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Academic Rankings as a Source of Information for Study Candidates

Abstract

Objectives: The aim of the article is to present a proposal for a ranking of public universities in Poland, taking into account the position of their graduates on the labour market.

Research Design & Methods: Three reflective indicators were used to create the ranking: average time (in months) from obtaining a diploma to taking up the first job under a contract of employment by graduates; the relative unemployment rate of graduates in the fifth year after graduation among graduates with no work experience prior to graduation; the relative wage rate of graduates in the fifth year after graduation among graduates with no pre-graduation work experience. The structure of three indicators has been based on zero-unitarisation.

Findings: The leading universities in the ranking were technical and economic universities. Their 2014 graduates (in all the variety of fields of study offered by these universities) found a job relatively quickly – i.e. within five years of obtaining their diploma – as well as experienced less than average unemployment in the poviats of their residence and their earnings were higher than the average in the poviats of their residence.

Implications / Recommendations: It is advisable to continue research on the methodology of creating academic rankings (including reflective indicators). In this regard, it is worth taking into account possibly large – but at the same time homogeneous – research samples.

Contribution / Value Added: Extended research on how to create academic rankings (in particular devoted to study candidates).

Article classification: research article

Keywords: ranking, Higher Education Institutions, didactics, graduate, Poland

JEL classification: A23, I23

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Introduction

Rankings of universities are an important element of the academic order, enabling the evaluation of the quality of didactic or scientific-research processes taking place within them (Urbanek, 2018, p. 456). A high position in prestigious global and national rankings may be an indicator of the application of the highest academic standards by the university, and a confirmation of the right choice of the educational offer made by potential candidates for studies. What is more, academic rankings can be the basis for allocating funds for institutions financing higher education.

It is worth noting that most of the rankings provoke numerous objections from the representatives of the academic community (Pusser & Marginson, 2013, pp. 544–568). Their comments concern mainly: the criteria used (and their weights), unreliable information provided by some universities participating in the ranking (which cannot be verified on the basis of other sources), improper selection of the research sample (e.g. employers to assess their preferences towards graduates, or academic staff to assess the reputation of universities), or unethical operation of journals creating rankings towards academic institutions (e.g. putting pressure on their participation in the ranking and buying advertising space in the journal at the same time) (Hall, 2013, p. 499). Despite negative views on how universities are ranked, no satisfactory alternative has been found so far. Hence, the aim of the article is to present an original proposal for the ranking of public academic universities in Poland, which would take into account the qualitative effects of the academic education (the position of graduates on the labour market). Thus, the proposed ranking will refer only to one of the processes carried out in universities, namely didactics. It can also be a valuable source of information for applicants to study. It should be noted that the ranking was created using the composite indicators method.

The article consists of five parts. The first part is an introduction and the second part presents the essence and meaning of academic rankings. In the next, methodical part, the research sample and the variables used for the construction of the ranking are defined. The research results and their interpretation are presented in the fourth part. Concluding remarks and recommendations for further research are presented in the fifth part of the article.

Literature review

In the light of the popular and common but informal definition, ranking is "organising information about certain objects according to some criterion or set of criteria" (Rocki, 2019, p. 343). In the literature on the subject, one can find many articles, studies or reports on academic rankings, including their methodology (Dill & Soo, 2005, pp. 495–533; Marginson, 2007, pp. 131–142; Amsler, 2014, pp. 155–166; Lynch, 2014, pp. 141–153; Dembereldorj, 2018, pp. 25–35).

Generally speaking, it can be said that the purpose of the university rankings is to indicate the "best" institution in terms of teaching, research, or dissemination activity (Rocki, 2019, p. 346). In most cases, authors of academic rankings look for a set of factors (indicators) which, in some way, combined with an aggregating function, allow for ordering the analysed universities (Rocki, 2019, p. 346). The choice of indicators depends, among others, on to whom the comparison is addressed (applicants for studies, academic teachers, regional authorities, central authorities, employers). International rankings focus primarily on the evaluation of the scientific and research achievements of universities. In the case of rankings aimed at informing students (predominantly domestic), the emphasis is on didactics indicators (Urbanek, 2018, p. 454). According to Szadkowski (2019, pp. 17–18), the main benefits of creating university rankings include: (1) the ability to monitor progress in the implementation of public policy goals related to higher education in a given country; (2) openness to global flows of students and faculty; (3) simplifying the vision of science

and higher education in order to make the practice of communicating it to the general public easier.

