

METRICS OF LABOR MARKET AS AN ECONOMIC SPACE AND EMPLOYEE LOCATION

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The article describes the characteristics of labor market economic space metrics.

The analysis of the functioning of open economic systems including labor markets is impossible without defining the parameters of *space* of such functioning.

Economics is a complex, dynamic system. Y.S. Kusner and I.G. Tsarev maintain that "Any economic event must occur in a certain space. It means that in the beginning of a model construction process a space shall be defined in which a system is build. Space is associated with a certain system of coordinates (economic variables) allowing to define location of any point with reference to the beginning of coordinates (the reference point)".

Let's review *specific elements* that constitute, in our opinion, an **economic space of labor market**.

The Subject of any market (or, similarly to natural sciences - **body**), including labor market, is a human endowed with *intellect* and *mind* (mind - is an ability to think logically and creatively, the highest degree of cognitive activity of a human, smartness, intellect, as opposed to senses) performing the function of profit generation in economics by implementing its intellect through technical and scientific progress.

In labor economics there should exist a notion of **trajectory**, that is the line, along which a body moves. To describe the trajectory of body movement, the **body's location needs to be identified** at a specific point of time.

In the economic space there is a multitude of **material points**, in a certain sense they represent a system. It is no wonder that inside the system the cooperation of points takes place also with the objects not included into this system because economic systems are open, therefore, their components can not avoid cooperation with external environment except for cases when cooperation of a system with the external environment is regulated by the manager.

In the light of non-equilibrium economic theory in order to define the location of an employee in the labor market the difference needs to be introduced between the material point (body) in physics characterized by one parameter to define its location in the economic space and an object in economics characterized by a multitude of parameters also including those parameters which define its location in the space. **Based on that, any subject of economics, including an employee in our case, can be viewed as a material point or an object.** In both cases it will be characterized by one parameter that defines its location in the space.

Based on the above, **in economics the prime task is represented** in the following way: **to define the location of an economic object - is to describe the location of all its points relative to selected reference point.**

Therefore **economic variables** should be selected comparable to each other. In this case the space will be *metrical*, and notions distance and direction can be introduced, for instance from the beginning of coordinates to a given point, that is to define a *radius-vector*. Let's believe that *our coordinates explicitly depend upon time only and do not depend upon each other.*

Since "in non-equilibrium economics we have our own dimensions to each economic object - manufacturer", it appears possible to define **dimensions for each employee in the labor market** in the following manner:

1. In ordinate axis we put, like in physics, the length (dimension one, rub.). "But unlike in physics, the length represents the quantities of services, rendered by an employee to the customer over a certain period of time calculated as quantities of production in a time unit ("intensity of production speed") multiplied by duration. That is in this axis of coordinates we

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put two physical units represented as speed multiplied by time in the same way as in physics we put distance passed equal to speed multiplied by time.

2. In applicant axis we put the factors of cost comparativeness of economic indicators with medial weighted price (dimension second, in fractions of unit). They are calculated for each employee and services they render as ratio of cost mass of indicators calculated in their dimensions to the cost mass of goods calculated in medial weighted market prices of goods. The ranging indicator is the prime cost factor for production of services.

3. In abscissa axis we put numbers of employees (dimension three, non-dimensional value).

Therefore, it is not difficult to determine **location** of any **employee in an economic space - labor market** - in the three-dimensional space. The following **algorithm** needs to be implemented typical for the general non-equilibrium economic theory:

1. Measure available scope of services rendered by *i-th* employee in mean weighted market process thus receiving consumer cost (consumer value).

2. Determine individual prime cost of rendered services of all types for a given employee.

3. Find relation of individual prime cost of indicated totality of rendered services to its consumer cost, obtain services prime cost factor for a given employee.

4. Range obtained prime cost factors for all employees.

5. Find the number of an employee we are interested in the ranged row.

So, the point reflecting an employee in the labor market (in the economic space) can be found by the **range number** in the ranged row in the abscissa axis, **length of range** - scope of services rendered in rubles of mean weighted market prices for a specific time period in the ordinate axis and **magnitude of range** - prime cost factor in the applicate axis. Thus we find just one cost factor characterizing an employee - aggregate prime cost of service rendered. There are also other factors existing that also characterize an employee in the labor market. This includes consumer cost of service in the labor market for a given employee and exchange value of service for an employee (measurable with individual market prices for rendering of

services for each manufacturer) and production cost expressed in production costs (prime cost plus normal profit). Their ratio to goods value for each employee will provide the values of such factors and their number will coincide with the number of cost range found above.

