Clustering of Students by Type of Relationship to Invest in a Special Human Capital

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Abstract: - The article analyzed the strategy of investing in innovative human capital of Kazan student youth. The author's model of Kazan student youth clustering by type of relationship to invest in an innovative human capital is proposed. Two-dimensional model of investment in human capital is a continuum with maximum and minimum values of the motivation indicators and efficiency of investment in a human capital.

Key-Words: - special human capital, investment in education, professional knowledge.

1 Introduction

The relevance of the professional knowledge and skills formation research is connected with the increasing influence of science, technology and innovation for the development of a modern economy. Maximizing the education efficiency, built on the basis of human capital theory, requires a complex solution that includes not only improving the scientific and legal framework, but a change in subjects attitude to learning process, the formation of own human capital.

Taking this into account, it is recognized the need to build the human capital of the population for the development of regions at different levels of social reality (in the media, civil society, educational institutions, federal and regional programs, during the composing of urban development strategies, etc.).

However, despite the activities of the various institutions in the promotion of the need for higher education, investment in human capital, sociological research in this area suggests that the possibility of obtaining additional knowledge and skills is not the main criterion for selecting of educational programs by applicants.

Numerous experiments of conceptualization and problematization of the concept of the "human capital" are based on various scientific traditions that are largely dependent on dominant paradigm in economic and social sciences.

In this paper, as an attempt to integrate theoretical knowledge of economics and sociology, we synthesized the basic theoretical and methodological strategies of scientists towards the problematization of the human capital concept.

As part of the human capital theory, we used its investment direction, based on the identification of investment strategies in human capital.

Our theoretical and methodological concept is based on the fact that the mechanism of human capital development can only be achieved if there is an adequate level of social order on him. In this connection there is the problem of social demand stimulating for human capital. We have identified a mechanism to stimulate the social demand for innovative human capital on two levels: the investment and network. At the investment level the subject of the social order is student youth. Investing in it is possible only in the period of study with a separation from work, because when working professionals undergo additional training, they are investing in a special human capital of the firm, i.e., in that knowledge that they will need to work in a particular company and, in principle, that can be unclaimed in other enterprises of the sector.

The existence of the gap between a high level of human capital relevance and the low level of awareness of gaining knowledge can be a result of the interconnected and interdependent factors, such as values and attitudes of the consumer society, situational factors, infrastructure, institutional and socio-cultural environment, etc.

As a basic methodology to evaluate it, we propose to use the theory of human capital of G. Becker. Under the human capital, you need to understand the sum of knowledge and experience of the employee, allowing him to earn income from his work. The most significant, in our opinion, is the withdrawal of G. Becker that special staff training is not limited to the scope of a

particular firm: "some types of training may have value not for most companies and not for a company, but for a limited number (depending on the product, the nature of work or geographic location), i.e. special training can be carried out for some "industry, profession or country" [3, p.77].

This thesis of G. Becker subsequently reflected in the selection of two types of specific human capital: a special human capital of the firm (firm-specific human capital) and a special human capital of the industry (industry specific human capital), the last one is the term that reflects the amount of knowledge required for the student after university within his specialty.

One of the first area of human capital specificity concept development [23] was a study of K. Shaw, in 1984 in her work she has modified the equation of J. Mincer [15], adding to it a variable of professional experience. In this case, she determined professional capital during the transition from one job to another as a weighted sum of accumulated knowledge and skills on previous work and the coefficients in front of the variables of knowledge and skills displayed their importance in the next work.

Further development of human capital specificity concept was continued in the research of industry and professional specificity. D. Neal [17] on the basis of empirical data on wages in the United States found that the greatest loss of earnings occurring in a transition from one industry to another, but not from the firm to the firm, which became the basis of the concept and the importance proof of industry specific human capital contribution (industry-specific) in wage growth, this finding was subsequently confirmed in the paper of D. Parenti [20].

K.K. Tang and Y.P. Tseng with the example of Taiwan investigates the role of industry-specific human capital (ISHC) in determining industry wage structure. The model presented in this paper distinguishes between knowledge labour and physical labour. Knowledge labour is physical labour embodied with ISHC. It is postulated that more ISHC-intensive industries, such as high-tech industries, pay higher wages and the wage premiums increase with workers' experience. [25]

Kambourov G. and Manovskii I. in their work [9] on the basis of data processing of “Panel Study of income dynamics in US” found a high return on professional experience and low - on work experience at one firm. The concept of occupational-specific capital based on the assumption that the stock of this type of capital is not transferred from profession to profession.

