JUSTIFICATION OF THE ECONOMIC MODEL OF LABOUR FORCE FORMATION

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ABSTRACT: *The formation of the economic model of the labor force is associated with the need to assess the system of external and internal factors of the labor market. In the context of intensifying intercountry integration, the problem of describing the process of forming the labor force is also associated with the processes of labor mobility, its changes, as well as the formation of new forms of both employment and labor mobility. The aim of the article is an attempt to evaluate the possibilities of economic modeling of the process of forming the labor force, to identify a number of key trends that are characteristic of it in the current socio-economic conditions.*

Keywords: math justification, modeling, social and economic factors, labor force, economic model, labor market

1. INTRODUCTION

Russian economy reforming in general and the Russian labour market reforming in particular were marked by a period of revealed structural imbalances that manifested themselves in specific forms of employment and unemployment. It is particularly worth noting the changes that occurred in the emerging youth segment, associated with a change in the attitude of society to the system of vocational training and distribution of labour and its assessments in general.

The disproportions in the labour market during the period of reforms in Russia in many respects focus on economic prerequisites, but today, apart from the economic component, the problems of employment and unemployment are also acute social issues that must be solved with the help of a properly established policy of all social institutions involved in regulation and formation of integrated links between the labour market and the education sector, and this should be done to minimize structural imbalances on the modern Russian labour market.

The table data on the distribution of the employed population by industry show not only the dynamics of changes in the economic activity of individual economic sectors, but also the nature of changes in the demand for labour in a given period, and, accordingly, the structure of employment [1]. In this regard, it is worth noting industries with a fairly stable distribution, such as: education, health care. Steadily increasing employment is shown in: mining, transport, financial, construction industries. And also there are those that demonstrate a decline in employment which may be caused not so much by the decline in output, but by the technological modernization of industries, among them are agriculture, manufacturing [1, 2].

Thus, the period of economic reforms in Russia can be characterized in general as a period of rapid employment decline in industrial enterprises. The non-rational ("non-market") sectoral structure of the economy created disproportions in the labour market, expressed, among other things, in structural unemployment.

2. METHODOLOGY: ASPECTS OF ECONOMIC MODELING

Conducted content analysis, analysis of statistical sources, application of regression estimation methods to empirical and statistical sources, and identification of attractors of observations by determining regressors allow to evaluate the economic model of labour force formation as a dynamic socio-economic system with established trajectories of economic behavior of economic entities included in this model, with the available distribution of motivational factors and investment expectations, with defined social and economic characteristics of the benefit realized within the intersection of the market of educational services of higher professional education and the labour market.

In this regard, the dominant economic field for studying is determined by the youth segment of the labour market, which, on the one hand, creates a demand for higher education services, thereby determining the quality of the labour force with investment expectations and economic preferences for selecting vocational training directions.

In this connection, the currently observed phenomena of the sect oral distribution of labour are largely similar to the economic needs of the market, and the consumer behavior of labour resources with respect to the quality, volume and specialization of the labour force is in line with the potential demand of the labour market and at the same time is economically justified by the rationality of consumption.

A distinctive feature of the formation of the labour force economic model is its untypical distribution, supposedly paralleled with the economic dynamics in general. In this regard, it is worth noting a significant contribution of the social model of labour formation to the formation of consumer behavior in relation to the vocational education benefit.

The value orientations of the choice of educational programs associated with the social transformation of society in the early 1990s allowed the economically correct formation of the consumer choice of labour resources in the end, with the stabilization of the economy and society as a whole. And although in the period of 2000-2006 the higher professional education benefit was viewed from the standpoint of Veblen's benefits with a high degree of demonstrative behavior, the main consequences of the so-called Dutch disease due to resource dependence of the economy during this period did not manifest in the Russian economy and society, and when the production trajectory and distribution of benefits took place, rational consumption of this benefit was formed [3].

Thus, the economic model of labour force formation can be defined as follows.

The economic model of the labour force formation is represented by the variable explained - it is the volume of consumption of the higher professional education benefit endowed with the properties of the economic public and private benefit and characterized by the appropriate economic properties of rational choice, consumption, and regressors: per capita income of the population, distribution of the population's expenditures, share of the higher professional education benefit in the consumption structure. The labour formation economic model is determined in the economic field of the youth segment of the labour market and the result of its functioning from the economic point of view is the formation of quality and competitive labour force. The result of the functioning of the labour force formation economic model is the quality of life of labour resources [4].

