
ANNALIS
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN – POLONIA

VOL. LIII, 3

SECTIO H

2019

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*An analysis of foreign students' expenses while studying at
universities: Interstate comparison*

Keywords: study period; foreign student; university; annual student's costs of studying

JEL: H75; I23; J13

How to quote this paper: Alieksieiev, I., Mazur, A., & Alieksieiev, V. (2019). An analysis of foreign students' expenses while studying at universities: Interstate comparison. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, Vol. 53, No. 3.

Abstract

Theoretical background: The focus of this article is to study and compare the indicators that are implemented to evaluate the quality of the educational activities of universities in Poland, Germany and Ukraine. The investigation is exercised, in particular, by the proposed indicator of comparing the annual students' costs during their studies for a bachelor's degree with the average annual incomes of these services for consumers in related countries. Because of the differences in remuneration across the regions of each country, the authors used statistical data from these regions. Regarding average annual incomes, the authors used the average wage level in the provinces of Poland, the federal lands of Germany, and the regions of Ukraine.

Purpose of the article: The research objective of the article is a substantiation of methodological and applied recommendations for interstate comparisons of foreign students' expenses while studying at universities based on the experience of Poland, Germany and Ukraine. The object of this paper is the analysis of annual costs of a foreign student while studying at domestic and foreign universities.

Research methods: During the research, the following methods were used: the dialectical method and methods of analysis and synthesis – to study the features of the comparison of educational activities of domestic and foreign universities, the characteristics to compare the costs of the training period within universities of different countries; statistical method – to analyse the average annual wage and the costs of international students during the training period at universities in Poland, Germany and Ukraine; structural and logical analysis – to develop theoretical and methodological principles to determine the indicator for “the ratio of the student's annual expenses while studying at the university to the average wage in the region”.

Main findings: The ratio of the annual costs of students during the studying period and average annual wages allows different categories of stakeholders to determine the real level of expenses. For applicants, primarily Ukrainians, such an indicator will allow them to navigate, not only the absolute amount of annual expenses, but also the comparison of costs with the remuneration for possible part-time work that is allowed to students in Germany and Poland. Moreover, the part-time work allowed for students correlates to a certain extent with the level of average wages. For university authorities, the proposed indicator may allow a comparison of the competitiveness of their higher education institutions, taking into account the solvency of educational services users. For business circles and local governments (in the provinces of Poland, the federal lands of Germany and regions of Ukraine), this indicator can be useful in assessing the competitiveness of their territories to attract students. Student youth and local residents act as consumers of goods and services, contribute to the development of local business and, thus, can be a source of filling local budgets.

Introduction

The comparison of the educational activities of domestic and foreign universities is extremely important for universities, applicants and employers. Regarding the interests of universities, they focus on gaining certain advantages when competing for the provision of educational services and use the national and international ratings of higher educational establishments (universities) for this purpose. Such generally accepted international ratings are: World University Rankings, QS Global World Rankings, QS Emerging Europe and Central Asia University Rankings (EECA), webometrics, etc. Countries also use national ratings. In Poland, this rating is developed by the “Perspektywy” fund, called the *Ranking szkół wyższych* (2018). In Ukraine, this is an academic ranking of the “TOP-200 UKRAINE”, a consolidated rating of higher educational establishments of Ukraine for every calendar year, SCOPUS (rating for the number of citation publications), etc.

For applicants, ratings provide an opportunity to assess the prospects for pursuing studies and further employment. Moreover, obtaining an education in a better (by rating) educational institution is, to a certain extent, a guarantee of a better assessment by an employer and, accordingly, a better job and higher wages. However, the university rating itself does not determine the level of knowledge and skills of the graduate, who can receive both high and low academic grades. Thus, the perception of a specialist using the rating of the university from which he graduated, is only one reason for the consideration of his candidacy by potential employers.

Employers also differentiate the employees they recruit. The employer is not always interested in hiring the graduate of a prestigious institution, since such a person, who is used to setting high objectives, will have similar requirements for the employer, primarily concerning remuneration. Consequently, if an entrepreneur desires to occupy a leading position in the market for his goods and services, he needs to hire the best graduate of a prestigious university.

The generally recognised ratings are important for projecting a certain view of the university. These ratings consider the estimates of the academic aspects of university activities, particularly the scientific and pedagogical potential, the science and technological infrastructure of the laboratories (this is the most important for technological universities), employers' feedback, the universities' openness, which is important for involving the best school graduates, etc.

The research objective of this article is the substantiation of methodological and applied recommendations for the interstate comparison of foreign students' expenses during the study period at universities based on the experiences of Poland, Germany and Ukraine. The object of this study is the analysis of the annual costs of a foreign student during the study period in domestic and foreign universities. This article is a continuation of the comparative studies published on this topic.

