

INTERNATIONAL COMPARISON OF UNIVERSITY EDUCATION QUALITY ON THE BASE OF MODELING VALUE INDEX

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Abstract: The article is dedicated to studying and comparing the indicators used to evaluate the educational activities quality of universities from various countries. In particular, the indicators of tuition fees, and expenses for the separate indices of inputs for educational activities are being investigated. The ratio of universities tuition fees to incomes of the educational services consumers is being simulated.

KEYWORDS: INDUSTRY 4.0, THE MINIMUM WAGE INDEX, THE REAL WAGE INDEX, THE ANNUAL TUITION FEES, THE RATIO OF TUITION FEES TO WAGES

1. Introduction

The investigation of universities activities, and in particular the education quality, has many dimensions [1-3]. Training programs and plans are being examined. Also, the researches of the educational services marketing are interesting [4]. There are realized special studies regarding the education quality [5]. Entrants, who are selecting the educational institution in order to obtain the university education, are particularly interested in the results of researches related to the education quality in universities of different countries [6-11]. When comparing the education at universities across countries, such aspects are separated as the university's image for providing further employment [12-13], as well as educational opportunities at the lowest cost [14-15]. A separate point must be made about studying the universities ratings, where the result of researches with wide spectrum are being consolidated [16]. There are a lot of ratings that somehow reflect the educational and scientific activities of universities. But the key goal of these rating systems is to substantiate the advantages of some universities over the others. In other words, ratings are being used for the further marketing conclusions that are addressed to the potential entrants. However, the universities goals are rather aimed at applicants of post-graduate course and potential research workers. This very contingent is already versed in rating activities. And more importantly, the future post-graduate students can bring new ideas into investigates, which the holder of master's degree is better informed in than the applicant of bachelor's degree. Consequently, both the ratings, which are the synthesized investigation results, and the researches across the separate factors of universities educational activities, in large amount, are pointed to persuading the potential consumers of education services in activities advantages of the certain higher educational establishments. In order to compare the educational activities of universities, they use various indicators. Instead of this, to convince the applicants for the bachelor's degree, that is, graduates from schools, gymnasiums, lyceums, as well as their parents, they use such concepts as "cheap education", "bad education" [17]. In this case, in particular, it is commonly believed that educational services are better in those universities where the price for educational services is higher. Comparison in such cases is carried out directly, for example, in the Euro currency or in US dollars.

This research is dedicated to discussing the problem of comparing the education quality by evaluating the educational services value and the abilities of consumers to pay these services cost. The implementation of "INDUSTRY 4.0" in Ukraine is possible only in the conditions of the wide staffing base existence. With this aim, it is a necessity to train the workforce in Ukrainian universities. The latter requires understanding of the fact that the value of education service needs to be evaluated not only within the direct comparison and transfer the education services cost from hryvnias to Euro or US dollars at the exchange rate. It is worth understanding that the value of education services, like the cost of other services and goods, should be always compared with the income of potential consumers in every country. We are not

objecting the importance of training national staff at the foreign universities. Similarly, we support the idea and practice of academic mobility. In this context, it is necessary to develop and enhance training of specialists in Ukrainian universities. And this requires the correct approach to evaluating and developing ratings of the domestic universities, as well as comparing the result of their activities with the foreign ones.

2. Prerequisites and Instruments for Solving the Problem

Education services are an important component of the activities of all the educational establishments and all levels of accreditation. However, for universities that are ought to work not only under the state order, but also in terms of payment of such services by individual persons and legal entities, the question of covering costs, related to education services provision, is extremely important. Recently, the mentioned problem has become particularly acute. There arises the need to increase the remuneration of teachers and the auxiliary personnel. The tariffs for public services are being raised. The facts, mentioned above, requires ever-increasing amount of expenditures from universities. But an income of individual persons interested in receiving the education services, and so obliged to pay for them, is growing much slower.

Let us present data on expenditures. The prime example of changing the wage costs is a dynamic of minimum wages (Table 1), related to all the citizens of Ukraine. We have adopted the changes in the minimum wages exactly because they are similar for all territories of Ukraine. At the same time, the amount of the average wages is different in various regions.

