

MODELING COMPETITIVE HIGHER-EDUCATION INSTITUTIONS INTERACTION IN EDUCATIONAL SERVICES MARKET

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The paper deals with defining the equilibrium price and the number of students under conditions of competition in the educational services market - under consideration of transition to competence-oriented training. Consideration has been given to the issues of developing these indicators for the solid model, price model and the price model with a glance to the competence constituent.

Under conditions of competition-based economic development in the educational services market, there is greater manifestation of stabilizing and integrating tendencies. The analysis of the educational sector status shows that the higher education institutions while selecting competition-related strategy strive for taking into account the cross-influence of all the market players and correlate their decisions with their actions as per ensuring competitiveness.

The problems of modeling such a market interaction are close to the theory of games and can be efficiently solved with its application.

While developing the mathematical model of higher education institutions' conduct in the market, the game model with a non-zero amount was assumed as the framework. It is suggested that prior to the game there is no coalition of its participants, but the mechanism of obtaining reliable information on the substantial part of each higher education institution's strategy and communicating this strategy to all the participants is in place. This facilitates mutual influence of the market players on the development of the respective strategy, under consideration of common interests.

In the course of developing models of market-based interactions of a higher education institution under conditions of competitive environment, a number of provisions and approaches contained in the paper are used.

Three educational services market models have been reviewed (solid, price and price with a glance to the competence), while each of them describes the market depending on its current status linked to the number of potential customers, their buying capacity as well as quality of the educational process as per employers' assessment.

It is offered to analyze the solid model of competition in the educational services market. This being so, the task of identifying educational services market players' competing strategies under conditions of oligopoly is solved.

It is assumed that there are competing higher-education institutions $n \in \mathbb{N}$ in the education-services market, which provide an identical product (service) - education program training.

Let the costs 'i' of the respective higher-education institution related to educational program implementation attributed to the training price of one person equal $C_i > 0, i \in N = \{1, 2, \dots, n\}$. $Q = (x_1 + x_2 + \dots + x_n)$ and match the total number of training positions offered for sale in the education-services market (summarized service market volume). The educational service market price 'i' of the respective higher-education institution is defined as the function of the volume of this service:

$$p = \max\{p_0 - b \sum_{i=1}^n x_i; 0\},$$

where p_0 is the starting market price under absence of competition; $b = \text{const} > 0$ is the parameter of sensitivity of the service price to the modification of its supply volume in the market; x_i is the number of educational product units (training positions) offered for sale in the 'i' higher education institution.

Conditions of providing service in each higher education institution shall be deemed equal, i.e. the institutions select the number of students independently: $x_i, i \in N$.

Let the service costs attributed to one training position make up $C_i < p_i, i \in N$.

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Efficiency function of the 'i' higher education institution represents the net income (revenue position) RR_i defined as the difference between its income $p_i \cdot x_i$ and costs $c_i \cdot x_i$. The goal of the higher-education institution is to obtain the biggest net income RR_i generated by the provided service.

The relative efficiency functions have been developed for the price model and the model considering training quality.

The analysis of the equilibrium situation according to Nash provides such market parameters as equilibrium product volume, equilibrium price and correspondent equilibrium net income.

The developed models of competitive higher education institutions interaction shall be viewed as the basis for choosing the strategy in the educational services market. This choice is based on the principles of ensuring sustainability of higher education institutions activity as parties of a unified social-and-economic educational system and can be efficiently used both for determining the rational strategy and tactics of a single higher education institution and for solving the tasks related to the increasing efficiency of human resources development at the sectoral and regional levels.

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