It is worth noting that rankings of academic institutions have been an important part of the landscape of national higher education systems for over 100 years (Hazelkorn, 2015, p. 133). The first rankings of American universities, published since 1910 by J. McKeen Cattel (Hammarfelt et al., 2017, p. 392), paved the way for comparisons developed later in the *US News and World Report* ranking, similarly to the German university ranking conducted by the Center Für Hochschulentwicklung (Usher, 2016, p. 24). Global rankings of universities began to develop dynamically after 2003, when the first edition of Shanghai Jiao Tong's *Academic Ranking of World Universities* (ARWU) was issued (Liu, 2009, p. 2).

There are currently nearly 30 different world university rankings (Hazelkorn, 2015, p. 2). Among them, the most popular and prestigious are: *QS World University Rankings* and *Times Higher Education World University Rankings* by Thomson Reuters and ARWU (Hall, 2013, p. 499). Also in Poland, the ranking of universities of the *Perspektywy* monthly, published since 1999, has managed to build a strong position and gain trust of both future students and their parents, as well as academic institutions that decided to become subjects to comparisons (Siwiński, 2002, p. 399).

The structure of the indicated global rankings (indicators used in them) emphasises openness to the socio-economic environment (e.g. employers' opinions about universities, knowledge transfer), as well as the internationalisation of studies (number of students or lecturers from abroad and other international scientific successes, including the number of graduates or employees who received the Nobel Prize, Fields medals, etc.) (Hall, 2013, pp. 497–498). For example, in the QS ranking, indicators such as university reputation, employers' opinion, international staff, and foreign students have a combined weight of 60%.

On the other hand, most of national rankings (e.g. the *Perspektywy* ranking) concentrate mainly on the quality of educational programmes, i.e. didactics indicators (Urbanek, 2018, p. 453). When writing about the "quality" of the educational process, it should be noted that this is a difficult concept to define (Grudowski & Lewandowski, 2012, p. 399). Its extent depends, among others, on the composition, commitment, and competence of the academic staff, the quality and scope of research, the completeness and method of implementation of the study programme, the infrastructure of a university (Rocki, 2019, p. 346). In soft modelling (Rogowski, 1986, pp. 367–384), these variables are called generating indicators. It is worth emphasising, however, that there are also reflective indicators, relating to the effects of the "quality" of the teaching process, which are particularly important from the point of view of university graduates. Among them, the following can be indicated: the average time of looking for the first job, the average number of months during which graduates were registered as unemployed, average monthly salaries, etc.

These indicators are very often not included in national rankings, or they are given a low weight (in the *Perspektywy* ranking, this weight is at the level of 5%). This may be due to a lack of access to this kind of data. In Poland, however, the Polish Graduate Tracking System (hereinafter 'the ELA system') was launched several years ago. It collects information about graduates of individual universities, registered with the Social Insurance Institution (ZUS) (Pietrzak, 2020, p. 205). The ELA system guarantees full anonymity of the persons covered by the study (Pietrzak, 2018, p. 104). Moreover, this data is not burdened with biases resulting from the imperfect memory of the respondents, or the tendency to round numbers or colour the reality (Pietrzak & Khovrak, 2019, p. 342).

The methodology of the ranking based on the achieved economic status of university graduates will be presented in the further part of the article. This comparison is intended to be a valuable source of information for study applicants and their families.

Material and methods

Due to the profile of the Journal, public academic universities have been chosen as research objects. The ranking includes 58 out of 59 higher education institutions supervised by the Ministry of Science and Higher Education (MSHE). The Christian Theological Academy in Warsaw was excluded from the study due to the specific nature of its functioning (the only theological university under the supervision of the Ministry of Science and Higher Education). Table 1 presents the list of universities included in the study along with their