Table 1: Changes in the amount of the monthly minimum wages during 2014-2018 *

The date, on which the minimum wages is shown	The amount of minimum wages, UAH	Index** of minimum wages, %
01/01/2014	1218.00	
01/01/2015	1218.00	100.00
01/01/2016	1378.00	113.14
01/01/2017	3200.00	232.22
01/01/2018	3723.00	116.34
Draft at 01/01/2019	4173.00	112.09

Notes:

* according to [18]

**the minimum wages index is shown as ratio to the previous period, represented in a table.

Data from Table 1 indicates obviously of insignificant changes related to the minimum wages increase. It is well-known that the jump of the minimum wages amount in 2017 only slightly smoothed things over. This situation was that there appeared a

significant gap among the dynamic of prices and tariffs and the dynamic of a subsistence level, the minimum wages dynamic.

One more important factor, although not the largest by the absolute value, is changes in electricity tariffs (Table 2). We have taken electricity tariffs for dormitories, since they coincide with the tariffs for the population, among which there are also consumers of educational services. Here it is important to understand that in addition to higher education institutions (HEIs), which conduct calculations with power engineers, the same calculations are carried out by families of students - direct recipients of educational services, among which there are many residents of dormitories. That is, the family, on the one hand, pays for electricity in its premises, and on the other hand, it pays for electricity in the dormitory where its student lives. In other words, the expenses of a family while teaching her child at the university are increasing.

Table 2: Changes in electricity tariffs for dormitories and population during 2014-2018*

The date, on which tariff payments are shown	The amount of tariff payment, UAH kopecks/kWh.	Index** of the tariff payments amount, %
06/01/2014	30.84	
04/01/2015	36.6	118.68
09/01/2015.	45.6	124.59
03/01/2016	57.0	125.00
09/01/2016	71.4	125.26
03/01/2017	90.0	126.05

Notes:

* according to [18]

**the electricity tariff payments amount index is shown as ratio to the previous period, represented in a table.

The dynamic of electricity tariff payments indicates its steady growth. This requires the universities to increase permanently their costs. Electricity is spent not only for lightening the classrooms and spaces in campus and dormitories, since it is also necessary for conducting laboratory exercises and research, develop prototypes of materials, instruments, machines and mechanisms developed by scientists at universities.

It is interesting to compare the data obtained regarding changes in minimum wages with the real wage index within the studied periods (Table 3).

Table 3: The comparison of changes in minimum and real wages during 2014-2018 *

The date, on which the minimum wages is shown	Index of the minimum wages, shown as ratio to the previous period (represented in a table), %	Index of the real wages per year, %
01/01/2014		86.5
01/01/2015	100.00	90.1
01/01/2016	113.14	106.5
01/01/2017	232.22	118.9
01/01/2018	116.34	100.8 (Forecast)
Draft at 01/01/2019	112.09	

Notes:

* according to [18]

As we can see from Table 3, the minimum wage index differs significantly from the real wage index, which indicates an increase in the value of the minimum wage against the background of a slight increase in real wages. As is known, it is real wages that give an idea of the purchasing power of the population, among which there are educational services consumers. And if the minimum incomes of people grow by even more than 2 times, as shown for 2017, then real incomes grew only 1.1 times. Is this 10-percent growth enough to cover the cost of paying for educational services?

To answer this question, it is worthwhile to analyze only for some examples the amount of tuition fees at universities in Ukraine (Table 4).

Table 4: The annual tuition fees for economic specialties at universities in Ukraine *

Universities of Ukraine	Annual tuition fee, thousand UAH / per year, 2018
1) Oles Honchar DNU	12.700
2) Taras Shevchenko NUK	33.430
3) KNEU	24.500
4) KNUTE	15.730
5) IFNUL	14.115
6) LPNU	9.000
7) ONU	15.028
8) ONEU	13.050
9) KhNEU them. S. Kuznets	16.400

Notes:

*According to data of the following universities:

- 1) Oles Honchar Dnipro National University
- 2) Taras Shevchenko National University of Kyiv
- 3) Kyiv National Economic University named after Vadym