Literature review

We can argue that the evaluation of university activities and educational service quality in particular has many dimensions (Ukrainian project "Quality of education", [n.d.]; DSTU ISO 9000:2007, 2008; Bakhrushyn & Horban, 2012). An important point in examining the quality and relevance of the work of universities is their educational programmes and plans, which are regulated by the relative standard in Ukraine (DSTU ISO 9000:2007, 2008). An extremely urgent area for both universities and applicants is educational services marketing (Sychenko, 2007). The investigation of education quality is important for the prospects of university educational activities (Kuzmin & Yastrubskyy, 2017). For applicants, this represents a great interest in the results when comparing the quality of education of universities in different countries (Sysoieva & Krystopchuk, 2012; Zaiac, 2014; *Economic and Business...*, [n.d.]; Chekhovska, 2016; Yastrubskyy & Kuzmin, 2016). The comparison of universities

across countries is also implemented by the university's image to provide further employment (Horbenko, 2014; Karpenko & Karpenko, 2017; Bachynska, 2013), along with the opportunity to access education at a minimum cost (Repko & Ruda, 2017). Certain studies of university ratings generalise the results of scientific and applied researches in various directions (Abiturients.info). Ratings only partially represent the educational and scientific activities of universities. The key purpose of rating systems is an endeavour to persuade the potential consumers of educational services of the advantages of certain universities in comparison to others. We can also formulate the purpose of rating comparisons in the following way: ratings are implemented for the further marketing conclusions that are being addressed to the potential applicants. Thus, to a significant extent, both ratings as generalised investigation results and researches by the separate factors of a university's educational activities are intended to persuade the potential consumers of educational services of the advantages of the individual higher educational establishments. To compare the educational activities of universities, various indicators are implemented. In contrast, to persuade applicants and their parents, the concept of "cheap education" is used the most frequently (Repko, 2016). Consequently, it is generally believed that educational services are better at those universities where the price of these services is higher. Therefore, the comparison is undertaken directly, e.g., in Euro currency or dollars. Incidentally, not all countries have a tuition fee. For example, in Germany, since October 2014, education became free of charge (*Free higher education...*, [n.d.]; *Studying at universities...*, 2017), and thus became very advantageous for foreign students. In Poland, the training of certain categories of foreign student, including Ukrainians, is free of charge (Euro Study; Moja Edukacja).

This investigation focuses on discussing the problems of educational service comparisons at the universities of Poland, Germany and Ukraine through evaluating the ratio between the costs incurred during the training period and consumers' abilities to pay for these services. The latter requires understanding that the value of educational services and associated costs should be assessed, not only by directly comparing and transferring the educational service costs from hryvnias to Euros or dollars at the exchange rate. We must be aware that the value of educational services and the cost of other services and goods should always be compared to the income of potential consumers in each country.

While investigating the costs of studies in Poland, Germany and Ukraine, we should not forget about the possibility of further employment. The comparison of direct and indirect costs immediately related to the period of study at the university represents the "tactical" aspect. Regarding further employment and work, whether in Ukraine, Poland or Germany, this should be viewed as a "strategic" aspect, designed for a great perspective. Training can last from 4 to 10 years, and the working period is much longer – from 10 to 40 years.

The proposed methodology for the interstate comparative analysis of students' expenses while studying at universities

At first, it appears easy to compare the costs of the period of study within universities of different countries. The most primitive and highly deceptive of these is a direct comparison of the education costs by converting the values to a single currency, and consequently, measuring in dollars or Euros. This comparative approach considers only the price that is paid by the consumers of educational services. However, if the tuition fee has been cancelled, as happened in Germany, or it is not established for certain categories of students, there is nothing to compare. Alternatively, the internal situation for every country is not considered according to the ratio of remuneration with prices and tariffs. Undoubtedly, the market condition prices and tariffs can be different across individual regions, along with the remuneration conditions. This is particularly visible in Germany, where every federal land has the right to establish its own level of prices, tariffs and remuneration. Considering these peculiarities and that the minimum wages of parents do not seem to indicate a family's desire to provide higher education for their children, we use average wages in our investigations; i.e. we will consider that the average wage level can be the indicator that adequately reflects (with some degree of likelihood) the ratio of remuneration with the tariff and price system of each of the countries investigated. Moreover, the average wage of employees, at least hypothetically, should cover all the needs of the working person to provide for themselves and their families in food and industrial goods, in paying for utilities, transport and other services, including educational services for children-students. However, it is noteworthy that in Ukraine, the average wage is still insufficient to cover all the needs of the person and the family. It is generally recognised that to solve this problem, a certain level of economic growth is necessary. Nevertheless, the average wage is also an acceptable indicator for Ukraine when conducting an interstate analysis and a comparison of costs in the process of the educational services provided by universities.

