INDUSTRY AND INTER-INDUSTRY ASSOCIATIONS

doi 10.15826/recon.2015.1.014
UDC 338.46+332.1

V. A. Koksharov [a], ***G. A. Agarkov*** [a]
[a] Ural Federal University named after the first President of Russia B.N. Yeltsin

ANALYSIS OF ECONOMIC MOTIVES IN THE INDIVIDUAL CHOICE OF EDUCATIONAL PATHS[1]

The article explores economic motive forces that drive individuals to make their choices of educational paths. This research issue is relevant in equal measure to theory — the study of economic human behavior, and practice — the enhancement of human capital investment efficiency.

The authors have developed an econometric model of individual choice decisions concerning educational paths. It was implemented with the software support and bolstered with the live data on over 5.5 thousand students. To analyze the values of rational economic expectancies in the choice of educational paths, the students' preferences were compared to the optimal, economically feasible educational paths.

The findings have shown that a choice of educational paths is chiefly made in line with the economic incentives. With respect to the analyzed sample, 66% of university applicants made their choices with regard to economic preferences. Higher expected earnings after graduation — 22% of the choices, and reduction in college tuition costs or education against the budget — 12%, are the most significant factors shaping optimal educational paths.

We believe that one outcome from the research is the prospect of a national policy issue for human capital investment with due regard for students and university entrants' expectancies.

Keywords: system of higher education; econometric modeling; educational paths; behavioral economics; economic expectancies.

The challenge that state systems of higher education and universities face concern a global competition for the educational market, gifted students, teachers and scholars. The Russian education system commands a smaller amount of resources than its competitors. Thereupon, rational use of resources when competing for the gifted university entrants necessitates an insight into motivational factors of the young people, who are making their choice of a university and a major. In addition, the choice made determines their current and further personal well-being. The article attempts a research aimed at defining the significance of economic factors when making a choice of the major (tuition fees, scholarships availability, and expected earnings). This problem is both of practical and scientific interest, as it examines economic motivation in the context of individual behavior. This kind of study is under scrutiny of economists, market researchers, and psychologists.

Economic behavior of individuals making a choice of educational paths can be examined in the light of several economic theories: classical, behavioral and institutional. According to the classical behavioral theory, the decisions adopted proceed from considerations of clear rationality. It is assumed that individuals select best operations to maximize utility of the obtained benefits or job search, regarding highest possible future earnings. Along with this, it is implied that individuals are able to estimate every possible choice and are aware of the consequences of every option [1].

Behavioral economists argue that people respond differently to equivalent (relating to benefit/loss ratio) situations depending on whether they lose or gain [2]. This is called an asymmetrical response to the change in welfare. The researchers, in line with economic behavioral theory, demonstrated that often people's actions contradict classical economic theory.

[1] The translation has been made from the Russian version of the Journal of Economy of Region, No 1, 2015, with the consent of the authors.

The modern institutional economic theory states that economic behavior of an individual is determined largely by the constraints imposed by the institutions [3].

The study of economics of higher education and, particularly, economic analysis of preferences is seen as a pressing task for researchers. Some mathematical models were developed with the view of career choice analysis [4]. The dynamic model we introduce in this paper, serves the life-cycle analysis, educational and occupational choice, and significantly expands views of the efficiency of human capital investment. On the assumption of a young man's life cycle, the model also makes a reasonable prognosis about future occupational choices and the size of earnings.

The issues of economic expectancies of students and university entrants are widely discussed by the modern economists [5[. In particular, the dependence of expected earnings after graduation on a student's life experience is under examination [6]. Obviously, the educational choices made by the youth, greatly affect both the system of education and public financing sector in general [7], and this impact has significant national distinctiveness [8].

Economists can trace an interdependence of various students' characteristics and financial effects of their higher education degrees [9]. At the same time, diverse aspects are being examined, for instance, students' awareness of the available concessional crediting when taking up a loan [10].

The relevant data have been reported by Beffy M., Fougère D., and Maurel A. [11] when modeling the determinants that influence the choice of a college. The decision model training was exercised in three stages, focusing on the value of choice with respect to expected earnings. The results of the analysis suggest that, according to the French education data, non-monetary factors are considered key aspects determining a choice of the major.

