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Comparative study of international academic rankings of universities

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International academic rankings that compare world universities have proliferated recently. In accordance with latter conceptual and methodological advances in academic rankings approaches, five selection criteria are defined and four international university rankings are selected. A comparative analysis of the four rankings is presented taking into account both the indicators frequency and its weights. Results show that, although some indicators differ considerably across selected rankings and even many indicators are unique, indicators referred to research and scientific productivity from university academic staff have a prominent role across all approaches. The implications of obtained data for main rankings consumers are discussed.

Comparative study of international academic rankings of universities

Increasing market-based orientation and international character of higher education institutions around the globe have led students, universities and governments to take a great interest in knowing the position that a particular centre, university or other higher education entity have in comparison with other entities. With the massification of universities practically in every continent, the initiatives to obtain independent analysis of the quality of universities have increased rapidly in recent years across many nations.

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Since 1983, the journal *U.S. News and World Reports* started the annual publication of "America's Best Colleges", other countries quickly followed this enterprise and create their own measures with the double purpose of giving information to consumers and functioning as an institutional marketing strategy. In the past two decades, university rankings or league tables (as they are known in United Kingdom) have proliferated not only from the private sector but also from professional associations and public entities.

There exist three key issues in the approximation to the university ranking systems: who ranks, why rank and the audience for rankings.[1] Most of the university rankings have been done by private and media-based entities (e.g., magazines). However, professional associations and governments are paying more and more attention to this option. Regarding the question about why rank, a main purpose is to give information to the consumer in order to help him to make higher education choices. Other important purpose is to function as an institutional marketing strategy. A last purpose refers to the promotion of quality of education institutions motivating competence among them. The third key issue is the audience for rankings. Students are considered the more important consumers. Parents are other key collective since they pay expending of students' education. Other consumers are the academic entities and government institutions responsible of education politics.

University ranking systems vary extensively since the type of indicators selected depends on the particular definition of academic quality adopted by their authors. Nevertheless, several guidelines on ranking elaboration process can be established.[2] First, data are either collected from existing data sources or from original sources specifically for the ranking. From the information collected, the type and the quantity of variables to use are selected. Next, indicators are standardized and weighted. Lastly, calculations and comparisons are done in order to sort institutions into ranking format.

Although initial trends in academic ranking systems and university analysis were only limited to the context of one nation (to know methodological aspects of rankings of German universities,[3]; Australian and New Zealand universities,[4]; Chinese universities,[5]; Spanish universities,[6,7,8]; USA universities,[9]; Japanese universities,[10]; Latin-American universities,[11,12]; Britain universities,[13,14]; Poland universities,[15]; Russian universities,[16]), the fast increase in the mobility of students due to technological and economical expansion has moved away from that strictly nation-specific approach to offer academic rankings of international character. Nowadays, higher education has become so international that it is no longer enough for universities know their position in comparison to other universities from their own country. As universities increasingly compete in a global environment, they tend to compare themselves with world universities. In fact, the expression "World Class" has been created and many universities expect being considered as "World-Class Universities". The precursor of an academic ranking of universities worldwide was the Institute of Higher Education of

Shanghai Jiao Tong University[17] (see also Ref. 18). After this initiative, the purpose of doing global rankings of universities based on internationally comparable academic data has been followed by other entities.

