Modelling the interaction between the demand for skills and the demand for higher education

Technological development changes skills in demand of employers, thus, changing the quantities of high, medium and low skilled workers. Theories of [Tinbergen, 1988; Goldin, Katz, 1998] allow to consider labor market parameters to be the determinants of demand for higher education. The aim of the research is to illustrate the significance of influence of the growth of the quantity of high, medium and low skilled workers, their relative wages on the growth of the share of university students in the number of youth; formulate the theoretical model to explain why different dynamics of the quantity of high, medium and low skilled workers in the developed and the developing countries is associated with the similar dynamics of the share of university students. The papers of [Meyer, Schiopu, 2015, Blundell, Green, Jin, 2018] exploits the theoretical models to show that technologies lead to the rise of demand for highly qualifies workforce, thus, contribute to increasing demand for higher education. Nevertheless, the authors refer in their analysis to the two groups of workers – skilled and unskilled – whereas the current research focuses on the more detailed classification of workers doing non routine manual tasks (low skilled workers), routine manual or routine cognitive tasks (medium skilled workers), non routine cognitive tasks (high skilled workers). Moreover, the current research fills the gap of the lack of quantitative research on the influence of dynamics of the number of workers with different skill levels on the growth of enrollment in higher education on the samples of developed and developing countries.

Using the data on 218 countries for the period 1989-2019 we estimate coefficients in the regression with fixed country-specific effects for the dependent variable of the growth rate of enrollment in higher education. Decrease of the share of medium skilled workers, as a result of replacement of tasks they previously performed by machines, slows down the rate of high education expansion in the developed countries. Growth of the share of medium skilled workers, in response to the enhancement of the service sector in the economies, contribute to the decrease in the growth rate of enrollment in higher education in the developing countries. Due to the lack of the data on wages of workers by skill level, we analyze the influence with the use of the theoretical model.

The theoretical model considers individuals who make the decision about getting higher education comparing the expected utilities. The utility is described by the following function: , where is the utility of the *i-th* individual, – his income, – stochastic component with the expectation equal to zero . We assume income depends positively on abilities , randomly distributed on the interval [0,1].

Medium skilled individual applies to university if his utility gets higher in this case. After university graduation the individual is employed as a high skilled worker. The costs of university studying are equal to Solving the equation (1) for the abilities we get the threshold level of abilities such that all individuals with abilities higher than this level enter university.

 (1)

 (2)

The utility of low skilled individual becomes lower if he/she applies to university:

 (3)

Individuals with abilities below the threshold level do not enter university

 (4).

If we assume that the supply of places to study at university is unlimited [Toutkoushian, Paulsen, 2016], the share of university students in the quantity of youth () is equal to

 (5)

Production function is in the form of

(6)

 – output, – the quantity of high, medium and low skilled workers involved in the production process. Then, the demand of firms for workers by skill level is found from the condition of equality of marginal products to wages

, (7)

 , (8)

 , (9).

In equilibrium there exist such values of , satisfying the equations (2), (4), (7-9), that:

* wages of workers are consistent with their marginal products;
* individuals with abilities higher than the threshold level are high skilled workers: is the share of such workers;
* the share of medium skilled workers with abilities in the range of [] is equal to ;
* the share of low skilled workers with abilities below is equal to .

The analysis of comparative statics of the equilibrium supports the results of the econometric analysis. The decrease of pace of growth of the wage premium for higher education (measured by ) in the developed countries after 2010 [Valetta, 2016, Beadry, Green, Sand, 2016] can explain the slowdown of growth rate of enrollment in higher education.

Having single out the components of dynamics of enrollment in higher education explained by the dynamics of the quantity of medium and high skilled workers, we come up with the following results:

* the dynamics of the quantity of medium skilled workers have greater influence on the dynamics of enrollment in higher education than the dynamics of the quantity of high skilled workers which is supported by the estimates of the regression coefficients;
* high growth rates of the quantity of medium skilled workers compared to the growth rates of the quantity of high skilled workers in 1989-2005 in the developing countries (9% in a year vs. 3% in a year in average) partly explain fast growth of enrollment in higher education;
* further decrease of growth rates of the quantity of medium skilled workers in the developing countries after 2005 resulted in a fall of growth rate of the share of students in the quantity of youth;
* task replacing technologies limit the role of medium skilled workers in the production process and as well as their relative wage in the developed countries which drives up the demand for higher education.