Hetman

- 4) Kyiv National University of Trade and Economics
- 5) Ivan Franko National University of Lviv
- 6) Lviv Polytechnic National University
- 7) Odessa I.I. Mechnikov National University
- 8) Odessa National Economic University
- 9) Simon Kuznets Kharkiv National University of

Economics

The data from Table 4 show that university tuition fee on economic specialties, which in recent years have been one of the most popular among applicants, exceeds the minimum wage. Of course, this should not be considered as some kind of complete anomaly. However, the situation when the annual minimum wage is equal to the annual tuition fees indicates a difficult environment for providing university education to children from low-income families. In Ukraine, individual examples are well-known, when not only good specialists with a university education, but also eminent scientists came out of low-income families.

3. Solution of the Examined Problem

In order to solve the examined problem, it is necessary to simulate the corresponding indicator (Ex_{min}^{ed}). It is inadvisable to rely, for comparison, on determining only the value of educational services. We propose to compare the costs for education (Pr_{year}^{ed}) with an income of citizens, which are the potential consumers of education services. In particular, let us take the minimum wages (Wg_{min}^{per}) as an income indicator in this research. Then, the proposed indicator will look as follows:

$$Ex_{min}^{ed} = \frac{Pr_{year}^{ed}}{Wg_{min}^{per}}$$

Ex_{min}^{ed} – expenditure for education with minimum wages, point;

Pr_{year}^{ed} – price for education per year, €;

Wg_{min}^{per} – minimum personal wages per year, €.

Thus, to determine the proposed indicator, the one should perform the following calculation algorithm.

First, we define the costs of educational services and income of Ukrainians. For comparability of such indicators, a single value should be taken for the whole country. This value is the minimum wage.

Secondly, we determine the costs of educational services and revenues for the countries, which we are comparing with, in particular for Bulgaria and Austria.

Thirdly, we compare calculated indicators for Ukraine with those of Bulgaria and Austria.

Table 5: University tuition fees by the example of specialties in economics and management

Country	Average annual tuition fee, UAH	Average annual amount of wages, UAH**	Ratio of the tuition fees to wages, %
Ukraine			
Lviv Region	9000.0*	78024.00	11.53
National University of "Kyiv-Mohyla Academy"	27000.00*	132876.00	20.32

Notes:

*Average annual tuition fee for the bachelor's level. For Lviv region, the equivalent in Euros is 300,00 €. For the National University of "Kyiv-Mohyla Academy", the equivalent in Euros accounts for **900,00 €**.

**Average annual wages (gross, before the tax payment) in Ukraine is taken according to the Ukrstat statistical data for August 2017: Lviv region – 6502.00 UAH per month; Kyiv – 11073.00 UAH per month.

Determining the average annual tuition fee for Austria requires a study of tuition fee for a certain number of leading Austrian universities. In general, it is worth noting that education in public educational establishments is free both for Austrians and for foreigners. However, students are required to pay a semester fee. This contribution may be of varying sizes in different universities.

At the Technical University of Wien (WTU) students pay the semester contribution that is equal to 726,72 € per a half-year. At the Wien University (WU) Ukrainian students are ought to pay 382,06 € per half-year as the semester fee. At Wien Economic University (WEU) students contribute 726,72 € as a semester fee. The tuition fee at University of Applied Sciences Wiener Neustadt is 363,36 € per half-year, and the student trade-union contribution is estimated at 19,20 € / semester. Talking about the University of Applied Sciences of Kärnten, students pay 363,36 € as a semester fee. At University of Klagenfurt (UKLf) students pay the semester fee equal to 726,0 € per half-year. Lauder Business School, which is private, provides free education, although students are ought to pay the semester fee in the amount of 726,72 € per half-year. Students at Johannes Kepler University Linz are obliged to pay the semester fee equal to 363,36 € / semester.

The results of such a study, recalculated per average annual value, are generalized and presented at Table 6.