Table 1. Universities included in the ranking

University code	University name	Percentage of graduates present in ZUS registers (in %)
U1	AGH University of Science and Technology in Cracow	94.3
U2	Jan Długosz University in Częstochowa	97.4
U3	Maria Grzegorzewska University in Warsaw	98.6
U4	Pomeranian University in Słupsk	96.0
U5	University of Technology and Humanities in Bielsko-Biała	98.5
U6	Gdansk University of Physical Education and Sport	98.1
U7	University School of Physical Education in Cracow	97.1
U8	Poznan University of Physical Education	97.1
U9	The Jerzy Kukuczka Academy of Physical Education in Katowice	97.8
U10	Józef Piłsudski University of Physical Education in Warsaw	97.9
U11	University School of Physical Education in Wrocław	96.4
U12	Bialystok University of Technology	96.7
U13	Częstochowa University of Technology	98.5
U14	Gdansk University of Technology	96.2
U15	Koszalin University of Technology	98.3
U16	Cracow University of Technology	97.2
U17	Lublin University of Technology	97.4
U18	Lodz University of Technology	97.6
U19	Opole University of Technology	96.4
U20	Poznań University of Technology	97.4
U21	Rzeszów University of Technology	96.8
U22	Silesian University of Technology	97.9
U23	Kielce University of Technology	99.0
U24	Warsaw University of Technology	95.3
U25	Wrocław University of Science and Technology	95.8
U26	Warsaw University of Life Sciences	96.3
U27	Warsaw School of Economics	96.4
U28	University of Economics in Katowice	98.4
U29	Cracow University of Economics	96.6

Table 1 – continued

University code	University name	Percentage of graduates present in ZUS registers (in %)
U30	Poznań University of Economics and Business	96.8
U31	Wroclaw University of Economics	97.4
U32	University of Gdańsk	97.3
U33	Adam Mickiewicz University in Poznań	96.3
U34	Jagiellonian University	94.9
U35	Jan Kochanowski University in Kielce	98.4
U36	Cardinal Wyszyński University in Warsaw	98.4
U37	Kazimierz Wielki University	98.0
U38	Uniwersity of Lodz	97.3
U39	Maria Curie-Skłodowska University	95.2
U40	Nicolaus Copernicus University	97.2
U41	University of Opole	96.4
U42	Pedagogical University of Cracow	98.3
U43	Siedlce University of Natural Sciences and Humanities	96.6
U44	University of Life Sciences in Lublin	92.9
U45	University of Life Sciences in Poznań	96.0
U46	Wrocław University of Environmental and Life Sciences	94.5
U47	University of Agriculture in Kraków	95.6
U48	University of Rzeszów	96.4
U49	University of Szczecin	96.6
U50	University of Silesia in Katowice	96.6
U51	Kazimierz Pułaski University of Technology and Humanities in Radom	98.2
U52	University of Technology and Life Sciences in Bydgoszcz	96.3
U53	University of Białystok	95.7
U54	University of Warmia and Mazury in Olsztyn	95.4
U55	Warsaw University	94.8
U56	University of Wrocław	95.4
U57	University of Zielona Góra	97.6
U58	West Pomeranian University of Technology in Szczecin	96.6
	Minimum	92.9
	Average	96.8
	Maximum	99.0

Source: own elaboration based on: ELA, 2020.

codes and the percentages of graduates included in the Polish Social Insurance Institution's (ZUS) registers.

The ranking was created using the composite indicators[1] method (CIs). It is being increasingly employed to make cross-national comparisons of country performance in specified areas such as competitiveness, globalisation, innovation, etc. Rather than using a disaggregated set of individual indicators, aggregated composites supposedly allow for an analysis of interrelated performance. Composite indicators method can also be used successfully in the creation of various rankings, including for higher education institutions.

The strengths and weaknesses of composite indicators largely derive from the quality of the underlying variables. Ideally, variables should be selected on the basis of their relevance, analytical soundness, timeliness, accessibility. What is important is that the data selection process can be quite subjective, as there may be no single definitive set of indicators. That is why five reflective indicators were selected for the construction of the ranking, relating to the effects of "quality" of the higher education process. Their selection was based on the experience of other researchers (Rocki, 2018, pp. 343–354; Pietrzak, 2019, pp. 148–160).