Regarding an indicator for the direct comparison of costs incurred by students during the period of study at the universities in different countries, we suggest taking the ratio of the annual amount of expenses during the study period at the university to the average annual wage in a particular region of the country. In Poland, such an area is the province (voivodeship), in Germany – the federal land, in Ukraine – the region.

Prerequisites and means for solving the problem

The cost of studying abroad is significantly different from what people are used to in Ukraine. However, it is also true for Ukraine that when training a student outside the family's residence, and in universities in other cities, the following expenses should be considered: payment for a dormitory (or private accommodation); trans-

portation costs when the educational buildings are located at a distance from the place of residence; and nutrition in catering establishments. When studying abroad prior to the specified expenses, expenses for obtaining a visa, medical insurance and other possible expenses may be added. Thus, exploring the system of expenses associated with studying abroad, it should be understood that the payment of purely educational services (especially in the absence of such a fee) does not exhaust all costs. Separately, it is noteworthy that, e.g. in Germany, there are laws regarding free education at universities. On the other hand, German universities differentiate the costs that a student may incur during the period of study. German universities also include other expenses (sometimes separately), such as the payment for German language courses. It is quite natural to assume that staying in the country requires communication with others, which requires a knowledge of German. The same applies to studies in Poland, where the overwhelming number of students from Ukraine are studying in Polish.

Each university has its own peculiarities in the formation of grades accorded to the costs and other associated expenses during the period of study. As an example, we present the cost differentiation based on the data from Ludwig Maximilian University of Munich (also referred to as the University of Munich). Within this university, they studied the minimum and maximum amount of costs carried by the student during the training period (Table 1). Within this, differences in the tuition fee and living conditions are considered. Some rooms in the students' dormitory cost approximately EUR 270.00 per month, and those with improved conditions – EUR 350.00 per month.

Table 1. Annual costs of a student during the study period at Ludwig Maximilian University of Munich (in EUR)

| Costs for, per 1 year: | Minimum | Maximum |
|----------------------------------------|---------|---------|
| Studying | 252 | 504 |
| Accommodation | 2,400 | 3,960 |
| Other costs | 7,908 | 7,908 |
| Medical insurance* | 600 | 600 |
| Transport (during the training period) | 0 | 0 |
| Total per year | 11,160 | 12,972 |
| Total without "other costs" per year | 3,252 | 5,064 |

* further, we will consider that the value of medical insurance is similar for all German universities and is equal to EUR 600.

Source: Ludwig Maximilian University of Munich. Retrieved from <https://www.uni-muenchen.de/aktuelles/index.html> [access: 24.04.2019].

Not all universities disclose the students' costs in detail. In particular, "Other costs" are not specified elsewhere, and according to the data from Ludwig Maximilian University of Munich, they are equal to EUR 7,908. To correctly compare the indicators of costs that students from various universities ought to pay for during

the training period, we will exclude from our investigation the general amount of "Other costs". As is shown in Table 1, the "Other costs" calculated for both variants are similar. However, the costs for the items "Studying" and "Accommodation" are different. Obviously, the costs within various regions are dissimilar. Even from this university's data, we can observe the difference for Munich: a minimum of EUR 3,252 and a maximum of EUR 5,064; i.e. the difference in total is EUR 1,812. Such an amount is rather high for international students, especially those from Ukraine.

At Karlsruhe Institute of Technology, in addition to "total fees per semester", which is equal to EUR 153.69, the additional fee of EUR 1,653.69 is also provided. At the University of Humboldt, there are specific rules, according to which, students have obligatory semester payments. They include: the "Admission fee" of EUR 50; the "Mandatory semester fee to the student parliament of the University of Humboldt" – EUR 9.75; the "Mandatory semester fee in a Berlin student organization" – EUR 54.09. The total amount of these payments is EUR 113.84. In addition to these payments, the university obliges students to purchase a "Seasonal student card for the use of public transport in Berlin" – EUR 201.8 for a semester. Taking into account the seasonal student card, the student's expenditures are EUR 315.56 per semester. Regarding accommodation, prices may differentiate from EUR 475 to EUR 900 per month. For our research, we will conditionally accept that the items above cost EUR 690 per month. Thus, for a semester (with a duration of 6 months) the accommodation cost will be EUR 4,140 and, relatively, EUR 8,280 per year. Under these baseline data, the expenditures of international students at Humboldt University of Berlin will be equal to EUR 5,055.56 ($315.56 + 4,140 + 600$ for medical insurance) per semester. Annual costs will double the mentioned amount – EUR 10,111.12.

