ENTRANTS’ CHOICE OF THE UNIVERSITY TO STUDY INNOVATIVELY ORIENTED SPECIALTIES: THE INFLUENCE ON HUMAN CAPITAL DEVELOPMENT

Prof. I. Alieksieiev, D.Sc., Assoc. Prof. A. Mazur, PhD, Assoc. Prof. V. Alieksieiev, PhD
Lviv Polytechnic National University
Lviv, Ukraine
Ihor.V.Alieksieiev@lpnu.ua, Andriana.V.Mazur@lpnu.ua, Vladyslav.I.Alieksieiev@lpnu.ua,

Abstract: The article deals with the development of human capital through training specialists in innovatively oriented specialties and applicants’ selection of specialties by different criteria. There is presented the argumentation of the criterion of education cost, in other words the cash (financial) flow from the family of the consumer of educational services when choosing the university for studying innovatively oriented specialties. These specialties include Bachelor’s Degree Programmes in Materials Science and Engineering, a number of Computer Science degree programmes, namely Computer Science, Computer Engineering, Systems Analysis, Information Systems and Technology. In order to achieve the goals of the study, the typology of Ukrainian universities, which implement educational programmes in the studied specialties, is deepened. Comparison of bachelor’s programmes in several selected specialties on the criterion of the cost of studying in Ukrainian universities is made. The cost of one of the study programmes of Ukrainian as compared with foreign universities of Austria, Bulgaria, Germany, Poland and Russia, has also been analysed.

KEYWORDS: DEVELOPMENT OF HUMAN CAPITAL, INNOVATIVELY ORIENTED SPECIALTIES, BACHELOR OF SCIENCE STUDIES, CRITERIA FOR CHOOSING A UNIVERSITY, CASH (FINANCIAL) FLOW OF THE CONSUMER OF EDUCATIONAL SERVICES.

1. Introduction

The human capital category is an important contemporary characteristic of not only the individual - the bearer of that capital, but also of the state. Every individual, having acquired certain knowledge and skills, both general and professional, enriches himself and acquires additional intellectual capital. However, every workable, and even more so, working person raises the human capital level of the enterprise (institution or organization) where he or she puts in their labor efforts and uses the acquired capital. Therefore, through its activity in a certain group, people increase human capital in society and in the state. It is well known, and numerous publications confirm this [1; 2; 3 and others], that this concept was introduced and developed in the 1960s by G. Becker [4], T. Schultz [5], S. Kuznets [6]. It is the application of this category that makes it possible to comprehensively evaluate and compare different countries in their development using the Human Capital Index [7] or the Human Development Index [8].

The educational level of the population is undoubtedly one of the most important components of the country’s human capital. Education is not only recognized as a factor that significantly affects the economy, culture, health of people and entire nations. The educational level is a factor in the growth of professional knowledge, skills of employees. In turn, the whole set of consequences of the growth of professional skills affect the economic growth of the country. This is noted by researchers from different countries [9; 10; 11; 12 and others]. At the same time, in today’s context, it is important not just to educate people, but to have workable individuals with innovative knowledge and skills.

It is possible to speak about mutual influence of innovative tendencies of workers and development of the economy. The level of economic development determines the possibility of forming an advanced and effective education system. Instead, advanced education enables the development of research that underpins a competitive economy.

The current state of the economy is mainly determined by advances in materials, technologies for their production and transformation into the required goods. This means that the training of specialists in materials science, mechanical engineering leads to many of the necessary professions. Digitization, IT development are also signs of a high level of human capital in the country. However, it should not be forgotten that the IT sphere should use state-of-the-art facilities that are entirely material - supercomputers produced by machine-building enterprises with super-modern materials. This is especially true of processors and storage media.

The modern economy is developing largely due to new materials. The emergence of synthetic materials in the chemical industry, the creation of new metallic alloys in the metallurgy opens up new opportunities in mechanical engineering. New design solutions for machines, mechanisms, devices, computers rely heavily on new materials. The innovative nature of the industry’s development of new materials structures, the production and use of metals and non-metallic structural materials is a factor in training material science professionals. There are specialties of machine-building profile that are directly related to parts forming, assembly of components, assemblies, machines, etc. Production computerization requires the availability of a complete set of related hardware and software. However, the training of bachelor’s in these groups of engineering and computer specialties requires a strong material and technical basis and highly qualified scientific and pedagogical staff of the University. These requirements influence the choice of entrant to study at the university. However, according to our research, there are other criteria for choosing a university.