Location of an employee in the labor market is characterized by other cost parameters having their own value. For instance, the quantities of resources spent to obtain level of skills (time, funds, non-tangible factors, etc.). If the term of time is applicable to economic structures, then the term of usual geometric coordinates X,Y,Z loses sense in the economic space. It is possible to determine physical (geometrical, geographical) location of an economic structure, object (for instance, an enterprise), but economic parameters characterizing the evolution of economic structures can not be determined by means of geometrical coordinates". Therefore, an economic space must be characterized by economic parameters and time t".

Labor market determined by the metrics described is found in the first quadrant of rectangular coordinates system. In the abscissa axis it is limited by a zero (beginning of coordinates) and the last number M of the totality of producers. This economic space (labor market) is continuously moving after phase statuses of the labor market, beginning of coordinates continuously changes "which always coincides with zero numbering" of employees. The reason for such a movement - "leaving the industry" of some and "joining the industry" of other employees.

Because of the fact that "Economic space of non-equilibrium model of economics changes towards the direction of ordinates, since the quantities of goods produced and their assortment are never constant. So, the economics pulsates towards this direction as well, but, as a rule, in the general case, expansion-wise", the labor market changes as well in the ordinates axis, because the quantities of services rendered by employees and their assortment are not constant in time.

We can find the confirmation that the labor market as an economic space continuously moves after phase statuses of the labor market in the following quotation: "If the number of goods do not change, then the point does not move, (the system rests, but this status is not

interesting for our analysis). If quantities of goods begin to change, the system starts to move. In this case we must take into consideration the speed and direction of movement of the system thus introducing additional coordinates $(q'_p, i = 1, \dots, n)$, quantities of goods (assets, merchandize) of our system which are produced and consumed in the system during a specific time period (unit of time). This way we introduce as additional coordinates the derivatives of the quantities of goods by time which provide the rate of goods change in the system”.

Figure describes the non-equilibrium model of labor market in the 3 dimensional space.

(q, q') is called the phase space. Selected values of coordinates *fully* determine the status of the system or the point in space named *describing point*. Movement of a system (its describing point) in the space is called the *phase trajectory* - the locus where the system was ever present in the course of its movement. The phase trajectory must not be confused with an integral curve described by point (t, q, q') in the space R^{2n+1} . Trajectories of space R^n can cross each other because in a given point the system may have different speeds and its status is not fully determined. Phase trajectories never cross because in each point the status of the system is definitely determined in no uncertain terms and therefore