Studying at the University of Freiburg is also free of charge. However, students pay fees equal to EUR 142. In addition, at other universities, international students should consider the cost of a room at the students' dormitory. In Freiburg, a room can be rented at different costs: from EUR 300 to EUR 400 per month. This payment, on a yearly basis (for 12 months) is equal to EUR 3,600 or EUR 4,800. We consider that the amount of medical insurance is similar for all universities – EUR 600. When calculating per semester, the payment for accommodation, medical insurance and the student's fee will be from EUR 2,171 to EUR 2,771. We have calculated the arithmetical average of EUR 2,471 $[(2,171 + 2,771) : 2]$ for our average estimations.

At the University of Bonn, the semester fee is EUR 292. Regarding accommodation fees, the university names an amount from EUR 700 to EUR 800 per month. For our study, we use an average cost of EUR 750 for living per month; i.e. living expenses will be EUR 4,500 per semester, and EUR 9,000 per year. Then, the sum of expenses for a semester for accommodation, medical insurance and a semester fee will amount to EUR 5,392 ($4,500 + 600 + 292$). The annual expenses will be EUR 10,784.

The data on the average annual expenses of one student during the bachelor's programme within eight leading universities in Germany (according to their ranking) and the average monthly salary in the respective federal states are presented in Table 2.

Table 2. Average monthly wage and the amount of foreign student expenses while studying at German universities in 2018

| Federal lands of Germany | University | University rankings 2019 in Germany / QS | Annual student's costs: obligatory fees including accommodation, medical insurance, transport, specific fees, etc., or an additional fee, (in EUR) | Average monthly wage ¹ , USD/EUR* |
|--------------------------|-----------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Bavaria | Technical University of Munich ² | 1 / 61 | 11,946.8 | 2,814.4 / 2,503.97 |
| Bavaria | Ludwig Maximilian University of Munich ³ | 2 / 62 | 8,316.00 | 2,814.4 / 2,503.97 |
| Baden-Württemberg | Heidelberg University ⁴ | 3 / 64 | 3,000.00 | 2,890.7 / 2,571.86 |
| Baden-Württemberg | Karlsruhe Institute of Technology ⁵ | 4 / 116 | 3,307.38 | 2,320.7 / 2,064.73 |
| Berlin | Humboldt University of Berlin ⁶ | 5 / 121 | 10,111.12 | 2,131.2 / 1,896.13 |
| Baden-Württemberg | Albert Ludwig University of Freiburg ⁷ | 10 / 186 | 4,942.00 | 2,785.9 / 2,478.62 |
| North Rhine-Westphalia | University of Bonn ⁸ | 15 / 110 | 10,784.00 | 1,926.1 / 1,713.65 |
| Baden-Württemberg | University of Mannheim ⁹ | 23 / 123 | 3,000.00 | 2,785.9 / 2,478.62 |

* USD/EUR rate in Germany: EUR 0.8897: https://www.finanzen100.de/waehrungen/euro-us-dollar-eur-usd_H1763038774_14959435/ [access: 24.04.2019].

EUR 1 = USD 1.2: <https://greenwichmeantime.com/time-zone/europe/european-union/germany/currency/> [access: 24.04.2019].

We will do the same to the data from Poland. The data on the average annual expenses of one student during training at a bachelor's programme within eight leading universities in Poland (according to their ranking) and the average monthly wage in the respective provinces are presented in Table 3.

¹ IamExpat Media. Retrieved from <https://www.iamexpat.de/career/working-in-germany/salary-payslip-german-minimum-wage> [access: 24.04.2019].

² The Technical University of Munich. Retrieved from <https://www.tum.de/en/about-tum/our-university/locations/> [access: 23.04.2019].

³ Ludwig Maximilian University of Munich. Retrieved from <https://www.uni-muenchen.de/aktuelles/index.html> [access: 24.04.2019].

⁴ Heidelberg University. Retrieved from <https://www.uni-heidelberg.de/en/study/management-studies/tuition-fees> [access: 24.04.2019].

⁵ Karlsruhe Institute of Technology. Retrieved from <https://www.intl.kit.edu/istudies/9638.php> [access: 24.04.2019].

⁶ Humboldt University of Berlin. Retrieved from <https://www.hu-berlin.de/de> [access: 22.04.2019].

⁷ Albert Ludwig University of Freiburg. Retrieved from https://www.unipage.net/ru/university_of_freiburg [access: 22.04.2019].

⁸ The University of Bonn. Retrieved from https://www.uni-bonn.de/studying/international-students/degree-programs/during-your-studies-1#Support_of_international_students [access: 23.04.2019].

⁹ The University of Mannheim. Retrieved from <https://www.uni-mannheim.de/en/academics/coming-to-mannheim/international-students/prior-to-your-arrival/tuition-fees/> [access: 24.04.2019].