When analyzing factors determining college drop-outs, Eckstein Z. and Wolpin K. I. [12] concluded that there was a relationship between successful educational paths and economic expectations. The students with lower expected earnings compared to their group-mates, leave college more often without obtaining a diploma.

Considering the benefits of an individual's business education diploma for the international recruiters, some researchers contrast the method of a financial interpretation of the costs and benefits of business education with the holistic approach based on the concept of "internal" and "external" career success [13]. At the same time, they shift the emphasis towards a precedence of social values.

In our research we adhere to the classical economic approach. The state of the Russian higher education provides extensive information data for the study of economic incentives' impact on human behavior. In short, the situation can be characterized as follows:

— The government creates incentives for learning technical and natural sciences by providing a wide spectrum of tuition subsidies and state scholarships.

— The state and independent experts report about the "overproduction" of the humanities graduates (economists, students of law, managers).

— Young people show a preference for a liberal arts education, despite a lack of available scholarships.

— The system of the Unified State Examination (the USE) allows of formalizing and analyzing "the window of opportunity" for university applicants in search of a major.

The state of affairs makes it possible to examine how the students' preferences are economically feasible.

To analyze the values of rational economic expectancies in the choice of educational paths, the students' preferences were compared to the optimal, economically feasible educational choices, calculated from the facts mentioned above.

The econometric methods are often used to study the relation between individuals' educational path and economics of education [14], but we used the computer simulation method.

Our analysis concerns the following students' educational pathways data:

— The USE marks submitted to the university selection committee e_i, $i \in \overline{1,\ m}$ denote the examinations required; $e_i = 0$ if no examinations are required.

— The enrolment marks determined for the major $k \in \overline{1, l}$, with paid tuition ov_k or budgeted tuition ob_k (for the applicants entitled to), $ob_k < ov_k$.

— The entrance examinations determined for the major k are denoted by matrix Q_{ks}; $q_{ks} = 1$ if the subject examination is specified, $s \in \overline{1, m}$; $q_{ks} = 0$ if the subject (s) and the field of study (k) examinations are not specified.

— c_k denotes a tuition fee for the major k, considering the overall cost for the whole training period.

— cv denotes student's education costs; $cv = 0$ if a student's educational path allows for budgetary funds, and $cv = c_k$ if tuition requires payment.

— The expected income data over the two-year working period following the exit from the university, depending on the major k according to the diploma's record w_k. The data were received by analyzing the requests from employers and recruitment companies.

To estimate the value of optimal educational paths in respect of economic rationality, the above mentioned data are processed with software support, implementing a possible educational path search algorithm (considering the limitations for the USE results and the set of examinations for the major). Then the path, showing an optimal discrepancy between tuition costs and expected income after the graduation, is searched. The task can be defined in math terms:

$$\max\left(w_k - cv\right), \tag{1}$$

$$\sum_{i=1}^{m} e_i \le ob_k \Rightarrow cv = 0, \tag{2}$$

$$\sum_{i=1}^{m} e_i \le ov_k \Rightarrow cv = c_k, \tag{3}$$

where units q_{ks} of matrix Q_{ks} for the major k equal one ($q_{ks} = 1$) if $e_s > 0$, and $q_{ks} = 0$ if $e_s = 0$ for all majors $s \in \overline{1, m}$.

The developed model was tested out on the educational paths data of 5,513 individuals (including 2,113 students who paid the expenses and 3,400 students with the state subsidies), who were the university applicants in 2013.

As mentioned above in the model, a great number of educational choices at the disposal of university applicants are restricted to the set amount of the USE they took as school finals. The choice of the examinations caters to both personal preferences (e.g. interest in humanities, natural or technical sciences) and society and government demands (trends towards "occupational prestige" and the entry level of the specified school subjects). Table 1 shows an aggregate of educational paths an applicant can choose on the condition that a needed set of the USE is available. To save the table's space, we demonstrate a sample of the three out of eighteen sets of the USE. In addition, the amount of the marks obtained for the needed examination sets narrows educational paths.