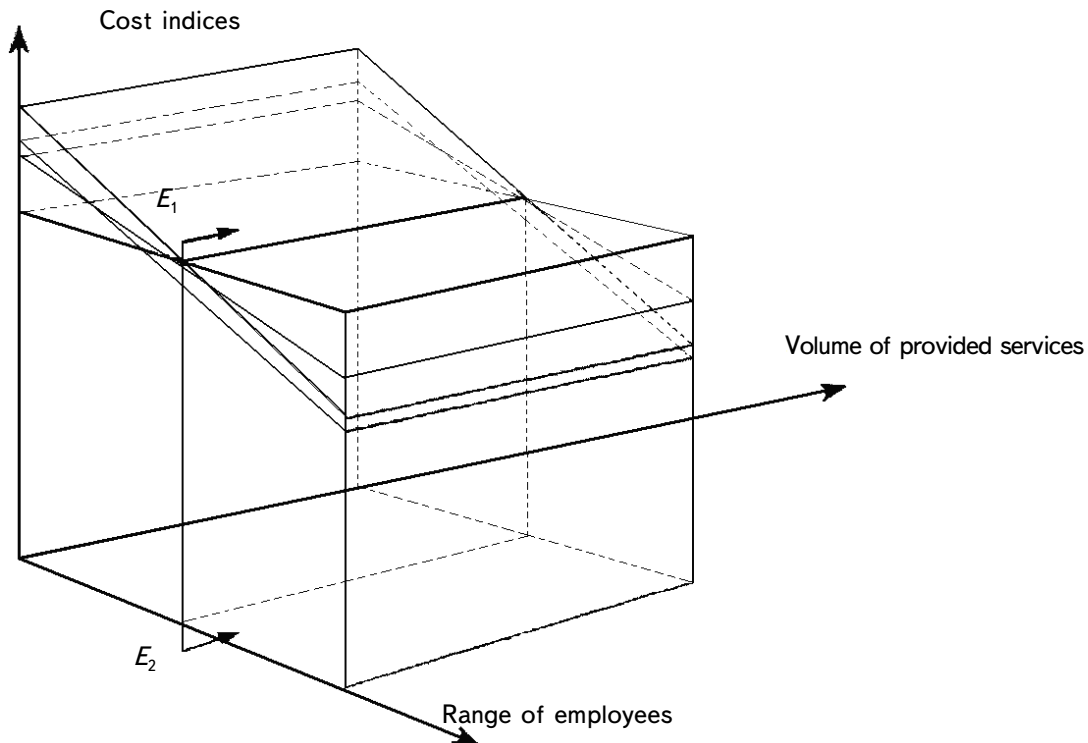


Fig. Non-equilibrium model of labor market in the three-dimensional space

Consequently, it is evident that the labor market, same way as any economic space, continuously evolves in the space of its statuses after the phase statuses of economics. Such **phase statuses** create phase trajectories determined by a variety of parameters that characterize economics. The literature provides the following understanding of **phase statuses of spaces**: “A variety of possible phase trajectories constitute a phase portrait of development of economic system, economics in the space of its statuses. The most critical task of forecasting is to determine the optimal trajectory of development in the phase portrait”. “Space R^n of coordinates

the further movement is set. This way there is no need to set any higher-level derivatives (more than zero and first) order, for instance q, q'_p to fully describe the movement of the system. This uncommon fact is the natural law. When coordinates fully determine the system (fully describe those characteristics of the system that are important for us), then we say that the coordinates selected are *substantial*”. “The most easy one for us to understand is 4-dimensional space “coordinates-time” in which we possess the ability to see and create geometric objects, however, to describe non-linear structures of processes we need to introduce relatively abstract auxiliary

spaces, phase space generally used to describe physical processes. Abstract spaces, in particular, phase space, lead to specific realistic results. Phase space is given by generalized coordinates $q_1... q_n$ (for shortness described as q) of generalized impulses $p_1... p_n$ (short - p) and time t , which allows to introduce the function of phase denseness of distribution characterizing, for example, the denseness of particle in the plasma, denseness of distribution of gas molecules etc.

With reference to economic processes a question arises what we need to understand by generalized coordinates in the economic space. As a generalized economic coordinate we can choose a specific universal economic variable - income. Developed by V.F. Tuganov in plasma physics, a regular method of finding distribution function can be applied to describe economic processes, explain the nature and reasons of the existence of degree laws in economic and other processes which allows not only to forecast such processes, but also control their increasing growth rates of economics in general and life times of specific economic entities”.

In the light of non-equilibrium economic theory in the labor market the value of labor service (consumer cost) measured in mean weighted market prices acts as a **real substance** by means of which all cost data for employees and services they provide are compared. Each employee can build its own cost characteristics and determine its location in the economic space relative to this substance. In other words, the values of labor service - is its “...essence represented by a general measures - mean weighted market prices; the formula for which acts in this case as a formal way to determine the metrics of economic space. By this substance all goods (and producers) are tied in the economic space.... . This way this substance determines specific, strictly tied with other goods (and producers) location of this good (and a given producer) in their totality.

The most important element of economic space of employees labor market is the **reference frame**: “To describe the location of a body ... in the space relative to other bodies in any point of time the reference frame is used. The reference frame includes:

1. Body of reference with a point of reference selected inside it. (Body of reference is a body relative to which we describe the position of bodies interesting to us).
2. System of coordinates connected with the reference point. (Selection of the system of

coordinates is defined by the conditions of a specific task).