Table 3. Average monthly wage and the amount of foreign student expenses while studying at Polish universities in 2018

| Provinces in Poland | University | University rankings 2019 in Poland / QS | Annual student's costs: obligatory fees including accommodation, medical insurance, transport, specific fees, etc., or an additional fee, (in EUR) | Average monthly wage, PLN/EUR* |
|-------------------------|----------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Mazovia Province | University of Warsaw | 1 / 260 | 2,905 | 5,919.00 / 1,376.51 |
| Lesser Poland Province | Jagiellonian University in Kraków | 1 / 381 | 11,700 | 4,809.00 / 1,118.37 |
| Mazovia Province | Warsaw University of Technology | 3 / 576 | 4,000 | 5,919.00 / 1,376.51 |
| Greater Poland Province | Adam Mickiewicz University in Poznań | 4 / 741 | 5,850 | 4,567.00 / 1,062.09 |
| Lesser Poland Province | AGH University of Science and Technology in Kraków | 5 / 633 | 3,000 | 4,809.00 / 1,118.37 |
| Lower Silesia Province | Wrocław University of Technology | 6 / 844 | 3,350 | 5,025.00 / 1,168.61 |
| Lower Silesia Province | University of Wrocław | 8 / 776 | 2,750 | 5,025.00 / 1,168.61 |
| Mazovia Province | Warsaw Medical University | 12 / 834 | 11,100 | 5,919.00 / 1,376.51 |

* PLN/EUR rate: EUR 1 = PLN 4.30: https://uk.coinmill.com/EUR_PLN.html [access: 24.04.2019].

Source: *Wynagrodzenia w Polsce według GUS – dane dla województw*. Retrieved from <https://wynagrodzenia.pl/gus/dane-województw> [access: 22.04.2019]; Adam Mickiewicz University in Poznań. Retrieved from https://www.unipage.net/en/294/adam_mickiewicz_university_in_poznan [access: 22.04.2019]; AGH University of Science and Technology in Kraków. Retrieved from <https://www.international.agh.edu.pl/eng/regular-studies/tuition-fees/> [access: 22.04.2019]; Warsaw Medical University. Retrieved from <https://2wl.wum.edu.pl/en/6-year-program/fees> [access: 22.04.2019].

Similarly, we proceed according to the data in Ukraine. Data on the average annual expenditures of one student during the period of study at the bachelor's programme at eight leading universities in Ukraine (according to their ranking) and the average monthly wage in the relevant areas are presented in Table 4.

Table 4. Average monthly wage and the amount of foreign student expenses while studying at Ukrainian universities in 2018

| Regions of Ukraine | University | University rankings 2019 in Ukraine / QS | Annual student's costs of studying including accommodation, UAH/EUR | Average monthly wage, UAH/EUR* |
|--------------------|-------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------|--------------------------------|
| Kyiv | Taras Shevchenko National University of Kyiv | 1 / 531–540 | 27,278.00 / 909.27 | 14,107.00 / 470.23 |
| Kharkiv | Vasyl Karazin Kharkiv National University | 2 / 481 | 21,420.00 / 714.00 | 7,876.00 / 262.53 |
| Kyiv | National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" | 3 / 601–650 | 26,278.00 / 875.94 | 14,107.00 / 470.23 |
| Lviv | Ivan Franko National University of Lviv | 4 / 1,000+ | 14,950.00 / 498.34 | 8,061.00 / 268.70 |
| Lviv | Lviv Polytechnic National University | 5 / 751–800 | 12,204.00 / 406.80 | 8,061.00 / 268.70 |

| Regions of Ukraine | University | University rankings 2019 in Ukraine / QS | Annual student's costs of studying including accommodation, UAH/EUR | Average monthly wage, UAH/EUR* |
|--------------------|----------------------------------------------|------------------------------------------|---------------------------------------------------------------------|--------------------------------|
| Kyiv | National University of "Kyiv-Mohyla Academy" | 6 / 1001+** | 24,045.00 / 801.50 | 14,107.00 / 470.23 |
| Dnipro | Oles Honchar Dnipro National University | 8 / *** | 15,714.00 / 523.80 | 8,013.50 / 300.45 |
| Odesa | Odessa I.I. Mechnikov National University | 9 / *** | 14,480.00 / 482.66 | 8,386.00 / 279.87 |

* UAH/EUR rate: EUR 1 = UAH 30.0; https://kurs.com.ua/nbu?gclid=EAiaIqObChMiv9XftICN4QIVl8myCh0vCg-CEEAAYASACEgILz_D_BwE [access : 24.04.2019].

** <https://nachasi.com/2019/06/19/ukraine-university-in-world-rating/> [access: 24.04.2019].

*** according to university data

Source: *Minfin Media*. Retrieved from <https://index.minfin.com.ua/ua/labour/salary/average/2018/> [access: 23.04.2019].