Table 6: Tuition fees at universities of Austria, by the example of specialties in economics and management

Country	Average annual tuition fee*, Euros €	Number of students, people
Austria		
Technical University of Wien. WTU	1453.44	20000
Wien University WU	764.12	79300 (bachelors)
Wien Economic University. WEU	1453.44	23000
University of Applied Sciences Wiener Neustadt	726.72	3600
University of Applied Sciences of Kärnten	726.72	2000
University of Klagenfurt UKLf	1452.00	10000
Lauder Business School BUW	1453.44	310
Johannes Kepler University Linz JKU	726.72	18036

Notes:

*Average annual tuition fee for the bachelor, according to data of the Austrian universities

In addition, Table 6 represents data on the number of students in certain universities for the further determination of average pay rates. Data on the students' number is taken from the official websites of universities and Wikipedia. Of course, these data are approximate and may not fully correspond to the number of students on a specific date. Instead, it should be mentioned that the number of students is always a variable value. This is due to the constant migration of students, which is explained by their academic mobility, exclusions because of the academic failure and other factors.

The calculation of the average annual tuition fees for Austria will be obtained by means of weighted average value, where the weighting factor is the number of students at the university.

1) First, we determine the total amount, paid by students, as the sum of multiplies of tuition fee at a particular university and the number of students at that university:

$$1453.44 \times 20000 + 764.12 \times 79300 + 1453.44 \times 23000 + 726.72 \times 3600 + 726.72 \times 2000 + 1452.00 \times 10000 + 1453.44 \times 310 + 726.72 \times 18036 = 29\,068\,800.00 + 60\,594\,716.00 + 33\,429\,120.00 + 2\,616\,192.00 + 1\,453\,440.00 + 14\,520\,000.00 + 450\,566.40 + 13\,105\,318.32 = 89\,663\,516.00 + 36\,045\,312.00 + 15\,973\,440.00 + 13\,555\,884.7 = 125\,708\,828.00 + 29\,529\,324.700 = \mathbf{155\,238\,153.00€}$$

2) Now we determine the total number of students studying in all the examined universities in Austria:

$$20000 + 79300 + 23000 + 3600 + 2000 + 10000 + 310 + 18036 = \mathbf{156246\,students}$$

3) We define the average annual amount of tuition fees when dividing "the general amount paid by the students per year for the education services delivery" by "the number of students that are studying at all researched Austrian universities":

$$\mathbf{155\,238\,153.00: 156246 = 993.55\,€/year}$$

4) To compare with the tuition fees in Ukraine, let us determine the equivalent amount in hryvnias under the certain exchange rate of Euro to UAH. The amount of **993,55 €/ per year under the exchange rate of 31.1** (<https://minfin.com.ua/ua/currency/eur/>) hryvnias per year, is an equivalent to **30 899,405 ₴** per year (UAH/year).

Now we will carry out similar calculations for universities in Bulgaria. Data on tuition fees on the specialties of economics and management in some of the leading universities in Bulgaria are shown in Table 7.

Table 7: Tuition fees at universities of Bulgaria, by the example of specialties in economics and management

Country	Average annual tuition fee*, Euros €	Number of students, people
Bulgaria		
Sofia University "St. Kliment Ohridski"	3450.00	14000
Technical University of Sofia	3000.00	1100
Technical University of Varna	2500.00	7000
University of economics - Varna	2500.00	11000
Varna Free University	3000.00	10000
Plovdiv University "Paisii Hilendarski"	3000.00	1300
Burgas Free University	3000.00	7500

Notes:

* Average annual tuition fee for the bachelor's level, according to data of the Bulgarian universities

Calculation of the average annual tuition fees for Bulgaria will be held similarly as for Austrian universities, through the weighted average, where the weighting factor is the number of students at the university.

1. First, we determine the total amount, paid by students, as the sum of multiplies of tuition fee at a particular university and the number of students at that university:

$$3450.00 \times 14000 + 3000.00 \times 11000 + 2500.00 \times 7000 + 2500.00 \times 11000 + 3000.00 \times 10000 + 3000.00 \times 1300 + 3000.00 \times 7500 = 48\,300\,000.00 + 33\,000\,000.00 + 17\,500\,000.00 + 27\,500\,000.00 + 30\,000\,000.00 + 3\,900\,000.00 + 22\,500\,000.00 = 81\,300\,000.00 + 45\,000\,000.00 + 33\,900\,000.00 + 22\,500\,000.00 = 126\,300\,000.00 + 56\,400\,000.00 = \mathbf{182\,700\,000.00 \text{ €}}$$