Poletaev M. and K. Robinson [21] in their study measured the lost wages of workers changed their work and found that it is possible to avoid excessive salary loss, if go to work requiring skills similar to those used in the previous work. They divided human capital expressed in skills to "fluid" specific capital (high degree of transferability) and "crystallized" capital (highly specialized, losts in the transition).

In some studies special human capital is considered within the problematics of organizational management. J.M. Kyle and others described special human capital at organizational level based on the data of legal work outsourcing involved in filing patents (i.e., patent prosecution) [12]. E. Esther studied the special human capital as an asset of the company, which is greatly influenced by the firm industry affiliation [7].

It is necessary to highlight the work on the analysis of the human capital special features of the specific professions. Butters R., et al., found that the pupils performance affects by the availability of investments in both the general and specific human capital of their teachers [5]. B. Ost specifies the special human capital as a pedagogical experience in the cohort of classes and proves its better use by reducing the number of such cohorts in which the teacher works [18]. S.A. Le et al. examined the effect of the company's Board of Directors at a special human capital of its top managers [13].

The theory of a special human capital of G. Becker allows the analysis of investment in special human capital of the industry. Within the human capital theory the knowledge accumulation process is understood as investment in human capital in order to obtain dividends in the future.

Problems of investment in human capital of the students were discussed by a number of studies.

M.E. Rodolfo and A.Seshadri considered the impact of human capital on the wealth of the nation, the majority of cross-country differences in the volume of production is due to differences in the quality of human capital. The typical person in a poor country not only chooses a smaller number of years of education, but also obtains less human capital in the year of the study [22].

L. Keita came to similar conclusions, countries that have invested heavily in human capital for the production of a highly literate population, usually benefit from such factors on the criteria of high GDP per capita, regardless of their technological and industrial production level [10]. T.Moyo substantiated the necessity of advanced countries experience use to develop human capital as one of

the factors of rapid industrialization of African countries [16].

One of the way of human capital development in the catching-up countries is a free education. Azarnert L.V. believes that free education helps reduce poverty for children whose parents have a low level of human capital and reduce investment in education for children whose parents have a high level of human capital [2].

Household investment in human capital can create to the family some financial problems. M.Cooper writes that not the right decisions with respect to investments in human capital lead to large debt on student courts in American households [6]. Fos V. et al. write about the negative impact of student educational loans for investment in human capital and identify the level of debt that affects the decision on the continuation of graduate studies [8].

One of the way to reduce the negative effects of educational loans is the implementation of human capital contracts.

MP Lleras proves expediency of "Human capital contracts" use instead of student loans while investing in human capital, in which students agree with the time to pay a percentage of their income in exchange for money to finance their education [14]. F.LAndrés proves expediency of "Human capital contracts" use in the financing of education in some specialties in Chile colleges [1].

A number of papers discussed some aspects of human capital investing process in the period of higher education study. The research of young students investment in human capital through academic mobility on the basis of international scholarship programs selection should be mentioned [20]. C.C. Brian and J.B. Keys consider the causes of under-investment in human capital by the students and believe that it depends on the features of their character, so impatient people can stop their studies in college with the rest of the year or less which leads to lower wages in the future [4].

J. Kinsler, R. Pavan substantiated the importance of awareness of investing in human capital, so college graduates not working in their specialty earn 30% less [11].

Summing up the analysis of the literature it should be noted that there are studies devoted to the analysis of the special human capital nature, its impact on the level of wages, the peculiarities of investing in human capital, but the questions of student youth investment in a special human capital have not been enough studied.

2 Problem Formulation

The main purpose of our study was to determine the characteristics of the students invest in their own human capital. This study was conducted to determine the degree of motivation and efficiency of investment in human capital.

The choice of the region for the study was driven by several interrelated factors. Firstly, it is a high concentration of students in the studied region. For example, in Kazan there are 44 institutions of higher education, in which more than 190,000 students are educated. Kazan is the only city in Russia, having both Federal University and two national research universities. Secondly, it is the multidisciplinary nature of higher education institutions of the Republic of Tatarstan. Differentiation of students is possible within majors: natural and technical, social and humanitarian, economics and management. The combined multistage sampling was used as a method to study. The sample was not more than 400 units depending on the method used. Since we were dealing with a diverse set of general totality the volume of sample was increased (n=870). Maximum allowable sampling error does not exceed 4%.

The analysis of the investment process in a special human capital involves the students' assessment of investment conditions. Based on the fact that the constituent parts of the human capital is the knowledge and practical skills, we estimate the conditions for their receipt. To identify them, respondents were asked to agree or disagree with the proposed statements (see Table 1 and Table 2).

Table 1. Summary of Questionnaire Results on the receipt during training sufficient theoretical knowledge to go to work in their specialty.