Assuming that a substantive selection of variables for the ranking was made, the next step was to assess the power of population discrimination by a given variable, using the classic coefficient of variation (Vs). Due to the low level of the coefficient of variation Vs (below 10%)[2], two indicators were excluded from the ranking structure, leaving the following:

- I_1: average time (in months) from obtaining a diploma to taking up the first job under a contract of employment by graduates (the day of having a job is the moment of paying the first contribution to ZUS for the received remuneration, regardless of the type of employment);
- I_2: the relative unemployment rate of graduates in the fifth year after graduation, among graduates with no work experience prior to the graduation;
- I_3: the relative wage rate of graduates in the fifth year after graduation, among graduates with no pre-graduation work experience.

The relative unemployment and wage rates indicators make it possible to relate the absolute values of the unemployment risk and the remuneration of graduates to the situation in the poviats[3] in which they had lived in the period covered by the study. The relative unemployment rate (I_2) is the average value of the quotient of the unemployment risk among graduates to the registered unemployment rate in their poviats of residence (ELA, 2020). The closer the indicator is to zero, the better is its value, and values lower than 1 mean that the risk of unemployment among university graduates is lower than average. A pointer value of zero means that none among the graduates in the analysed period registered as unemployed. From the construction and definition of I_2 it follows that this indicator is a destimulant.

In turn, the relative earnings ratio (I_3) is the average value of the quotient of the average monthly remuneration of a graduate to the average monthly remuneration in his/her poviat of residence (ELA, 2020). The higher this indicator, the better its value, thus it is a stimulant. Values greater than 1 mean that the salaries of graduates of a given university are higher than average.

[1] An indicator is a quantitative or qualitative measure derived from a series of observed facts that can reveal a relative position in a given area and, when measured over time, can point to the direction of change.

[2] In the literature, the minimum level of the coefficient of variation of the discriminating parameter is generally assumed to be 10%–20% (Tarka, 2012, pp. 47–73).

[3] In Poland, there is a three-level administrative (territorial) division into 16 provinces, called voivodeships, 314 poviats (counties), and 66 cities with the status of poviat, further subdivided into 2477 municipalities (Pol. *gminy*). In NUTS (Fr. *Nomenclature des Unités territoriales statistiques*) classification – which is a geographical standard used for a statistical division of the EU Member States' economic territories into three regional levels of specified classes of the population – poviats would correspond roughly to NUTS 3.

Short time of job-seeking after graduation, high wages, low unemployment rate among graduates all mean that universities offer study programmes in line with the needs of society and the economy (Rocki, 2018, p. 346). Indirectly, it also means that the university is able to successfully establish cooperation with employers on the improvement of study programmes.

It is worth emphasising that the indicators used in the ranking (I_1, I_2, I_3) referred to graduates of the second-cycle studies in 2014 from particular academic universities. However, they do not make it possible to distinguish between graduates of different modes of study. This means that the achievements of full-time and part-time graduates are described jointly.

Results

Table 2 presents synthetic characteristics of academic universities in the cross-section of the three proxy indicators of teaching quality (I_1, I_2, I_3) included in the ranking.

As these indicators were expressed in different units, it was necessary to make them comparable before creating the ranking. The analysis of the literature on the subject shows that the best formal properties among the normalisation methods have zero unitarisation (Kukuła, 2012, pp. 5–16). The normalising formulas used for the I_3 indicator being a stimulant (the stimulant set is marked with the symbol *S*) and the destimulant indicators, i.e. I_1 and I_2 (the destimulant set is marked with the *D* symbol) assume the following form (Kukuła, 2012, p. 7):

$$z_{ij} = \frac{x_{ij} - \min\limits_{i} x_{ij}}{\max\limits_{i} x_{ij} - \min\limits_{i} x_{ij}}, X_j \in S(1)$$

$$z_{ij} = \frac{\max\limits_{i} x_{ij} - x_{ij}}{\max\limits_{i} x_{ij} - \min\limits_{i} x_{ij}}, X_j \in D(2),$$

where:

z_{ij} – unitarised value of the *j* indicator for the *i* object (here: an academic university),

x_{ij} – value of the *j-th* indicator for the *i* object, *j* indicator range.

Another issue is the selection of weights for indicators. As in the *Perspektywy* ranking 'the status of economic achievements of graduates' is reduced to one indicator with a weight of 5%, it was decided that I_1, I_2, I_3 should be assigned the same weights (moreover, it is a common practice in this type of research). Thus, the ranking of academic universities according to the 'quality' of the results of the didactic process was created as the arithmetic mean of the three unitarised values of indicators. The intention was that the university with the first position is the one whose graduates of the year 2014, on average, looked for a job under an employment contract for the shortest time as well as are characterised by the lowest relative unemployment rate and the highest relative earnings rate in the fifth year after graduation. The created ranking is presented in Table 3.