2. Now we determine the total number of students studying in all the examined universities in Austria researched:

$$14000 + 11000 + 7000 + 11000 + 10000 + 1300 + 7500 = \mathbf{61800 \text{ students}}$$

3. We define the average annual amount of tuition fees when dividing "the general amount paid by the students per year for the education services delivery" by "the number of students that are studying at all researched Bulgarian universities":

$$\mathbf{182\,700\,000.00 : 61800 = 2956.31 \text{ € per year}}$$

4. To compare with the tuition fees in Ukraine, let us determine the equivalent amount in hryvnias under the certain exchange rate of Euro to UAH. The amount of **2956.31 € per year under the exchange rate of 31.1** (<https://minfin.com.ua/ua/currency/eur/>) hryvnias per year, is an equivalent to **91 941,241 ₴** per year (UAH/year).

Let us determine the minimum wages calculated per year for each of the countries.

Table 8: Minimum wages within the researched countries, calculated per month and per year, respectively

Country, monetary units	Minimum (gross) wages per month / per year	Date (period), at which the amount of wages has been determined, and the literary source
Austria, € (Euros)	1500.00 / 18000.00	July 2018 [19]
Bulgaria, € (Euros)	260.00 / 3120.00	2018 [20]
Ukraine, ₴ (UAH)	3723.00 / 44676.00	May 2018 [18]

Let us determine the average annual tuition fees for each country (Table 9). As the data from Table 9 shows, the lowest annual amount of tuition fee is in Ukraine. This is explained by the national ratios of prices and tariffs with Ukrainian income. Slightly more sum is characteristic for universities of Austria. However, the state policy of financial support for universities makes the costs for consumers of educational services quite small. The most expensive from the three countries studied is the education at universities in Bulgaria and it can also be explained by the national policy of education financing. But a direct comparison of the education cost in universities of the compared countries is, in our opinion, not objective enough. After all, such a direct comparison does not consider the solvency of potential consumers of educational services.

Table 9: Comparison of the annual tuition fees in Austria, Bulgaria and Ukraine *

Countries	Annual tuition fees	
	Euros	UAH
Austria	993.55	30 899.405
Bulgaria	2956.31	91 941.241
Ukraine: Lviv region National University of "Kyiv-Mohyla Academy"	300.0	9000.00
	900.00	27000.00

Notes:

*Calculated by the authors

To overcome this drawback, we will simulate an indicator that should take into account not only the educational services costs, but also the solvency of entrants and their families. We propose to

determine solvency as the value of wages. At the same time, we consider it expedient to choose the minimum wage when determining the proposed indicator for international comparisons. Let us determine the values of the simulated and proposed by us indicator of the ratio of the tuition fee and the minimum wage as a possible characteristic for the cross-country comparison of universities by value indicators.

Table 10: Tuition fees at universities in comparison with the annual minimum wages amount*

Countries, monetary units (gross, before taxes)	Average annual tuition fee **	Minimum wages within the country in 2017, monetary units	Ratio of the tuition fees and wages, %
Austria, Euros	993.55	18000.00	5.52
Bulgaria, Euros	2956.31	3120.00	94.75
Ukraine, Lviv region, UAH	9000.0	44676.00**	20.15
Ukraine, Kyiv-Mohyla Academy, UAH	27000.00	44676.00**	60.44

Notes:

*Calculated by the authors

** Average annual tuition fee for the bachelor's level

***Average annual amount of wages (gross) in Ukraine was taken according to the Ukrstat statistical data on August 2017.

It follows from the calculations that, despite significant differences in absolute values of tuition fees, the cost of educational services at universities in Ukraine is significantly higher compared to income of Ukrainians.

So, comparing the cost of education in different countries, it is necessary to take into account not so much the hryvnia exchange rate, but the ratio of the fee offered by universities to the income received in a particular country.

Also, an important aspect of domestic comparisons should be considered regional differences in the parameters indicated and studied by us. Obviously, when getting less income in the Lviv region is not worth raising prices for studying in Lviv universities to the level of Kyiv ones.