The economic model of the labour force formation proceeds from the general econometric prerequisites for constructing regression models and presents the following general requirements for regressors and the explained variable:

- the dependence has a linear form
- number of observations exceeds the estimated coefficients
- mathematical expectation of an error with fixed regressors is zero
- there is conditional homoscedasticity
- there are conditional uncorrelated random errors
- vectors of individual observations are independent and identically distributed
- there are no linearly dependent regressors
- evaluations are effective and unbiased

Economic assessments of the consumer choice of the higher professional education benefit were presented on the basis of the analysis of transformation and stabilization period of economic and social reform. In these assessments, demographic prerequisites that influence the empirical base play an important role, as well as economic properties in the production and distribution of the benefit in question.

3. MODEL SPECIFICATION

The economic model of the formation of labor can be defined as follows.

The economic model of the formation of the labour force represented a dependent variable – consumption of the good "educational services of higher professional education" who have the characteristics of economic public and private benefits and is characterized by relevant economic properties of rational choice and consumption, and the regressors: the average per capita income, distribution of expenditures, the share of inclusion good "educational services of higher professional education" in the structure of consumption. The economic model of the formation of labor determined in the economic field, the youth segment of the labor market and the result of its functioning from an economic point of view is the formation of high-quality and competitive labour force. A result of functioning of the economic model of the formation of the workforce is the quality of life of the workforce.

Economic evaluation of consumer choice of benefit "educational services of higher professional education" was presented on the basis of the analysis of the period of

transformation and stabilization of the economic and social reforms. In these estimates no small role, and demographic preconditions that affect empirical base, but also on the economic properties of the production and distribution of considered good.

4. JUSTIFICATION OF MODEL

On the one hand, the economic modeling of the processes of labour force formation determines the social prerequisites for changing the value of higher professional education in the consciousness of society, and this predetermines the social background of consumer choice; on the other hand, economically the consciousness of modern society proves the influence of the basic criteria of rational choice on consumer preferences, including the view of educational services of higher professional education as an economic private and public benefit, and demographic prerequisites are the basis for the formation of the consumer sector of higher professional education services market. All three aspects of the process under consideration are separately defined as the social, economic and demographic models of the formation of the labour force, respectively. Their actual interaction allows one to make a conclusion about the invariable qualitative integration within the framework of a complex dynamic socio-economic system, as well as the possibility of a qualitative and holistic description only when considered within the system [5, 6].

Socio-economic modeling is a complicated process of possible application of mathematical methods to data analysis due to the variability and instability of the described subject and especially its interrelationships with other agents of the socio-economic field beyond which the phenomenon in question can be completely different in its behavior from those described under the conditions of modeling characteristics.

The term "model" is derived from the Latin word "modelus", which means "measure". In a broad sense, models are conditional copies of the object of research in its essential and process state, while any socio-economic modeling is built on the basic principles, the key one being the principle of other things equal in the subject under consideration. The use of this principle makes it possible to model complex socio-economic phenomena that are in permanent variability. The construction of a "measure" of the phenomenon makes it possible to form a certain pattern having studied its components and their interrelations for further comparison with a given measure of emerging research objects.

Principles and methods of mathematical modeling are mainly used in the development of socio-economic models. "Mathematical modeling means describing an economic phenomenon through mathematical justification. Despite the complexity of accurate reflection of the depth and complexity of the object under study, it is possible to make the most complete estimates with the help of a mathematical apparatus"[2][7].

Among the main types of economic models the following ones can be identified: prognostic, planned, production, often using certain parametric families of probability distributions including normal distribution, logarithmic distribution, gamma distribution, Weibull-Gnedenko distribution, etc. built on general functional parameters

with the definition of included independent factors: $y = f(o, z, u)$ and dependent factors: $y = f(x_1, x_2, x_3)$. Linear modeling is the most widespread tool in economic analysis at macro and micro levels, as well as in social disciplines, therefore, it is possible to model relatively uncomplicated phenomena and processes in the simplicity of calculations: $y = a_0 + a_1 x_1 + a_2 x_2 + ... + a_n x_n$, however, it requires additional justification of the parameters with the probability of obtaining inaccurate estimates. More complex models include those based on the principles of power, differential, graphic forms [9].

Results of economic and mathematical modeling range from simple analysis to the development of management decisions including issues of forecasting certain processes. When building a model, it is necessary to observe certain rules without which the model will be inaccurate or incomplete. Among such rules one can identify the following: inclusion or non-inclusion of nonessential variables in the model, inadequate estimation of model parameters, incorrect definition of the functional dependence of the accepted criterion on managed and unmanaged variables [8].

Estimates of homoscedasticity in the process of modeling, that is, homogeneity of variability in the values of observations, express the level of relative stability, homogeneity of variance of the random error of the regression model.

After constructing a mathematical model of a real phenomenon or a process, the question arises of its applicability and stability of its results.

For some material construction to be a model, that is, for it to establish the relationship between the simulated phenomena and their real reflection, a similarity relation is defined. There are different ways of establishing such similarity, which gives models features specific to each method.