3. Hours. The hours are understood as some periodic process that can be used to count the time).

By indicating the specific moment of time that corresponds to the location of the moving body we single out this location from all locations of the body”.

In the labor market as a non-equilibrium economic space the body of reference is the zero original point of numbers of employees in coordinate axes. The location of an employee, similarly to the location of a material point in physics, is determined by three coordinates: **number, length and width of its range**, represented by the **prime cost factor** of rendering labor services for a given employee.

All other individual economic indicators of an employee are derivatives of their own value in the range plane and range length of an employee which is defined by value contents of the labor service of a given employee

The entire totality of employees in the labor market is an economic system similar to mechanical system in physics: “the system in which all material points or bodies belonging to it can take arbitrary locations and have arbitrary speeds”.

The location of an employee in the labor market is defined by the following parameters:

$$R_i = \{i, L_i, k_i\},$$

where R_i - range (location) of the i -th employee in the labor market; i - range number; L_i - length of range, scope of rendering the services by an employee cost-wise; k_i - range value.

Since the location of a physical point in space can be described using radius-vector, in the non-equilibrium economics this can be done to compare location of employees in the labor market as well as to determine their movements. Despite of the fact that the magnitude of radius-vector will be measured in rubles, such description will have to some extent a notional nature relative to employees from the viewpoint of ideas generally accepted in economic theory.

It is obvious that, like in physic space, in economics there exists phenomena like “path”, “movement”, “unit of path”, “unit of movement” and other”. The “path” passed by an economic object (an employee) - is the scope of services rendered calculated as the scope of services rendered in a unit of time by time during which such services were rendered: in the non-equilibrium economics it

is measured in “rubles of the mean weighted market price”.

Movement in the non-equilibrium analysis of labor market is calculated by finding radius-vectors describing location of an employee in the labor market. The unit of movement in the non-equilibrium labor market as well is ruble of mean weighted market price which is absolutely identical for all employees participating in the market, that is, has constant nature.

An employee in the non-equilibrium labor market is also described by “economic speed, acceleration”. The gross scope of services per unit of time - is the “economic speed” of V_3 employee in the non-equilibrium analysis of the labor market, growth of the annual scope of services rendered per the same unit of time - is an economic acceleration a_3 . That is:

$$V_3 = l / t,$$

where l - the scope of service rendered; “ t - time.

$$a_3 = V_3 / t,$$

where “ V - the growth of scope of services rendered.

This way, within the frame-work of non-equilibrium analysis of the labor market of employees performed per principles of general non-equilibrium analysis of economic space it is possible to resolve the important task: define the location of an employee in the labor market.

The importance of metric space development of the labor market is the following.

For employees' labor market management structures who have taken the ownership of this methodology:

Firstly, unification of economics to ensure its transparency.

Secondly, the opportunity to create a database at the level of management system (employees' labor market for the city, federation unit, country) in which all employees can be represented in comparable indicators.

Thirdly, simplification of system management by expedient “identification and analysis of status” of any employee or group of employees in the labor market.

For an employee who has taken the ownership of this methodology:

Firstly, to define its location at present time in the labor market.

Secondly, to define the location of any employee in the labor market to promote its own services more successfully.

Thirdly, to manage its own future in order to fit its cost parameters into specific labor market and secure a niche when rendering labor services to an employer.

Fourthly, to determine factors that impact the size of remuneration for employees.

The evolution of viewpoints on the formation of phase economic space in the economic theory at present can be described through the following periods:

“1) **approximate intuitive description of the proportion of merchandize and market in statics of two-dimensional space** mainly through logical means (mercantilism, physiocracy, classical political economics);

2) **approximate intuitive description of the dynamics of two-dimensional space** using the static methods of formalization (marginalism, neo-classical theory);

3) **exact determined description of the statics of three-dimensional economic space** through formal methods (non-equilibrium economic theory);

4) **exact determined description of the differential dynamics of three-dimensional space**. At this period complex formalized models of differential development of economics of different levels depending upon parameters of individual economic subjects will be created (general theoretical economics”.

5) application of **situational and impulse method of managing the open non-equilibrium economic systems** representing a formalized algorithm for managing this type of economic systems which change in time in an unpredictable manner due to their nature under the impact of external environment due to the quantum nature of economics.

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