In accordance with the table, applicants, who received examination certificates in Mathematics, Russian, and Physics and submitted them to the university (line 1), can aspire to be enrolled on the fields of study dotted in the table line — for example, natural sciences, material sciences and metallurgy. Similarly, this can be applied to all examination sets. It should be noted that some examination sets considerably reduce the range of alternative possibilities. As a mathematical model, Table 1 is represented as matrix Q_{ks} (the table cells with dots are encoded in matrix Q_{ks} with representations equal one $q_{ks} = 1$).

To identify an optimal educational path in terms of economic conformity, the above search algorithm was applied. It included data on the students' USE marks submitted to the selection committee, information about admission marks for fee-paying students and those entitled to government subsidies, tuition fee data, and expected income in the chosen field over the two-year working period following the exit from the university. Subsequently, the optimal paths were correlated with the applicants' choices. Table 2 reports the obtained results.

As the table shows, the choices applicants made are in conformity with the economic incentives as a whole. With respect to the sample, 66 percent of the individuals chose optimal educational paths in terms of economic conformity. For different fields of study, this choice accounts for the sample proportion from 91.97 percent to 36.76 percent. The findings reveal that the fields with dynamic prospects for development in the Ural Federal region show the largest value of optimal educational paths. This trend manifests itself particularly in civil engineering, radioelectronics, information technologies, mathematics and computer sciences. Such resource as government paid places greatly influences an economically feasible choice. The illustration of this is the field of chemical technology.

It should be noted that the possibility of government paid places strongly influences a choice of educational paths. Obviously, this influential tool should be used in human capital investments.

Table 1

Aggregate of possible educational paths applicants can choose on the condition that the needed set of the USE is available

USE	Fields of study															
	1. Economics and Management	2. Public Administration and Entrepreneurship	3. Humanities and Arts	4. Natural Sciences	5. Mathematics and Computer Sciences	6. Material Sciences and Metallurgy	7. Mechanics and Machine Building	8. Radioelectronics and Information Technologies	9. Social and Political Sciences	10. Civil Engineering	11. Power Engineering	12. Physics and Technology	13. Physical Education and Sport	14. Fundamental Education	15. Chemical Technology	16. Military Technical Education and Security
1. Mathematics, Russian, Physics				•		•	•	•		•	•	•		•	•	•
2. Mathematics, Russian, Informatics	•			•	•		•	•				•		•		
3. Mathematics, Russian, Social Science	•	•	•			•			•				•			
. . .																
18. Mathematics, Russian, Foreign Languages			•													

Notation. Fields of study:
1. Economics and Management (banking, accounting and auditing, insurance)
2. Public Administration and Entrepreneurship (state and municipal administration, commerce)
3. Humanities and Arts (history of arts, journalism)
4. Natural Sciences (physics, biology, astronomy)
5. Mathematics and Computer Sciences (mathematics, computer sciences, applied informatics)
6. Material Sciences and Metallurgy (material sciences and modern materials engineering, optic engineering and materials)
7. Mechanics and Machine Building (manufacturing machines and equipment, mechatronics and robotics)
8. Radioelectronics and Information Technologies (radio engineering, radioelectronic systems and complexes)
9. Social and Political Sciences (philosophy, political science, psychology)
10. Civil Engineering (engineering of unique buildings and constructions, urban development and municipal services)
11. Power Engineering (heat-and-power engineering and heat technology, power machine building)
12. Physics and Technology (innovations, nuclear reactors and materials, applied mathematics and physics)
13. Physical Education and Sport (physical culture, service)
14. Fundamental Education (fundamental informatics and information technologies, linguistics)
15. Chemical Technology (bioengineering, chemical engineering)
16. Military Technical Education and Security (information security, fire safety, technospherical safety)

The high tuition fees and a small amount of government subsidies reduce the percentage of optimal educational paths, in spite of relatively high expected incomes after graduation. The field of economics and management serves as an example. Also, it should be added that the present model does not make it possible to analyze educational paths on the basis of budgeted higher education and further educational courses in the occupations demanded by the market. This strategy promotes economic appeal of government paid education for individuals.