As a rule, in socio-economic modeling, we talk about the study of fluxes of variables, that is, time series [10]. For modeling trends, the method of analytical equalization is used with the use of linear functions, parabola, power function, hyperbola,

For long statistical lists of indicators, the notion of "time series" (or a series of dynamics) is introduced. It is statistical material collected at different instants of time about the meaning of any parameters (in the simplest case of one) of the process under study.

The criteria for assessing the modeling of the time series are individual statistical indicators, namely: graphical image, min approximation error, estimation of R2 statistics, autocorrelation coefficients, etc.

In socio-economic modeling, forecasting of events is carried out mainly through extrapolation, which is based on the transfer of past events and trends to the future. The extrapolation method used in this case is called "evolutionary" and describes slowly changing events. In the context of socio-economic modeling, taking into account the use of the dominant principle "all other things being equal", the evolutionary nature of the changes in the phenomena analyzed is subject to the specified conditions. The limitations imposed by this method on the analysis of time series are as follows: limitations on the presentation of data, limitations on the amount of data, limitations on the length of the dynamic series, etc. Inadequate observance of

these three limitations is the prerequisite for distorting the results of socio-economic modeling, determining the model obtained as being not similar to the general population.

The time series is defined functionally: y = y(t), and is represented by the sequence y1, y2, y3, ... yn, where:
yi (i = 1, n) is the level of the series that characterizes the magnitude of the phenomenon;
i is the moment of time to which this magnitude of the phenomenon belongs;
n - duration or total number of members of the series;
y1 - entry level;
yn - final level.

The level of time series can be expressed by absolute, average and relative values.

Despite the fact that, depending on the frequency of recording the fact, time series are divided into discrete and continuous ones, modern methods of statistical analysis of time series are based on the hypothesis of their continuity.

In addition to analyzing time series, socio-economic modeling can be based on the principles of variance analysis. Variance analysis or "variance" (translated from Latin "dispersio") has the English designation ANOVA (Analysis of Variance), it is used to study the effect of one or more qualitative variables (factors) on one dependent quantitative variable. In this connection, variance analysis is based on the assumption that some variables are considered as causes (factors) and others are consequences (dependent variables).

Socio-economic modeling often needs to describe the quality variable as a dependent variable, the influence on the formation and change of which is exerted by both quantitative and other qualitative variables (factors), which requires additional criterion evaluation of the analysis.

In fact, variance analysis is based on the study of the differences between the averages by comparing the variances.

The essence of the variance analysis lies in the dismemberment of the general variance of the feature under study into individual components conditioned by the influence of specific factors, and testing hypotheses about the significance of the influence of these factors on the tested feature. By comparing the variance components with each other basing on Fisher's criterion, it is possible to determine what proportion of the overall variability of the outcome is due to the activity of the regulated factors.

Initial material for variance analysis is the data from three or more samples which can be either equal or unequal in number, whether connected or disconnected. In terms of the number of detected controlled factors, the variance analysis can be one-factor analysis (in this case, the influence of one factor on the experimental results is studied), two-factor (in studying the influence of two factors), and multifactorial analysis (allows to estimate not only the influence of each of the factors separately, but also their interaction).

An important refinement for the possibility of using variance analysis in socio-economic modeling is that it belongs to the group of parametric methods and therefore it should be applied only when it is proved that the distribution is normal.

The empirical basis used for possible analysis in socio-economic modeling using time series or variance analysis requires a primary justification for the homogeneity of the population or the representativeness of the sample used for the analysis.

Similarity of all units of the population by some criterion and dissimilarity by all the others are called qualitative homogeneity. In the statistical population, the differences of one unit of the aggregate from the other are often quantitative in nature. Quantitative changes in the values of the property of different units of the population are called variations.

Reliability of the conclusions drawn depends on representativeness of the sample, that is, completeness and adequacy of the representation of the properties of the general population, in relation to which this sample can be considered representative. That is, the sample described with the help of socio-economic modeling methods is a model similar to the general population, taking into account the attribute "all other things being equal" and, due to a number of unaccounted parameters of choice, this model may be different in its essential expression from the general population or substantially distort it, which can be taken into account in error estimates.

Socio-economic modeling seems to be a poorly described phenomenon due to the studied objects. The complexity of socio-economic modeling is associated with the complexity of socio-economic networks in the functioning of which the phenomenon or process chosen for analysis is considered. The lack of stability of the subject under study makes it impossible to assess similarity of the general population, which is associated with the appearance of a number of errors; in this regard, socio-economic modeling is a process exclusively constructed in accordance with the principle of limitation, taking into account the principle "all other things being equal" when defining the subject, description of the sample, description of the prerequisites and modeling conditions, model quality estimates, error estimates and conditional prediction with an estimate of qualitative characteristics of probability of certain events. In this regard, the statistical base, or the monitoring period, should have a sufficient time series, and the forecast estimates should be short-term.