The presented input data allows us to proceed to solving the problem under study in accordance with the methodology proposed by the authors and determining the student's annual expenses during the training period for the bachelor's degree at the university.

Solution of the examined problem

The indicator of the ratio of the student's annual expenses while studying and the average wage is calculated by the methodology proposed by the authors in this paper (Alieksieiev, Mazur, & Alieksieiev, 2019). This publication considered the minimum wage and tuition fees. This approach is obvious because the minimum wage in countries with a unitary system, such as Ukraine, is the same for all administrative and territorial units.

The difference of this study from the one mentioned above is in the calculation using the average salary and expenses of the student during the period of study at the university. Taking into account the federal structure of Germany, where each federal state may have differences in various financial and economic standards, we have considered the average wage. However, the statistics of Poland and Ukraine also give grounds for the use of the average wage for individual regions (provinces or regions). In accordance with aforementioned data, the formula for calculating the indicator "the ratio of the student's annual expenses during the study period at the university to the average wage in the region" will take the following form:

$$\text{Rat}_{\text{aver}}^{\text{ed}} = \frac{\text{Cost}_{\text{year}}^{\text{ed}}}{\text{Wg}_{\text{aver}}^{\text{per}}}$$

Where:

$\text{Rat}_{\text{aver}}^{\text{ed}}$ – the ratio of the cost for education to the average wage per year, notional units

$\text{Cost}_{\text{year}}^{\text{ed}}$ – costs for education per year, EUR

$\text{Wg}_{\text{aver}}^{\text{per}}$ – average annual wages, EUR.

Let us calculate this indicator for universities in Germany, Poland and Ukraine. The input data for the calculations and their results are presented in Tables 5, 6 and 7. Calculations for the studied universities in Germany are presented in Table 5.

The ratio analysis of annual student costs during training at German universities to wages in federal lands shows that it is not combined with national or world ratings. The range of values of the proposed indicator Rat_{aver}^{ed} is 42.72%, i.e. from 9.72% at the University of Heidelberg to 52.44% at the University of Bonn. From the proposed determination of Rat_{aver}^{ed} , the dependence on value indicators and not academic coefficients is evident, which determine the national and world rankings of universities. However, the proposed indicator allows a precise view of different universities through the value comparison of costs and sources of their coverage.

Table 5. Calculation of the ratio of foreign student expenses while studying at German universities to wages in the federal lands of Germany

| Federal lands of Germany | University | University rankings 2019 in Germany / QS | Annual student's costs: obligatory fees including accommodation, medical insurance, transport, specific fees, etc., or an additional fee ($Cost_{year}^{ed}$), (in EUR) | Average annual wage within federal land* (Wg_{aver}^{per}), (in EUR) | Ratio of annual student's costs while studying to average wage at the related federal land (Rat_{aver}^{ed}), (in %) |
|--------------------------|----------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Bavaria | Technical University of Munich | 1 / 61 | 11,946.8 | 30,047.64 | 39.76 |
| Bavaria | Ludwig Maximilian University of Munich | 2 / 62 | 8,316.00 | 30,047.64 | 27.68 |
| Baden-Württemberg | University of Heidelberg | 3 / 64 | 3,000.00 | 30,862.32 | 9.72 |
| Baden-Württemberg | Karlsruhe Institute of Technology | 4 / 116 | 3,307.38 | 24,776.76 | 13.35 |
| Berlin | Humboldt University of Berlin | 5 / 121 | 10,111.12 | 22,753.56 | 44.44 |
| Baden-Württemberg | Albert Ludwig University of Freiburg | 10 / 186 | 4,942.00 | 29,743.44 | 16.62 |
| North Rhine-Westphalia | University of Bonn | 15 / 110 | 10,784.00 | 20,563.80 | 52.44 |
| Baden-Württemberg | University of Mannheim | 23 / 123 | 3,000.00 | 29,743.44 | 10.09 |

* average annual wage in a federal land, calculated as the multiplication of average monthly wage (see Table 2) by 12 months.

Source: Authors' own study.

Table 6 presents the results of calculations for the universities in Poland, selected for the investigation.

Table 6. Calculation of the ratio of foreign student expenses while studying at Polish universities to wages in provinces of Poland