Do you agree with the fact that in the process of training you have received enough theoretical knowledge to go to work in your specialty?	Specialty			Total
	natural and technical	social and humanitarian	Economics and management	
Yes	22,8%	25,9%	30,0%	26,1%
not	40,2%	37,4%	29,0%	35,7%
Difficult to answer	36,9%	36,6%	41.0%	38,2%

The obtained results have ambiguous, contradictory character. On the one hand, the respondents felt that they had received insufficient theoretical knowledge to work in their specialty (35.7%), while satisfied with their theoretical knowledge is only 26.1%. A high proportion of respondents with difficult to answer (38.2%) indicating that the part of students theoretical knowledge not associated with knowledge applied when working on the field.

Table 2. Summary of Questionnaire Results on the presence of a sufficient level of skills and practical experience to work in their specialty.

Do you agree that your skills and experience will enable you to work in your specialty if you desire?	Specialty			Total
	natural and technical	social and humanitarian	Economics and management	
Yes	57.4%	65,0%	63.8%	61,7%
not	15,3%	11,1%	15,4%	14,2%
Difficult to answer	27,3%	23,9%	20,8%	24,1%

On the other hand, a high percentage of respondents were revealed (61.7%) that believe their abilities, skills and practical experience enable them to work in their specialty, as compared with those who disagree with this statement (14.2%) and the “difficult to answer” (24.1%). Duality revealed explains, firstly, the overestimation of their own experience and practical skills based on the youthful exuberance; secondly, the fact is that university education do not associate with the knowledge to use when working in specialty for some number of students.

If we consider the creation of conditions for acquiring knowledge and practical skills with regard to students’ majors, the general trend is not changed for students of natural-technical and socio-humanitarian specialties. But among the students of economic and management specialties there are more those who said that they had received sufficient theoretical knowledge to work in their specialty (30%), while not satisfied with their theoretical knowledge 29%. But the difference between these two groups is very small, with a very high proportion of respondents who found it difficult to answer (41%), all it points to the fact that the part of the students for economics and management majors doesn’t associate theoretical knowledge received with knowledge used when working on a specialty to an even greater extent.

Structuring and typology of groups with different strategies of investment in human capital and innovative human capital will be made on the basis of the data obtained.

The author's approach groups the subjects in different types of investment based on two-factor model: according to their level of investment motives formation and action on investment. Two-dimensional model of investment in human capital is a continuum of the maximum and minimum values of motivating performance and efficiency of investment in human capital (Table 3).

Such analytical conceptualization will facilitate more comprehensive and reliable qualitative and quantitative assessment of the characteristics of young people groups with different levels of relation to investment in their own human capital and innovative human capital. Four types of investment in human capital marked by us reflect the students' behavior strategies. "Investing" type invests in his human capital, "Declarative" type does not invest in his human capital and "Active" type invests in his human capital but is not aware of the need for these investments, i.e., his investments have unclear nature.

Table 3. Model of students youth groups clustering in relation to the types of investment in a special human capital

Type of investment in human capital	Factors	
	The level of investment efficiency	The level of motivation of the investment
Investing	+	+
Declarative	-	+
Active	+	-
Not investing	-	-

"Not investing" type does not invest in his human capital and is not aware of the need for these investments.

3 Problem Solution

As a control evaluation questions of the human capital investment conditions we choose revealing of students' opinion dynamics about the specifics of their future profession before and after entering the university. In order to identify the views of the respondents they were asked to agree or disagree with the proposed statements.

Table 4. Summary of Questionnaire Results on the understanding before enter university about the qualities that should have people working for the profession for which you are trained.

Do you agree with the statement that before enrolling in college, you know exactly what qualities the specialist of your major should have?	Specialty			Total
	natural and technical	social and humanitarian	Economics and management	
Yes	42,3%	49,4%	42,7%	44,4%
not	44,1%	39,5%	46,8%	43,7%
Difficult to answer	13,5%	11,1%	10,6%	11,9%

It is necessary to mark the presence of not significantly different number of respondents who have changed (43.7%) and remained unchanged (44.4%) representation of major specialist qualities after entering the university (Table 4 and Table 5).

Table 5. Summary of Questionnaire Results on the understanding before enter university what duties people are engaged at work in your profession for which you are trained.

Do you agree with the statement that before enrolling in college, you know exactly what do the experts of your profile?	Specialty			Total
	natural and technical	social and humanitarian	Economics and management	
Yes	40,5%	52.7%	44,7%	45,3%
not	48,3%	42.0%	43,0%	44,8%
Difficult to answer	11,1%	5,3%	12,3%	9.9%

There is about the same distribution of respondents according to the degree of knowledge changes about their employment specialists profile: at 45.3% remained unchanged, at 44.8% have changed their views. The results also indirectly confirmed that for half of the students the study in high school does not give investment effect.