The overall analysis of the situation shows that the possibility of high incomes after graduation (22 percent) serves as the most essential factor determining alternative (different from realistic) optimal educational paths. The possibility of lower tuition fees or government subsidies can be the cause for developing an optimal educational path, in terms of economic expectations, that accounts for 12 percent of all the paths.

In our opinion, the research outcomes raise concern about higher education and the labor-market, as the current situation can decrease the efficiency of the public investments in human capital. Some individuals may choose a strategy including budgeted higher education and further educational

Table 2

Aggregate of possible educational paths individuals can choose on the condition that the needed set of the USE is available

Fields of study	Percent of individuals with optimal choice, %	Factors determining alternative optimal educational paths		
		Relatively low tuition fee, %	Possibility of government paid places, %	Higher expected income after the graduation, %
1. Economics and Management	71.46	85.66	0.74	13.60
2. Public Administration and Entrepreneurship	73.40		5.41	94.59
3. Humanities and Arts	53.03		100.00	
4. Natural Sciences	53.89		39.06	60.94
5. Mathematics and Computer Sciences	76.92		100.00	
6. Material Sciences and Metallurgy	36.76	5.41		94.59
7. Mechanics and Machine Building	52.76		9.35	90.65
8. Radioelectronics and Information Technologies	78.42	23.81	4.76	71.43
9. Social and Political Sciences	58.63	20.39	25.24	54.37
10. Civil Engineering	91.97	87.10	12.90	
11. Power Engineering	75.53	24.27	7.77	67.96
12. Physics and Technology	71.95			100.00
13. Physical Education and Sport	72.00			100.00
14. Fundamental Education	73.33		21.88	78.13
15. Chemical Technology	83.96			100.00
16. Military Technical Education and Security	71.59			100.00

courses in the occupations demanded by the market. Consequently, the budgetary funds will be spent inefficiently.

We believe that one of the most significant practical inferences from the research on the optimal educational paths must be an accounting of applicants and students' expected incomes in the process of giving state assignments to the universities.

Many fields of study indicate the nonoptimal educational paths on account of the savings on tuition costs and the discrepancy within expected incomes.

The estimate of the relation between the chosen economically optimal educational paths and academic motivation (Table 3) is of an unconditioned interest. We assess the academic motivation in terms of the percentage of the students dropped out after one academic year spent on the chosen major. To assess the influence of learning abilities and school background on the university admission, we also considered the individual's mean school mark. Interestingly, but the choice of economically optimal educational paths has a little influence on academic motivation, and the drop-out rate among the students, who chose some economically optimal fields of study, has reached a maximal value. With respect to Table 3, we may conclude that a small drop-out rate among the students can possibly be attributed to a high individual's mean school mark, not to the percentage of the students chosen optimal educational paths. This implies the importance of personal characteristics as an educating factor.

In this connection, we believe that a model differentiation should be given a development priority. This implies extension of social and personal characteristics of the analyzed individuals. The new elements include direct characteristics, such as gender, age, progress in studies, and indirect assessment of personal qualities — situation assessment. We are planning to extend the analysis potential of the model, adding aftereffects of the chosen educational paths and the cluster analysis of possible educational paths.

The present model of individuals' choice of economically optimal educational paths has received approval and allows us to draw the following conclusions:

1. The research on economic incentives and individual's choice motivation is of theoretical and practical value.

Table 3

Correlation between economically optimal educational paths and academic motivation