4. Results and Discussion

The implementation of INDUSTRY 4.0 ideas in Ukraine requires appropriate staffing. Undoubtedly, the quality of education is placed high on in this context. Training of highly qualified personnel for Ukrainian enterprises should take place both in Ukrainian universities and in foreign ones. At the same time, it is important to bear in mind that in Ukrainian universities, training at a lower cost provides for obtaining at least equally qualified specialists. Obtaining knowledge and skills on innovative technologies is possible as a result of the active introducing the academic mobility of students and teachers of Ukrainian universities.

5. Conclusions

The key idea of the study is the proposal of a new characteristic for international comparison of the university's educational services quality - the simulated indicator of the ratio of tuition fees to the minimum wage in the country. Such a minimum wage can act as a characteristic of the solvency of educational services consumers.

6. Literature

1. Ukrainian Project «Quality of Education». Access mode: <http://yakistosviti.com.ua>
2. DSTU ISO 9000:2007. Quality Management System. Fundamentals and Vocabulary. — Kyiv.: Derzhspozhivstandard of Ukraine, 2008. — 37 p.
3. Kuzmin, O. Factors of providing the state management quality of HEIs educational activities / O. Kuzmin, M. Yastrubskyy // Regional Economy. — 2017. — #2(84). — PP. 31-38.
4. Education systems of the European Union countries: general characteristics: training manual / S. Sysoieva, T. Krystopchuk; Borys Grinchenko Kyiv University. — Rivne: Ovid, 2012. — 352 p.: ISBN 966-8179-77-8
5. Zaiac L. Comparative analysis of the university education in Ukraine and Netherlands in the context of Bologna agreements. ISSN Online: 2312-5829. Educological Discourse, 2014, # 3 (7), PP. 82-94.
6. Economic and business education in Austria. Access mode: http://osvita.ua/abroad/higher_school/austria/41359/
7. Chekhovska, M. Comparative analysis of development stages of higher pedagogical education in Ukraine and Republic of Bulgaria. Bulletin of Alfred Nobel University. Series "Pedagogy and Psychology". Pedagogical sciences. 2016. # 1 (11), PP. 17-21. ISSN 2222-5501.
8. Bulgarian University Ranking System [Electronic resource]. — Access mode: <http://rsvu.mon.bg>
9. Yastrubskyy, M., Kuzmin, O., 2016. Peculiarities of Higher Educational Establishments Funding Accounting: National and Foreign Experience. Economics, Entrepreneurship, Management, 3 (2), p. 1-6.
10. Bachynska, O. The role of image in the structure of providing the HEIs competitiveness [Electronic resource] / O. Bachynska. — Access mode: http://www.confcontact.com/20130214_econ/4_bachinska.htm.
11. Horbenko N. The features of forming the image of the modern university / N. Horbenko // Educological Discourse. — 2014. — # 1(5).— PP. 36-43.
12. Karpenko Yu., Karpenko N. Image of educational institution: the main components and problems of formation. Scientific Bulletin of Polissia. ISSN 2412-2394 (online). PP.118-124.
13. Education in Ukraine: 129 billion - waste of money or investment? Access mode: <https://www.epravda.com.ua/publications/2017/02/15/620955/>
14. Abiturients.info. Access mode: <https://abiturients.info/uk>
15. Repko M. Expensive and bad, but for everyone: how much does higher education actually cost for Ukraine. VOX UKRAINE, 2223, July, 19, 2016.
16. MinFin. Access mode: <https://index.minfin.com.ua/ua/labour/salary/min/>
17. Minimum and average salary in Austria. Access mode: <http://hochusvalit.com/avstriya/zarplata-v-avstrii#ggl-1>.
18. Minimum and average salary in Bulgaria. Access mode: <http://hochusvalit.com/bolgariya/zarplata-v-bolgarii>.
19. Bakhrushyn, V. Higher education quality and modern approaches to measuring it / V. Bakhrushyn, O. Horban // Education and management. — 2012. — V. 14, # 4. PP. 7-11.
20. Sychenko, V. The essence and peculiarities of education services marketing in Ukraine [Electronic resource] / V. Sychenko. — Access mode : <http://www.kbuapa.kharkov.ua/e-book/db/20072/doc/2/10.pdf>