2. Proposed methodology of national and interstate comparative analysis of universities, where the bachelors of studied groups of machine building and computer specialties are trained

To compare universities by any criterion, it is necessary to deepen the typology of universities by branch, or by type of economic activity of future specialists. As for the criteria by which an applicant should choose a university for future study, they are well known. There are enough publications devoted to researching and determining the criteria for choosing a higher education institution. Among them there are the following [1-11].

Researchers [1] have identified the criterion of “quality of higher education” as the main criterion for choosing a university. This was stated by 53% of respondents. The study [2] noted a fairly high level of entrants’ confidence in information from the Internet. 19% of the respondents testify to this. A small number of studies do not indicate the importance of the criteria, but simply give a list of sequential steps to make the choice of higher education [3; 6; 7]. At the same time, such steps are not only an orientation to the university itself [6], but also to the prospects of a particular specialty [7]. A number of researchers prefer not so much the criteria for choosing a university, but rather emphasize the benefits, salient indicators of education and research that are reflected in the rankings of certain universities. Such studies have been conducted in particular for the Taras Shevchenko National University of Kyiv [5], the Kyiv National University of Culture and Arts [4], National Technical University “Kharkiv Polytechnic Institute” [10].
Some studies mention the selection criteria for foreign universities, in particular [8, 9].

Research on the sectoral profile of universities is of great interest [11]. It outlines a sectoral typology of universities. However, the author does not differentiate higher education institutions in so much detail as to reflect exactly the profile of engineering and computer science.

We have chosen to consider the problem of human capital development as the final and desirable result for the socio-economic development of the country, depending on the training of specialists in innovation-oriented specialties. Awareness of the importance of qualitative training in the field of engineering and computer specialties leads to the need to take into account the cost of training, which is determined by the high prices for modern equipment, equipment, software, supplies (for specialties in materials science, gas engineering etc.). Thus, we came to the conclusion that it is important to study the problem posed by the price for studying factor. Of course, the price for studying alone cannot give an answer about the quality of the educational process, its material and technical base. However, it is an objective cost features of the university’s potential, as the university itself evaluates its ability to train a specialist in each occupation.

It is also important to realize that the price of an educational service is influenced by the regulatory framework of pricing for educational services, as well as by a complex of market factors. The state determines, through indicative prices, the indicative need for financial support of the educational and scientific process in the universities of the country. Such legal regulation means establishing the minimum or average level of financial (cash) flow (price) required for the education of one student of the relevant specialty. Ukraine has been debating for several years the introduction of such a statutory level of payment for university education services. In the context of considering different (by directions and nature of pricing) educational services, one could call such cash (financial) flow incoming to universities and outgoing to payers – students’ families or individuals receiving education.

With regard to a complex of market factors, it includes not only the cost of elements of the logistics of the educational process. Each university must take into account the solvency of potential consumers of educational services and competitive influences from other universities that are training in similar specialties. With regard to assessing the solvency of consumers of educational services in Ukraine, we have determined the level of average remuneration for it. For comparison with foreign universities it is important to determine the price in foreign currency for which we chose euro currency. The exchange rate, which can change at any time, as evidenced by the dynamics of foreign exchange rates in Ukraine in August-October 2019, is deliberately chosen by us on the date that precedes the academic year. In fact, this is the date of payment of applicants before enrolling in universities in Ukraine.

3. Prerequisites and means for solving the problem

An important aspect of the study is the deepening of the topology of the universities of Ukraine by the groups of engineering and computer specialty. Relying on determining the profile of universities [11], we have investigated the composition of the leading universities in Ukraine, which train Bachelors in these specialties. The list of such universities is shown in Table 1.

Table 1
Ukrainian Higher Education Establishments that Provide Bachelor’s Degree in machine building and computer specialties in 2019 *

<table>
<thead>
<tr>
<th>Higher education institutions of Ukraine</th>
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<tbody>
<tr>
<td>Donbass State Engineering Academy</td>
</tr>
<tr>
<td>Donetsk National Technical University</td>
</tr>
<tr>
<td>Zaporozhye National Technical University</td>
</tr>
<tr>
<td>Ivano-Frankivsk National University of Oil and Gas</td>
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</tbody>
</table>

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”
National Metallurgical Academy of Ukraine
National University of Transport
Lviv Polytechnic National University
National Technical University “Dniprovsk Polytechnic”
Azov State Technical University
Pridneprovsk Academy of Civil Engineering and Architecture
Sumy State University
Kharkiv National Highway University
Central Ukrainian National Technical University
Cherkasy State Technological University

* According to data of universities in August 2019.