Fields of study	Percent of individuals with optimal choice, %	Percent of students dropped out after one academic year, %	The USE mean mark
1. Economics and Management	71.46	9.23	245.59
2. Public Administration and Entrepreneurship	73.40	9.57	244.71
3. Humanities and Arts	53.03	14.65	256.81
4. Natural Sciences	53.89	23.32	204.79
5. Mathematics and Computer Sciences	76.92	24.18	228.78
6. Material Sciences and Metallurgy	36.76	17.84	180.33
7. Mechanics and Machine Building	52.76	13.47	195.45
8. Radioelectronics and Information Technologies	78.42	19.18	203.55
9. Social and Political Sciences	58.63	10.84	240.98
10. Civil Engineering	91.97	17.88	226.6
11. Power Engineering	75.53	14.73	201.08
12. Physics and Technology	71.95	23.10	207.55
13. Physical Education and Sport	72.00	9.33	238.18
14. Fundamental Education	73.33	20.00	213.21
15. Chemical Technology	83.96	25.13	218.2
16. Military Technical Education and Security	71.59	7.95	201.34

2. The economic incentives significantly influence a choice of educational paths, and should be used as an advantage in educational policy when planning human capital investments.

3. The most significant factors in determining optimal educational paths are an expected income after graduation (22 percent) and a decrease in tuition fees or government subsidies (12 percent of all the paths). There is no evidence of explicit dependence of the choice of economically optimal educational path on the education progress.

4. The research on educational paths requires further improvement of the present economic model. Undoubtedly, its development concerns extension of the data contributing to the analysis of social and personal characteristics of the subjects of modeling.

References

1. Gerard Debreu Market Equilibrium (1956). *Proceedinqs of the National Academy of Sciences,* 42, 876-878.

2. Kahneman D. & Tversky A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica,* 47 (2), 263.

3. Geoffrey, M. Hodgson (2003). The hidden persuaders: institutions and individuals in economic theory. *Cambridge Journal of Economics,* 159-175.

4. Keane, M. P. & Wolpin, K. I. (1997). The career decisions of young men. *Journal of Political Economy.* 105 (3), 473-522.

5. Jerrim, J. (2011). Do UK higher education students overestimate their starting salary? *Fiscal Studies,* 32 (4), 483-509

6. Jerrim, J. (2015). Do college students make better predictions of their future income than young adults in the labor force? *Education Economics,* 23 (2), 162-179.

7. Dearden, L., Fitzsimons, E., Goodman, A. & Kaplan, G. (2008). Higher education funding reforms in England: The distributional effects and the shifting balance of costs. *Economic Journal,* 118 (526), 100-125.

8. Carnoy, M., Froumin, I., Loyalka, P.K. & Tilak, J.B.G. (2014). *The concept of public goods, the state, and higher education finance: a view from the BRICs.* Higher Education, 1-20.

9. Bachan, R. (2014). Students' expectations of debt in UK higher education. *Studies in Higher Education,* Vol. 39, 5, 848-873.

10. Booij, A. S., Leuven, E. & Oosterbeek, H. (2012). The role of information in the take-up of student loans. *Economics of Education Review,* 31 (1), 33-44.

11. Beffy, M., Fougère, D. & Maurel, A. (2012). Choosing the field of study in postsecondary education: Do expected earnings matter? *Review of Economics and Statistics,* 94 (1), 334-347.

12. Eckstein, Z. & Wolpin, K.I. (1999). Why youths drop out of high school: The impact of preferences, opportunities, and abilities. *Econometrica,* 67 (6), 1295-1339.

13. Kuznetsov, A. & Kuznetsova, O. (2011). Looking for Ways to Increase Student Motivation: Internationalisation and Value Innovation. *Higher Education Quarterly,* 65 (4), 353-367.

14. Meghir, C. & Rivkin, S. (2011). Econometric Methods for Research in Education. *Handbook of the Economics of Education,* 3, 1-87.

Information about the authors

Koksharov Viktor Anatolyevich (Yekaterinburg, Russia) — PhD in History, Associate Professor, Rector, the Ural Federal University named after the first President of Russia B. N. Yeltsin (19, Mira St., Yekaterinburg, 620002, Russia, e-mail: rectorat@ustu.ru).

Agarkov Gavriil Aleksandrovich (Yekaterinburg, Russia) — Doctor of Economics, Associate Professor, Head of the Chair of the Public and Municipal Finances, the Ural Federal University named after the first President of Russia B. N. Yeltsin (19, Mira St., Yekaterinburg, 620002, Russia, e-mail: g.a.agarkov@urfu.ru).