Once back the initial boom of creation of internationally academic rankings, experts have started the debate regarding some controversial issues as what indicators can accurately measure quality, which methodology is more useful for the development of ranking systems, how presenting the information in a ranking-format to increase the transparency of these measures, etc.[19,20,21] Some of these questions were addressed in the first-ever international meeting on these issues, convened by UNESCO-CEPES (European Centre for Higher Education) and held in Warsaw in 2002. This event featured top-level experts in higher education quality and representatives of journals that regularly publish university rankings in order to clarify different conceptual and methodological aspects of national, cross-national and international ranking systems (some of the papers presented on that meeting have been published in *Higher Education in Europe, 2002, vol. XXVII).* More recently, in December 2004, Institute for Higher Education Policy and UNESCO-CEPES have organized other important event in Washington D.C. Different working groups formed by top-level experts from the countries with the best universities worldwide discussed about the strengths and weaknesses of ranking systems. Relevance of that meeting for academic and professional audience led to spread its key findings throughout different sources (e.g. special issue in *Higher Education in Europe,* 2005, *v. XXX*). This event encouraged as well the constitution of the International Rankings Expert Group (IREG), integrated by top-level experts from different countries whose mission is to look after the validity, reliability and utility of the ranking systems. In the same direction, the "First International Conference on World-Class Universities (WCU-1)" was held in China from 16 to 18 June 2005, with the aims of increasing cross-national agreement necessary to establish standards that allow the advance of international comparative evaluations of higher education institutions and global university rankings.

It is a fact that international rankings of universities have become both popular with the public and increasingly important for academic institutions. In this context and with antecedents previously commented, it is presented the current study that aims to compare different international rankings of universities in order to explore if, in spite of large differences in universities and countries, internationally comparable academic indicators to be reliably used in cross-national and international university comparisons can be identify.

Method

Design

According to classification proposed by Montero and Leon,[22], it is a descriptive study through analysis of documents.

Procedure

First, a revision of specialized literature about university rankings and other systems of evaluation of academic quality was done in order to define several criteria that guided the selection of international university rankings to be included in the study. Selection criteria were the following:

Criterion 1. Only international university rankings that met Webster[23] definition were included in the study. According to this author, an academic ranking:

[M]ust be arranged according to some criterion or set of criteria which the compiler(s) of the list believed measured or reflected academic quality [; and] it must be a list of the best colleges, universities, or departments in a field of study, in numerical order according to their supposed quality, with each school or department having its own individual rank, not just lamped together with other schools into a handful of quality classes, groups or levels (p. 5).

In agreement with this criterion, universities or academic programmes must be ranked on the basis of its relative performance in selected indicators. If various indicators are considered, there are two possibilities: i) offer separated rankings by each indicator; ii) apply weights to each indicator to arrive at an overall score for each institution and offer just a single ranking. Therefore, classifications that offer just ranks of universities without information about scores got on different indicators were excluded of the study (for example, classifications like The Top 25 Colleges for Latinos, published by *Hispanic Magazine*[24] were not included, since Latino-American universities are presented in a ranking-format but scores on particular indicators are not provided).

Criterion 2. Only international university rankings employing long-established academic indicators documented in specialized literature about evaluation of academic quality were included in the study. The generic conceptualization of academic quality indicators proposed by Webster[23] was followed: Faculty accomplishments (e.g., survey of reputation, faculty awards, faculty citations in citation indexes, etc.), students achievements (e.g., distinguished alumni, scores in incoming tests, etc.) and institutional academic resources (e.g., faculty-student ratio, expenditures per student, library resources, etc.); and only rankings employing some of the previous indicators were included. In agreement with this criterion, rankings like "World Universities'

Ranking on the Web"[25] that includes cybermetrics indicators (e.g., number of "html" pages, rich files, etc.) were not considered.

Criterion 3. Only international university rankings that clearly and unambiguously define both indicators and methodology were included in the study.

Criterion 4. Only international university rankings that evaluated multidisciplinary academic institutions were included in the study. According to this criterion, rankings of specialized centers or programmes (for example, law and medical schools, MBA programmes, etc.) were not considered since indicators used are too specific and do not allow comparability. For example, the MBA World Top 100 of *Financial Times*[26] includes an indicator of "weighted salary" referred to the average salaries three years after graduation with adjustment for salary variation between industry sectors. Such a specific indicator does not allow comparing international rankings. Thus, only multidisciplinary rankings are included, without prejudice these ones can offer analyses of data into specific discipline areas or specializations.

Criterion 5. Only rankings that evaluated universities from at least two different continents were included in the study.

According to the five criteria, a systematic search through different sources (specialized publications, university websites, private entities websites, Internet browsers) was done and international university rankings to be included in the study were selected. When a ranking had more than one edition, its last edition was selected.