The above presented list of universities, which provide Bachelor degree in engineering and computer science, is not exhaustive. Instead, these universities are the leading technical majors in their respective regions.

4. Solution of the examined problem

Considering the uneven income, the cost of education should be considered one of the main criteria for choosing a university by Ukrainian citizens. In other words, cash flow is unstable for the family of the consumer of educational services, both in volume and timeliness of receipt. This is despite the fact that 75% of respondents consider it possible to study on a fee-for-tuition basis [1]. Such consent is dictated by the small amount of tuition fees dated August 2019, which we can see in Table 2. It is possible to apply such statement to the previous years as well. Considering the direction of our research, namely the consideration of problems of human capital development from the point of view of individuals receiving education, the titles of the tables indicate “tuition fees” also as source cash (financial) flows for consumers of educational services.

Table 2
Tuition fees (initial cash (financial) flow for consumers of educational services) for the first year full-time course in Ukrainian higher education institutions: specialty 131 – Applied Mechanics, 132 – Materials Science, 133 – Industry Machine Building for Entrants 2019 *

<table>
<thead>
<tr>
<th>Higher education institutions of Ukraine</th>
<th>Tuition fees **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hryvnia</td>
<td>Euro</td>
</tr>
<tr>
<td>Donbass State Engineering Academy</td>
<td>13,200.00</td>
</tr>
<tr>
<td>Donetsk National Technical University</td>
<td>13,850.00</td>
</tr>
<tr>
<td>Zaporozhye National Technical University</td>
<td>6,950.00</td>
</tr>
<tr>
<td>Ivano-Frankivsk National University of Oil and Gas</td>
<td>12,600.00</td>
</tr>
<tr>
<td>National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”</td>
<td>15,000.00-18,800.00</td>
</tr>
<tr>
<td>National Metallurgical Academy of Ukraine</td>
<td>9,200.00</td>
</tr>
<tr>
<td>National University of Transport</td>
<td>9,300.00-10,400.00</td>
</tr>
<tr>
<td>Lviv Polytechnic National University</td>
<td>10,800.00</td>
</tr>
<tr>
<td>National Technical University “Dniprovsk Polytechnic”</td>
<td>11,600.00-12,000.00</td>
</tr>
<tr>
<td>Azov State Technical University</td>
<td>13,600.00</td>
</tr>
<tr>
<td>Pridneprovsk Academy of Civil Engineering and Architecture</td>
<td>9,300.00-9,770.00</td>
</tr>
</tbody>
</table>
Analysing the range of prices for the training of bachelors majoring in Applied Mechanics, Materials Science, Industry Mashine Building in Ukrainian universities, the following should be noted. First, if you look at the hryvnia national currency prices, they are not too huge. According to the official data of the Ministry of Finance, the average salary in June 2019 amounted to UAH 10,783.00 [13]. Secondl, if you compare the cost of educational services by region, you can note that the highest price is in the central Ukraine: 18,800.00 UAH at the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”. The second largest payment is in Cherkasy State Technological University – 16,200.00 UAH. The lowest price is 6,950.00 UAH in Zaporizhia Polytechnic, which is difficult to explain. After all, industry in the south of Ukraine is functioning and specialists in University 

The modern economy, as well as the society, is developing in the era of digitalization (or digitization). It is recognized that in the nearest future, almost all processes of life, and especially technological processes in enterprises will be directly controlled by computer systems. According to some experts, a man will still have the function of forming the necessary software for these systems for a certain time period. Understanding this perspective leads to awareness of the need for training in computer science. This trend of human capital development is gaining ground. It is extremely popular with entrants. Of course, our research cannot bypass the training of specialists in this field.

Comparing the prices for training in the specialties of Computer Science, Computer Engineering, Systems Analysis, Information Systems and Technologies with the price for training in the fields of Applied Mechanics, Materials Science, Industry Mashine Building, you can see their difference for the greater part. It should now be acknowledged that higher prices are influenced by higher demand from entrants, their vision of prospects for further employment and, as they see it, a decent wage.

However, as in the group of specialties in mechanical mashine building and materials science, the lowest price for the group of computer specialties is at the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, which ranges from 23,600.00 UAH up to 30,600.00 UAH for some specialties. The lowest price for this group of specialties is 6,950.00 UAH in Zaporozhye National Technical University.