Table 2. Characteristics of academic universities according to indicators used in the ranking

Specification	Average time (in months) from obtaining a diploma to taking up the first job under a contract of employment by graduates (I_1)	Relative unemployment rate of graduates in the fifth year after graduation, among graduates with no work experience prior to graduation (I_2)	Relative wage rate of graduates in the fifth year after graduation, among graduates with no pre-graduation work experience (I_3)
Minimum	4.14	0.25	0.67
Average	8.26	0.60	0.92
Maximum	13.75	1.27	1.68

Source: own elaboration based on: ELA, 2020.

Table 3. Ranking of academic universities according to the achieved economic status of their graduates

University code	The unitarised value of the indicator I_1	The unitarised value of the indicator I_2	The unitarised value of the indicator I_3	Ranking place
U27	1.00	0.88	1.00	1
U20	0.84	0.91	0.65	2
U25	0.71	0.95	0.66	3
U24	0.70	1.00	0.55	4
U22	0.81	0.94	0.50	5
U30	0.85	0.87	0.51	6
U18	0.75	0.93	0.55	6
U31	0.92	0.75	0.55	8
U16	0.67	0.96	0.52	9
U29	0.85	0.83	0.46	10
U1	0.68	0.84	0.60	11
U14	0.75	0.86	0.50	12
U28	0.98	0.80	0.27	13
U52	0.77	0.86	0.30	14
U17	0.79	0.72	0.36	15
U26	0.70	0.81	0.34	16
U45	0.66	0.73	0.29	17
U38	0.68	0.75	0.21	18
U3	0.89	0.72	0.02	19
U55	0.53	0.78	0.27	20
U15	0.78	0.61	0.19	21
U58	0.50	0.75	0.30	22
U23	0.41	0.77	0.32	23
U32	0.69	0.61	0.20	24
U12	0.56	0.67	0.26	25
U56	0.47	0.75	0.19	26
U13	0.55	0.60	0.27	27
U21	0.52	0.59	0.30	28
U49	0.70	0.55	0.12	29
U54	0.50	0.71	0.16	30
U5	0.73	0.42	0.21	31
U19	0.56	0.58	0.21	32
U34	0.37	0.75	0.21	33
U50	0.53	0.70	0.09	34

Table 3 – continued

University code	The unitarised value of the indicator I_1	The unitarised value of the indicator I_2	The unitarised value of the indicator I_3	Ranking place
U40	0.45	0.70	0.17	35
U57	0.60	0.54	0.14	36
U46	0.32	0.67	0.23	37
U9	0.47	0.68	0.06	38
U36	0.56	0.52	0.13	39
U41	0.56	0.55	0.10	39
U33	0.56	0.51	0.14	41
U42	0.60	0.52	0.08	42
U51	0.65	0.46	0.07	43
U37	0.55	0.53	0.10	43
U6	0.29	0.82	0.02	45
U10	0.21	0.82	0.06	46
U53	0.45	0.59	0.05	47
U47	0.35	0.56	0.16	48
U8	0.39	0.59	0.08	49
U11	0.26	0.57	0.11	50
U7	0.26	0.64	0.01	51
U4	0.64	0.20	0.04	52
U35	0.41	0.46	0.00	53
U39	0.24	0.46	0.12	54
U48	0.27	0.24	0.04	55
U2	0.35	0.04	0.03	56
U43	0.35	0.00	0.05	57
U44	0.00	0.32	0.07	58

Source: own elaboration.

Discussion

Among the best academic universities offering second-cycle studies, the dominant position of technical and economic universities should be noted. Among the first 13 universities in the ranking, there were 8 technical universities (Poznań University of Technology – U20, Wrocław University of Science and Technology – U25, Warsaw University of Technology – U24, Silesian University of Technology – U22, Lodz University of Technology – U18, Cracow University of Technology – U16, AGH University of Science and Technology in Cracow – U1, Gdansk University of Technology – U14) as well as all economic universities (Warsaw School of Economics – U27, Poznań University of Economics and Business – U30, Wroclaw University of Economics – U31,

Cracow University of Economics – U29, University of Economics in Katowice – U28).