Next, a brief description of the international university rankings that met the five criteria is presented. For their description, the typology of ranking systems proposed by Professor Jamie Merisotis[1] is followed. She proposes the following components of such systematized rankings typology:

Types of ranking

- Unified rankings: disparate sets of weighted indicators are combined into a single score that reflects overall quality of a given institution.
- Discipline-based rankings: Institutions are ranked according to the specific programmes, specializations or subjects that are offered.
- Other: Rankings that are not easily characterized.

Structure of rankings

- Numerical ranking: Universities are classified with numbers: 1, 2, 3, 4...
- Clustering or grouped ranking: Universities are ranked in tires-top, middles, bottom, etc.
- Top-level ranking: Universities are ranked numerically but reporting only a fixed number at the top.

Frequency of rankings: annual, biennial, triennial, or some irregular interval.

Sorting of rankings: Universities can be classified according to institutional control (public or private), geographic distribution, age, mission, etc.

Data sources: The data are either collected from existing data sources (e.g., reported by an institution) or from original sources specifically for the ranking (e.g., surveys to students, staff or employers).

Next, besides information according to this typology, additional details for each selected international ranking are presented.

1) ***Academic Ranking of World Universities***[27]

Type of ranking: Unified approach.

Structure: Combination of numerical and top-level approach (top 500 universities).

Frequency: Annual (2003; 2004; 2005).

Sorting: Based on geographic distribution of universities (Top 100 North & Latin American Universities; Top 100 European Universities; Top 100 Asia Pacific Universities).

Data sources: Existing data.

Web page: http://ed.sjtu.edu.cn/ranking.htm.

Description:

This ranking is the result of a detailed study of more than 2000 world universities, although only the top 500 universities are published. Indicators fundamentally based on scientific research are the following:

- Total number of the alumni of an institution winning Nobel Prizes and Fields Medals (10 per cent of the total).
- Total number of the staff of an institution winning Nobel Prizes and Fields Medals (20 per cent of the total).
- Number of highly cited researchers in 21 broad subject categories (20 per cent of the total).
- Number of articles published in *Nature* and *Science* between 2000 and 2004 (20 per cent of the total) (for institutions specialized in humanities and social sciences this indicator is not considered, and its weight is relocated to other indicators).
- Number of articles cited in Science Citation Index-expanded (SCIE), Social Science Citation Index (SSCI) and Arts & Humanities Citation Index in 2004 (20 per cent of the total).
- Size of institution: Total scores of the above five indicators divided by the number of full-time equivalent academic staff (10 per cent of the total).

For each indicator, the highest scoring institution is assigned a score of 100, and other institutions are calculated as a percentage of the top score. Standard statistical techniques are used to adjust the indicators if necessary. Scores for each indicator are

weighted according to percentages above indicated to arrive at a final overall score for each institution. The highest scoring institution is assigned a score of 100, and other institutions are calculated as a percentage of the top score.

2) ***World University Ranking***[28]

Type of ranking: Combination of unified and discipline-based approach. In addition to the main table that pulls together universities of different disciplines, tables that rank institutions according to specific discipline areas (science; technology; the arts and humanities; social sciences; biomedicine) are presented.

Structure: Combination of numerical and top-level approach (top 200 universities).

Frequency: Annual (2004; 2005).

Sorting: Based on geographic distribution of universities (Europe's top 50 universities; North America's top 50 universities; the rest of the world's top 50 universities).

Data sources: Existing and original data.