5. CONCLUSION

The general economic and demographic results of the received materials of economic modeling aimed at defining consumer demand for the benefit called "higher professional education services" and demographic preconditions of labour formation for the period of 1992-2015 are as follows:

- the formation of new relations based on the principles of the gradual transition of the national economy to the formation of postindustrial information society presupposes construction of new mechanisms for interaction of labour resources and employers;
- in the course of the reforms labour market disparities caused by the instability and underdevelopment of the economy as a whole were revealed, in particular, the problem of structural unemployment was clearly identified;
- labour resources, unlike other resources of the economy, are burdened with a social component that is significant in the process of their regulation. The very process of production activity of any country is represented by a system of use and distribution of available resources, including capital resources largely dependent today on the level and nature of innovation activities of individual organizations and the policy of modernization of states

as a whole, as well as the nature of social policy pursued by the state, including the framework of the process of labour formation and distribution. In this connection, conjuncture of the labour market is understood as several interdependent systems: industrial and social ones;

- at present, the growth in the enterprises' needs in the workforce only partially implies an increase in employment and a reduction in unemployment, these two indicators are now changing insignificantly. In addition, the employment rate has been decreasing in recent years, therefore, the reason for the growth in labour demand is different, most likely it is related to structural changes in the labour market;
- multifactority of the model of real labour income socio-economic interpretation and the possibilities of its measurement presupposes studying multiplicity and variability of the defining criteria with the purpose of substantiating the most significant ones in social and economic conditions;
- the workforce quality is determined by the criterion of the level of professional competencies, which also allows to assess the level of possible labour income;
- professional competencies in modern world, in particular, for the modern labour market can be defined as a measure of the acquired abilities of an individual to bring profit, including knowledge and skills based on the existing (innate) abilities and those acquired during the life and through vocational education, and also obtained as part of the work activity (on-the-job training) in accordance with the achieved professional level;
- effectiveness of employees' implementation of their competencies in the company depends not only on the potential of each of them. Professional competencies affect competitive advantages of a company depending on the way it supports their development in comparison with competitors. Formation and development of professional competencies of an organization can be carried out only with the help of a set of interrelated elements of the competence assessment system, assessment of their compliance with the required level, as well as the system of training and development of employees;
- labour force desire to get a high level of professional education means that they expect to receive a higher level of income, a high-paying job, but when choosing a place of study the most important criteria for entering a university are not knowledge as such, but the possibility of future successful employment, connections, high income. At the same time, the entrants' choice of specialties today is predetermined by the existing distribution of wages, depending on the professional and status structure on the labour market, which leads to the formation of a list of "fashionable specialties";
- as a part of the world economic space, the modern labour market in Russia is characterized by an increasing gap between the labour force's ambitions and the opportunities for meeting them;
- the benefit of educational services of higher professional education is economically determined in the structure of consumption of the population, the demand for it is characterized by economic prerequisites and rationality of choice;

- the demographic situation changes reflected by the phenomenon "demographic hole" has a general demographic significance, however, in the context of the process of labour force formation, it does not cause significant structural changes: estimates of the share of HPE students for the period under review have not undergone significant changes.

On the basis of research we come to the conclusion that this benefit has economic properties of a luxury commodity. In this regard, with the growth of the income level of the population, there is an increase in demand for this benefit at relatively constant prices, as reality shows. Consumer behavior of the population in relation to the benefit in question is in fact not related to the professional orientation in terms of the level of the general classification of labour. Graduates continue working in different spheres including service sector. The boundaries of professional identification are inherently blurred and clear professional stratification is not defined. Perhaps this phenomenon is a consequence of the prevailing public perception of the level of vocational training and work opportunities, and this perception was significantly distorted during the period of reforms, when the phenomenon of quasi unemployment was specifically marked by the level of qualifications and positions held. On the other hand, the benefit of "higher vocational education" has already been fairly consistently included in consumer expectations of the population and is perceived as necessary due to its availability, often without comparison of the expected benefits. Thus, we note the absence of a clear structuring of vocational education in the mind of the population and the comparison of the education received with the qualification structure, which characterizes the attitude to vocational training from the point of view of the consumer.

The regression model, the results of empirical research, the formed structure of consumer behavior, consumer expectations of the Russian population in relation to the benefits of "higher professional education services" form a different view of Russian society with respect to the benefit in question, which leads to the inadequacy of assessing Dutch disease against Russian communities in the form in which this phenomenon is defined for other energy-intensive economies.

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