The highest position in the ranking was occupied by the Warsaw School of Economics (SGH). On average, its graduates needed 4.4 months to find their first job under an employment contract after graduation. Moreover, the unemployment rate in the group of graduates in the fifth year after receiving the Master's degree was lower than the average in the poviats of their residence (relative unemployment rate equalled 0.37). Graduates of the SGH also received higher than average earnings in the poviats of their residence (relative earnings index of 1.68). It is worth noting that despite the short work experience, their situation on the labour market is good. It should be stressed, however, that more information should be obtained from a ranking made on the data particular fields of study, because in this case the ELA system also provides data on the mode in which the studies were conducted (full-time or part-time).

On the basis of the obtained ranking, it can also be concluded that the labour market, on average, does not value graduates of natural-science or agricultural universities too highly (the lowest positions in the ranking were taken by the Jan Długosz University in Częstochowa – U2, Siedlce University of Natural Sciences and Humanities – U43, and the University of Life Sciences in Lublin – U44). One should remember, however, that these universities also have technical and economic faculties (e.g. Economics at the Jan Długosz University in Częstochowa or Management at the Siedlce University of Natural Sciences and Humanities).

It should also be stressed that the created ranking is relative. Supplementing the list with universities supervised by other ministries (e.g. medical universities) as well as non-public institutions would have probably change the obtained classification. Moreover, the indicators used in the construction of the ranking referred only to one year of graduates whose length of employment is relatively short.

Conclusion

The primary role of academic rankings is to evaluate the achievements of universities in the field of teaching, research, and dissemination activities. Currently, there are several dozen competing rankings (based on various methodologies) at global, international, and national levels. This may support the thesis that measuring something as immeasurable as academic excellence is not a trivial task. In addition, there is always a lack of comparisons that would be addressed to a specific group of recipients (e.g. candidates for studies). Hence, the aim of this article was to attempt to create a ranking that would take into account the qualitative effects of the academic education process.

The findings of the study showed that the leading universities in the ranking were technical and economic universities. Their 2014 graduates (in all the variety of fields of study offered by these universities) found a job relatively quickly within five years of obtaining their diploma, experienced less than average unemployment in the poviats of their residence, and their earnings were higher than the average in the poviats of their residence.

It is worth noting that the use of reflective indicators in the study increased the objectivity of the obtained results. In the case of popular rankings, data from surveys completed by universities independently is often used, and such data is difficult to verify reliably. It may be an incentive for universities to improve the values of individual indicators (generating indicators) in order to obtain a better position in the ranking. In the case of the proposed ranking, indicators describing the effect of the university's activities in the field of teaching were taken into account. Thus, the presented comparison of universities can be a valuable source of information, e.g. for study candidates.

At the same time, one should be aware of the shortcomings of the adopted research methodology. First, the research was an exploratory pilot study

(according to the Authors' knowledge, few studies to date have been devoted to rankings of universities dedicated to selected groups of stakeholders). Second, the obtained results are relative. Including e.g. non-public universities in the analysis would probably change the obtained classification. Third, the study did not take into consideration graduates (3.2% on average) who did not appear in the ZUS reports, such as people insured with KRUS (Agricultural Social Insurance Fund), people with employment contracts signed abroad, and people without a formal contract of employment. Fourth, the ZUS data does not contain information about graduates' occupation, which is why it is not known whether the job undertaken by the graduates is consistent with the profile of their completed studies.

Therefore, it is advisable to continue research on the methodology of creating academic rankings (including those dedicated to university candidates). In this regard, it is worth taking into account possibly large (also including different countries), but at the same time homogeneous research samples. It would be worth considering the expansion of the pool of non-public universities as well as those supervised by ministries other than the Ministry of Science and Higher Education. Another interesting research direction would be the inclusion of individual study groups, which would encourage the creation of a separate ranking for full-time and part-time graduates.

References

Amsler, S. (2014). University ranking: A dialogue on turning towards alternatives. *Ethics in Science and Environmental Politics*, *13*(2), 155–166.