If compared in European currency, it is certainly worth looking at the cost of training the bachelors by the studied specialties at foreign universities. Let’s consider the specialty “Material Science” in higher education institutions for comparison: in Austria (Vienna University of Natural Resources and Applied Natural Sciences), Bulgaria (Sofia Technical University, Varna Technical University), Germany (Dresden Technical University), Poland (Mining and Metallurgic Academy, St. Warsaw Polytechnic University), Russia (Russian Technological University). The data are shown in Table 4.

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As not all universities have prices quoted in euros, we have carried out corresponding transfers of Bulgarian levs, Russian rubles into euros according to the indicators of their national central banks. In particular, such data are: the Bulgarian Lev to Euro exchange rate in August 2019 is 0.5072 Euro per Lev [14]. The ruble to euro as of 08/28/2019 according to the Central Bank of Russia was 72.83 rubles / euro [15].

It should also be noted that different sources indicate different prices for training. In particular, this concerns the price of tuition at Sofia University, which, according to the website of this university, we have received, is 1320.00 levs, which equals 669.50 euros. Instead, information from the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, which has relevant agreements on training specialists of different specialties, shows an approximate sum (apparently average cost of studying at Bulgarian universities) of 1,500.00 Euro [16]. The very averaging of the data explains the significant difference with the data of the site of Sofia University. Although, in certain circumstances, given the first payment, the cost of living, meals, insurance, visa and transportation and other expenses of the student, this sum may well amount to approximate estimates of the cost of training and related costs.

There is also a certain assumption about the specialties at Bulgarian universities, where we take the specialty “Mechanical Machine Building and Engineering” at Sofia University and the branch of “Engineering Sciences” at the University of Varna. This is due to the fact that the websites of these universities do not explicitly refer to the specialty “Materials Science”, which can be explained by differences in national classifications of specialties.

At the Russian Technological University, the specialty is called “Materials Science and Materials Technology". Differences in the names of specialties or branches of science have national characteristics. Instead, the content and focus of the bachelors training is of great importance. It is the content of the named specialties in different countries that has similarities, which determine the uniformity of filling their curricula, at least approximate uniformity of logistics, qualification of scientific and teaching staff. This allows you to compare the cost of their training, which should reflect the prices for studying.

For some simplification of perception by Ukrainian specialists, we have shown prices at European universities not only in Euros but also in UAH.

5. Results and discussion

Comparison of prices (outgoing cash (financial) flows for consumers of educational services) of Ukrainian and European universities shows that at Austrian and Polish universities the prices for study in the field of "material science" are higher. Instead, at German and Bulgarian universities, prices are similar to the ones in Ukraine. Of course, a deeper study of the factors that determine the price of tuition at a higher education institution could reveal the motivations of university leaders who want to determine exactly the level of tuition fees. These may be market requirements (business needs, student solvency, peculiarities of the organization and equipment of the educational process, etc.).

6. Conclusion

Comparison of national universities with each other, as well as with foreign universities, in terms of the cost of studying bachelors in the specialty 132 “Materials Science” and other specialties shows a significant difference between the individual universities. The interpretation of this situation has several explanations and several consequences.

As for the explanations for Ukrainian universities, some of them do have a much more expensive and more efficient material and technical base, which requires some more expensive operation and maintenance. Therefore, the cost of training is higher. If we talk about foreign universities, there is a higher cost of machinery and equipment, raw materials and materials, and higher salaries of teachers and support staff. However, in some foreign universities the cost of preparing a bachelor’s degree by the studied specialties is comparable to Ukrainian universities.

When talking about the consequences, we should note the following. Firstly, there were opposing opinions among Ukrainians. Some believe they are better educated when the payment is higher. Others do not regard the price factor as an indicator of the quality of education. As a result, the choice of university depends on the applicants’ parents’ opinion.

Secondly, there is a view that foreign education is better because there is more modern equipment, advanced innovative technologies. Of course, the value indicator, if it is the chosen criterion for deciding on the university to study at, does not show it. Training programmes of foreign universities and staff composition should be studied in greater detail. This is also true while choosing domestic universities.

Thirdly, cash outgoing (financial) flow for the educational consumer’s family is an important criterion when choosing a university. This will be more noticeable after the transition of the Ukrainian higher education institution to new funding principles, when the number of universities receiving budgetary funding will be reduced and the vast majority of higher education institutions will be retained at the expense of individuals.

7. Literature


INTERNATIONAL SCIENTIFIC JOURNAL "INDUSTRY 4.0"