| Provinces of Poland | University | University rankings 2019 in Poland / QS | Annual student's costs: obligatory fees including accommodation, medical insurance, transport, specific fees, etc., or an additional fee ($Cost_{year}^{ed}$), (in EUR) | Average annual wage within province* (Wg_{aver}^{per}), (in EUR) | Ratio of annual student's costs while studying to average wage in the related province (Rat_{aver}^{ed}), (in %) |
|-------------------------|----------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Mazovia Province | University of Warsaw | 1 / 260 | 2,905 | 16,518.14 | 17.59 |
| Lesser Poland Province | Jagiellonian University in Kraków | 1 / 381 | 11,700 | 13,420.47 | 87.18 |
| Mazovia Province | Warsaw University of Technology | 3 / 576 | 4,000 | 16,518.14 | 24.22 |
| Greater Poland Province | Adam Mickiewicz University in Poznań | 4 / 741 | 5,850 | 12,745.12 | 45.90 |
| Lesser Poland Province | AGH University of Science and Technology in Kraków | 5 / 633 | 3,000 | 13,420.47 | 22.35 |
| Lower Silesia Province | Wrocław University of Technology | 6 / 844 | 3,350 | 14,023.26 | 23.89 |
| Lower Silesia Province | University of Wrocław | 8 / 776 | 2,750 | 14,023.26 | 19.61 |
| Mazovia Province | Warsaw Medical University | 12 / 834 | 11,100 | 16,518.14 | 67.20 |

* average annual wage in a province, calculated as the multiplication of average monthly wage (see Table 3) by 12 months.

Source: Authors' own study.

Similarly, as for German universities, the ratio analysis of annual student costs during training at universities in Poland to wages in provinces shows that this ratio is not combined with national or world ratings. However, the range of values of the proposed indicator Rat_{aver}^{ed} is of a significantly higher value at 69.59% at Polish universities, i.e. from 17.59% at the University of Warsaw to 87.18% at the Jagiellonian University.

Table 7 represents calculations for universities in Ukraine.

Table 7. Calculation of the ratio of foreign students' expenses while studying at Ukrainian universities to wages in regions of Ukraine

| Cities of Ukraine | University | University rankings 2019 in Ukraine / QS | Annual student's costs while studying including accommodation ($Cost_{year}^{ed}$), (in EUR) | Average annual wage * (Wg_{aver}^{per}), (in EUR) | Ratio of annual student's costs while studying to average wage at the related region (Rat_{aver}^{ed}), (in %) |
|-------------------|-------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Kyiv | Taras Shevchenko National University of Kyiv | 1 / 531–540 | 909.27 | 5,642.80 | 16.11 |
| Kharkiv | Vasyl Karazin Kharkiv National University | 2 / 481 | 714.00 | 3,150.40 | 22.66 |
| Kyiv | National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" | 3 / 601–650 | 875.94 | 5,642.80 | 15.52 |
| Lviv | Ivan Franko National University of Lviv | 4 / 1,000+ | 498.34 | 3,224.40 | 15.46 |
| Lviv | Lviv Polytechnic National University | 5 / 751–800 | 406.80 | 3,224.40 | 12.62 |
| Kyiv | National University of "Kyiv-Mohyla Academy" | 6 / 1,001+ | 801.50 | 5,642.80 | 14.20 |
| Dnipro | Oles Honchar Dnipro National University | 8 / – | 523.80 | 3,605.40 | 14.53 |
| Odesa | Odesa I.I. Mechnikov National University | 9 / – | 482.66 | 3,358.40 | 14.37 |

* average annual wage in a region, calculated as the multiplication of average monthly wage (see Table 4) by 12 months.

Source: Authors' own study.

In addition to German and Polish universities, the ratio analysis of annual student costs during training at Ukrainian universities to wages in regions shows that this ratio is not combined with national or world ratings and is of a certain amplitude. This range of values for the proposed indicator Rat_{aver}^{ed} is lower at 10.04% for Ukrainian universities, i.e. from 12.62% at Lviv Polytechnic National University to 22.66% at Vasyl Karazin Kharkiv National University.

In short, the largest range of Rat_{aver}^{ed} at 69.59% is observed among the Polish universities studied; at German universities, this range is lower – 42.72%; and the least amplitude of 10.04% is recorded at Ukrainian universities. We can explain the data obtained from several positions. The highest values of the Rat_{aver}^{ed} indicator are recorded for the University of Bonn and the Jagiellonian University. Obviously, they are one of the oldest and most reputable universities in Europe. The historical fame allows these universities to be the centre of attention for applicants and attracts them to cities with a high level of expenditures for the self-sufficiency of students. Simultaneously, the University of Bonn in Germany is ranked 15th, and in the world ranking, it occupies 161st place and lags significantly behind the Technical University of Munich, which occupies 61st position in the QS rating. According to the Ukrainian universities studied, they do not have such an ancient history. In addition,

the market transformations of recent years have not yet created a stable and too large gap between the territories of their location. Therefore, it is impossible to expect too much scope for the indicator we have proposed.

Results and discussion

As can be seen in Table 8, the universities of three countries (Poland, Germany and Ukraine) selected for research show a decreasing value for the proposed indicator of the ratio of the student's annual expenses during training to the average salary of the corresponding national territory. This view of universities provides an opportunity to see those higher education establishments that, along with high or not very high national and world rankings, require more or less expenses for the period of study for a bachelor's degree.

