labor market across federal districts. The latter implies that the regional markets do not implement goal-setting strategies for the competitive behavior of the employees and do not assess the competitiveness of the employees, followed by the implementation of the predictive function of state regulation of the domestic labor market [5; 12].

The analysis of the segmentation diagrams of competition in the Russian labor market showed that the federal districts that formed Segment No. 3 accounted for about 50% of the segment structure. This means that half of the able-bodied population of Russia lives and works in the territories of the Central and Volga Federal Districts. The rest of the structure indicators is distributed between the Northwestern, Southern, and Siberian Federal Districts – 35% and the North Caucasian, Ural, and Far Eastern Federal Districts – 15% (see Figures 1, 2).

**Figure 1** Segmentation diagram for the development of a competitive environment
The result of the mathematical analysis of the indicators of competitive states, characterizing the course of competitive processes in the Russian labor market for the period of 2009–2018, and the competition development forecast until 2025 allowed obtaining the following conclusions [8]. The set of measures implemented by the state for the development of competitive processes in social and labor relations in the Russian labor market is characterized by its insignificant impact on the segment structure and features of competitive processes and can be characterized by the ineffectiveness of the implemented measures as well [10; 11].

The development of competitive processes is influenced by general market factors (external), namely as a result of the implementation of individual strategies for the competitive behavior of the labor market actors. The improvement of the imperfect competition in social and labor relations is expected until 2025.

The dynamics and forecast of the development of competitive processes are observed for all segments. For the "social guarantees and labor rights – social and labor relations" component, a slight increase in the dynamics of the probability that social rights and guarantees of the economically active population will not be violated is expected. The probability of the presence of the economically active population in this competitive state by the end of 2025 amounts to 96% and the growth up to 101% by 2018 is expected. Moreover, a downward trend is expected in the probability that a part of the economically active population will be unemployed, where the probability of an outcome by the end of 2025 equal to 3.5% and a decrease by 67% by 2018 are expected.

For the "state regulation" component, increasing dynamics of the probability of employment of the population at enterprises with private, mixed, and foreign ownership are predicted,
where the probability of an outcome by the end of 2025 will be 59.2% and an increase by 2018 will be 106%. At the same time, insignificant dynamics of employment of the population in the "small business" sector are predicted, where the probability of an outcome by the end of 2025 will be 5.9% and a decrease by 2018 will be 96.8%. Increasing dynamics of the probability of employment of the population in the informal sector of the economy are predicted, where the probability of an outcome by the end of 2025 will be 19.7% and an increase by 2018 will be 110.8%. A downward trend in the probability of employment of the population in enterprises with state and municipal ownership is predicted, where the probability of an outcome by the end of 2025 will be 15% and a decrease will be 74.2% by 2018.

For the "content, conditions and labor safety" component, a downward trend in the employment of the workers by the enterprises with normal working conditions is predicted, where the probability of an outcome by the end of 2025 will be 65% and a decrease by 2018 will be 88.4%. Increasing dynamics of the probability of employment of the population at enterprises and enterprises with difficult working conditions are predicted, where the probability of an outcome by the end of 2025 equals 10.7%, and an increase by 2018 amounts to 135%. Increasing dynamics of the probability of employment of the population by companies and enterprises with hazardous and harmful working conditions are predicted, where the probability of an outcome by the end of 2025 will be 24%, and an increase by 2018 will be 131%.

The result of the mathematical analysis of indicators of competitive states, characterizing the conditions of the competitive environment in the Russian labor market for the period of 2001–2018, and the forecast of the competition development until 2025 allow obtaining the following conclusions. The set of measures taken by the state to regulate the competitive environment in the Russian labor market is characterized by its insignificant influence on the segment structure and on the components of the competitive environment and can be characterized by the inefficiency of the measures being implemented as well [13].

The ineffectiveness of state regulation of the competitive environment in the Russian labor market is forecasted until 2025.

For the "Health" component, a slightly decreasing trend is predicted in the probability that the incidence of sickness among workers will increase, and by the end of 2025 the probability of the working-age population in this competitive state will be 77%, and the decrease by 2018 will be 99%. Increasing dynamics of the probability of the working-age population staying in a healthy state are also predicted, which will amount to 22% by 2025, and the growth by 2018 will amount to 106%.

**DISCUSSION**

In the Russian labor market, the preservation and spread of the influence of imperfect competitive processes and imperfect competitive conditions are predicted for the selected features and components. In this regard, it is expected that the spread of negative socio-
economic phenomena of the domestic labor market will continue to increase, which implies the further preservation of a sustainable regional segment structure and the possibility of its change only due to interregional migration flows [9].

The development of competitive processes in social and labor relations is expected in the direction of increasing the social protection of workers, increasing the employment of workers at enterprises with private, mixed, and foreign ownership in all segments, which characterizes the positive side in the development of competition. Moreover, an increase in the employment of workers with difficult working conditions is expected, which characterizes the negative side in competition development. In this regard, the development of competitive processes is predicted under the influence of external factors, conditioned by individual competitive strategies by the behavior of subjects of the labor market.

The competitive environment development in the Russian labor market is expected in the direction of reducing the incidence of workers and increasing the likelihood of workers being in a "healthy" state, increasing the education of workers, increasing the likelihood of employment for employees with higher education and reducing the likelihood of employment of employees with secondary and primary vocational education, increasing the permanent employment of employees at the enterprise and reducing the likelihood of hiring employees and maintaining the likelihood of employee retirement. In this regard, the development of the competitive environment is predicted under the influence of external factors, the state regulation of which is of a preventive nature and is aimed at elimination of the existing negative socio-economic phenomena of the labor market and neglecting the future development of events in the labor market.

In this regard, further preservation of the competitive segment structure is predicted and the ineffectiveness of government measures in imperfect competition regulation in social and labor relations is expected with a further increase in negative socio-economic phenomena in the domestic labor market.

**CONCLUSION**

Statistical and mathematical modeling of imperfect competition and obtaining the criteria of features-indicators and components-indicators of competitive states finds its practical application in the quantitative description of competitive processes in social and labor relations and competitive conditions for the presence of subjects in the Russian labor market, with the subsequent assessment of the effectiveness of the implemented measures on the state regulation of the domestic labor market, and forecasting the development of imperfect competition in social and labor relations in the Russian labor market. The forecast of the imperfect competition development in terms of quantitative indicators showed a further increase in imperfect competition in social and labor relations.
REFERENCES


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