If we consider the understanding before enter university of job characteristics of people working for their future profession in relation to students majors, the general trend won't change only for students of social and humanitarian fields. A large number of students of natural and technical specialties (44.1%) and the economic-management professions (46.8%) changed their presentation after entering the high school about what qualities specialist of their major should have. But with respect to a change in knowledge about the occupations of their profile professionals only students of natural and technical disciplines in most cases changed their opinion (48.3%) than has remained the same (40.5%).

The lack of effect of the investment in own human capital can be attributed to two factors. The first factor - the high level of own human capital, which does not require this type of investment; but this is unlikely, otherwise the student would work but doesn't study. The second factor - a low students score of conditions for investment in their own human capital provided by institutions of higher education, as evidenced by previous results.

The result of our analysis investment in own human capital was the analytical operation of two students' clustering model construction in relation to the types of investment in own human capital and innovative human capital. The author's approach groups the subjects in different types of investment based on two-factor model: on the level of investment motives formation and action on investment. Two-dimensional model of investment in human capital is a continuum with maximum and minimum values of motivation and efficiency of investment in human capital indicators.

Such analytical conceptualization will facilitate more comprehensive and reliable qualitative and quantitative assessment of the characteristics of young people groups with different levels of relation to investment in own human capital and

innovative human capital. Four types of investment in human capital marked reflect the students' behavior strategies. "Investing" type invests in his human capital. "Declarative" type does not invest in his human capital, but only declares the need on investing in it. "Active" type invests in his human capital but is not aware of the need for these investments, i.e., his investments have unclear nature. "Not investing" type does not invest in his human capital and is not aware of the need for these investments.

Initially, we identify the model of students groups clustering by type of relationship to investment in own human capital. For this purpose, the respondents were asked to agree or disagree with 11 different statements affecting various aspects of investment in human resources (Table6).

Table 6. Summary of Questionnaire Results on the investment in a special human capital.

Rotated Component Matrix (a)		
	Component	
	one	**2**
During the period of study at the university I am ready to pay extra for special knowledge	,713	,142
I use the assistance of teachers for the formation of special knowledge	,704	,157
I would pay additionally for special knowledge after graduation	,694	,138
Working independently on the training courses I try to obtain special knowledge	,691	,111
I believe that when applying for a job you need special knowledge	,571	9,508
I believe that you need special knowledge for promotion of the career ladder	,569	,251
I am against of special knowledge share lowering in studied disciplines	,494	,415
I believe that within the electives special knowledge should be formed	3,306	,766
I believe that in the lectures and seminars special knowledge should be formed	9,631	,756
I believe that the problematic of students scientific-research work, the subject of student projects must have special knowledge	,333	,473
I believe that during the use of interactive teaching methods (business games, analysis of case studies) the special knowledge should be presented	,285	,301

Two independent factors were identified on the basis of factor analysis:

1) the level of investment efficiency;
2) the level of motivation invest.

Factor analysis allowed to group our respondents in four clusters, which we can characterize by its degree of influence of each of the two factors. It has been experimentally found that the optimal number of clusters is four (Table 7).

Table 7. Final Cluster Centers

	Cluster			
	1	2	3	4
REGR factor score 1 for analysis 1	-,85036	,61541	-1,97131	,58054
REGR factor score 2 for analysis 1	,33706	,69254	-1,14988	-1,09634
	- / +	+ / +	- / -	+/-

Firstly, it will provide sufficient array differentiation and distinction of clusters on the characteristics of the respondents; secondly, the occupancy of the cluster is sufficient to be able to make informed and representative conclusions. Distribution of students in clusters presented in Table 8.

Table 8. Cluster Number of Case

	Frequency	Percent
1 Declarative	173	19,89
2 Investing	298	34,25
3 Not investing	176	20,23
4 Action	223	25,63
Total	870	100,0

The dominant type in the model of investment in own human capital of Tatarstan students is "investing" (n=298), next is "action" (n=223), Not investing (n=176), declarative (n=173).

4 Conclusion

The results obtained suggest the investment consciousness, because in the clustering model "investing" is a dominant type. More than 1/3 of students invest in their own human capital. The high proportion of "action" type shows that the number of students didn't form purely investment approach to education, professional knowledge and skills are associated with the achievement of not only material success but also social.

This is consistent with the typology of investment strategies, some of which is based on the preferences of connections and acquaintances, which can be obtained by entering a new professional community. The high proportion of "not investing" type shows that not investing motives of higher education obtaining are dominant in the number of students. Consequently, there is no understanding of the need to invest in their human capital.

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