Dembereldorj, Z. (2018). Review on the Impact of World Higher Education Rankings: Institutional Competitive Competence and Institutional Competence. *International Journal of Higher Education*, *7*(3), 25–35.

Dill, D., & Soo, M. (2005). Academic quality, league tables, and public policy: A cross-national analysis of university ranking systems. *Higher Education*, *49*, 495–533.

ELA (2020). *Ogólnopolski system monitorowania ekonomicznych losów absolwentów szkół wyższych*. Retrieved from https://ela.nauka.gov.pl/pl.

Grudowski P., & Lewandowski, K. (2012). Pojęcie jakości kształcenia i uwarunkowania jej kwantyfikacji w uczelniach wyższych. *Zarządzanie i Finanse*, *10*(3/1), 394–403.

Hall, H. (2013). Rankingi uczelni jako przedmiot opinii ich interesariuszy oraz źródło informacji dla kandydatów na studia. *Problemy Zarządzania, Finansów i Marketingu*, *30*, 491–503.

Hammarfelt, B., de Rijcke, S., & Wouters, P. (2017). From eminent men to excellent universities: University rankings as calculative devices. *Minerva*, *55*, 391–411.

Hazelkorn, E. (2015). *Rankings and the reshaping of higher education: The battle for world-class excellence*. Palgrave Macmillan.

Kukuła, K. (2012). Propozycja budowy rankingu obiektów z wykorzystaniem cech ilościowych oraz jakościowych. *Metody Ilościowe w Badaniach Ekonomicznych*, *13*(1), 5–16.

Liu, N.C. (2009). The story of the academic ranking of world universities. *International Higher Education*, *54*, 2–3.

Lynch, K. (2014). New managerialism, neoliberalism and ranking. *Ethics in Science and Environmental Politics*, *13*(2), 141–153.

Marginson, S. (2007). Global university rankings: Implications in general and for Australia. *Journal of Higher Education Policy and Management*, *2*, 131–142.

Pusser, B., & Marginson, S. (2013). University rankings in critical perspective. *The Journal of Higher Education*, *84*(4), 544–568.

Pietrzak, P. (2018). Skuteczność kształcenia akademickiego w zakresie nauk rolniczych. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, *20*(1), 97–103.

Pietrzak, P. (2019). Skuteczność procesu kształcenia na przykładzie państwowych szkół zawodowych w Polsce. In M. Kowalewski (Ed.), *Kierunki zmian i rozwoju współczesnej rachunkowości zarządczej i controllingu* (pp. 148–160). Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.

Pietrzak, P., & Khovrak, I. (2019). Market Valuation of Graduates with Agricultural Degrees in Poland. *Annals of the Polish Association of Agricultural and Agribusiness Economists*, *21*(3), 341–351.

Pietrzak, P. (2020). Evaluation of the economic situation of graduates of agricultural studies in Poland with the use of ELA: The innovative solution for knowledge management. In J. Paliszkiewicz (Ed.), *Management and Information Technology: New Challenges* (pp. 203–216). Warsaw University of Life Sciences.

Rocki, M. (2019). Ranking polskich uczelni według ekonomicznych losów absolwentów. *Ekonomista*, *3*, 343–354.

Rogowski, J. (1986). Kilka uwag o „miękkim" modelowaniu ekonometrycznym. *Przegląd Statystyczny*, *4*, 367–384.

Siwiński, W. (2002). *Perspektywy* – Ten Years of Rankings. *Higher Education in Europe*, *27*(4), 399–406.

Szadkowski, K. (2019). *Globalne rankingi uniwersytetów a d*ługoterminowa strategia wzmacniania pozycji polskich uczelni. Wydawnictwo Uniwersytetu Adama Mickiewicza.

Tarka, D. (2012). Influence of the features selection method on the results of objects classification using environmental data on Polish voivodeships, part 2. *Economics and Management*, *4*, 47–73.

Urbanek, P. (2018). Doskonałość akademicka. Rola rankingów akademickich w pomiarze dokonań uniwersytetów. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *514*, 447–457.

Usher, A. (2016). A short global history of rankings. In E. Hazelkorn (Ed.), *Global Rankings and the Geopolitics of Higher Education: Understanding the influence and impact of rankings on higher education, policy and society* (pp. 23–53). Routledge.