Table 8. Interstate table of university rankings according to the ratio of annual student costs while studying to the average wage of the related national territory

| No. | University | Ratio of annual student's costs during the study to the average wage at the related national territory (Rat_{aver}^{ed}), (in %) | QS World university rankings 2019 | University rankings 2019 in the country |
|-----|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------|
| 1 | Jagiellonian University in Kraków | 87.18 | 381 | 1 |
| 2 | Warsaw Medical University | 67.20 | 834 | 12 |
| 3 | University of Bonn | 52.44 | 110 | 15 |
| 4 | Adam Mickiewicz University in Poznań | 45.90 | 741 | 4 |
| 5 | Humboldt University of Berlin | 44.44 | 121 | 5 |
| 6 | Technical University of Munich | 39.76 | 61 | 1 |
| 7 | Ludwig Maximilian University of Munich | 27.68 | 62 | 2 |
| 8 | Warsaw University of Technology | 24.22 | 576 | 3 |
| 9 | Wrocław University of Technology | 23.89 | 844 | 6 |
| 10 | Vasyl Karazin Kharkiv National University | 22.66 | 481 | 2 |
| 11 | AGH University of Science and Technology in Kraków | 22.35 | 633 | 5 |
| 12 | University of Wrocław | 19.61 | 776 | 8 |
| 13 | University of Warsaw | 17.59 | 260 | 1 |
| 14 | Albert Ludwig University of Freiburg | 16.62 | 186 | 10 |
| 15 | Taras Shevchenko National University of Kyiv | 16.11 | 531–540 | 1 |
| 16 | National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" | 15.52 | 601–650 | 3 |
| 17 | Ivan Franko National University of Lviv | 15.46 | 1,000+ | 4 |
| 18 | Oles Honchar Dnipro National University | 14.53 | – | 8 |

| No. | University | Ratio of annual student's costs during the study to the average wage at the related national territory (Rat_{aver}^{ed}), (in %) | QS World university rankings 2019 | University rankings 2019 in the country |
|-----|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------|
| 19 | Odesa I.I. Mechnikov National University | 14.37 | – | 9 |
| 20 | National University of "Kyiv-Mohyla Academy" | 14.20 | 1,001+ | 6 |
| 21 | Karlsruhe Institute of Technology | 13.35 | 116 | 4 |
| 22 | Lviv Polytechnic National University | 12.62 | 751–800 | 5 |
| 23 | University of Mannheim | 10.09 | 123 | 23 |
| 24 | Heidelberg University | 9.72 | 64 | 3 |

Source: Authors' own study.

From the data in Table 8, it is obvious that the universities of each country occupy different places. Simultaneously, universities of one country are represented both in the upper and lower parts of the Rat_{aver}^{ed} rating. The top five are three Polish universities and two German ones. First, these are the metropolitan universities of Warsaw and Berlin, and the universities of the former capitals of Bonn and Kraków. In the bottom five, there are also three German universities and two Ukrainian ones. The low rate of Rat_{aver}^{ed} for German universities can be explained by their location in small towns, where the costs for students are much less. For Ukrainian universities, the explanation is that they generally do not have the ability to set high tuition fees due to the insufficiently high incomes of the population. The highest in our ranking among Ukrainian universities is Vasyl Karazin Kharkiv National University, which is ranked 10th.

Conclusions

From a scientific perspective, we should emphasise the novelty of the proposed indicator Rat_{aver}^{ed} – the ratio of annual student costs while studying at the university to the wage in the specific administrative and territorial unit of the specific state. The investigation, implemented in the universities of Germany, Poland and Ukraine, is allowed to realise the rating activity of the selected higher educational institutions by this indicator. The research reflects the possibility of obtaining data necessary for the calculation of the proposed indicator. The results of the calculation analysis provided an opportunity to demonstrate in a first approximation the advantages of the proposed indicator.

In practical activities, applications of this indicator will allow interested individuals and legal entities to satisfy their interests at the choice of the university, or to attract applicants and additional labour resources. The university ranking in terms of Rat_{aver}^{ed} – the ratio of the student's annual costs while studying at university to wages in a specific administrative and territorial unit of a particular state – is important

for students, their parents (families), authorities and the management of territorial communities, and entrepreneurs. Typically, consumers of educational services and academic ratings are also interested in financial issues. Academic university ratings show the possibility of obtaining quality education in their state and in the world. This is a quality education that guarantees good employment and high-paying work. Financial aspects make it possible to determine not only the level of tuition fees (after all, in Germany, tuition is free), but also the level of expenses during the period of study. In addition, in modern economic conditions, students understand the businesses and the opportunity to work. The level of payment in a particular region can fully or partially compensate students for their maintenance costs during the period of study.

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