Web page: http://www.thes.co.uk/worldrankings/

Description:

This ranking is published in the *The Times Higher Education Supplement*, a weekly newspaper under the same ownership than *The Times*, although sold separately from its older and better-known stablemate. Corrections and indicators are introduced in order to improve the initiative of Shanghai Jiao Tong University. Authors state that some of the indicators used in that ranking confer a big advantage on universities dominated by sciences and they are omitted. In this ranking academic reputation of university judged by academics (i.e., peer review) is very important, weighting at almost half of the total score (40 per cent of the total). 2375 research-active academics are asked to name the top universities in the subject areas and the geographical regions in which they have expertise. Other original measure has been introduced in 2005 edition, consisting of data on opinion of 333 major international employers of graduates (i.e., recruiter review). Besides these original data, other indicators collected from external sources are included. Altogether it was chosen six indicators that are described next:

- Peer review (40 per cent of the total).
- Recruiters review (10 per cent of the total).
- Citations per faculty member derived from the ISI databases (20 per cent of the total).
- Faculty-to-student ratio (20 per cent of the total).
- Percentage of international students (5 per cent of the total).
- Percentage of international staff (5 per cent of the total).

In order to provide a clearer presentation of data, the structure of main table has been altered on last edition. Each measure is now scored out of 100, following a similar

methodology than Academic Ranking of World Universities.[27] Thus, universities' performances on both the different indicators' scores and overall score are clearer.

3) ***International Champions League of Research Institutions***[29]

Type of ranking: Discipline-based approach (Engineering, Computing and Technology; Clinical Medicine; Physical, Chemical and Earth Sciences; Social and Behavioral sciences; Agriculture, Biology and Environmental Sciences; Arts and Humanities; Life Sciences).

Structure: Clustering ranking (quarters).

Frequency: Irregular intervals (1994–1999; 1998–2002).

Sorting: No.

Sources data: Existing data.

Web page: http://adminsrv3.admin.ch/cest/en/aktuell.htm

Description:

This ranking is elaborated by the Center for Science and Technology Studies, set up by virtue of the regulation on the Swiss Science and Technology Council. This center carries out projects of the Swiss Science Technology Council, the Swiss Federal Government and of other stakeholders in science and technology policy. Among other activities, they develop evaluations of institutions, programs, and disciplines/domains and this ranking is one of the results of its research actions. The ranking is based on exclusively the number of publications of research institutions belonging to the "International Champions League of Research Institutions" between 1998–2002. A institution is included in this international league when it has at least a so-called "qualified subfields" that is defined by two selection criteria: a minimum of 50 publications in a period of five years (1998–2002); a minimum impact of 120 in the same period of five years. Indicators included in the ranking are referred to both sub-discipline and institution.

Indicators concerning subdiscipline:

- Number of articles on ISI databases.
- Weighted impact of publications.
- Activity of publication.
- World share of publications.

Indicators concerning institution:

- Degree of specialization of publications.
- Total publications.

Statistical techniques and sciencetometrics calculations are used to adjust the scores on the six indicators of the academic institutions in different subfields. Unlike other three rankings selected for the present study, indicators in this ranking are not weighted and combined into an overall score. Institutions are ranked only according to one indicator referred to the number of articles on ISI databases, receiving a weight of 100%.

4) ***Asia's best universities ranking***[30]

Type of ranking: Combination of unified and discipline-based approach (science and technology schools).

Structure: Numerical approach.

Frequency: Annual (1999, 2000). *Asiaweek* ceased publication as of December 2001; its online archives, including its university rankings, are still available.

Sorting: No.

Data sources: Original and existing data.

Web page:

http://www.asiaweek.com/asiaweek/features/universities2000/index.html.

Description:

This ranking uses data from original questionnaires specifically designed for it as well as data from external sources. Indicators used are the following:

- Peer review: Experts from Asian corporations and foreign universities (among them Columbia University, University of California Los Angeles and University of Leicester) were asked to give ratings concerning academic reputation of Asiatic universities (20 per cent of the total).
- Student selectivity: Derived from 1) number of first-year students accepted compared with total applicants, 2) enrolled compared with accepted students, 3) median score of first-year students in the national or university entrance test. Schools whose educational systems or individual policies severely restrict the number of university applicants were awarded with an extra score (25 per cent of the total).
- Faculty Resources: Derived from 1) full-time teachers/researchers with PhD degrees, 2) full-time teachers/researchers with master's and PhD degrees, 3) median pay, 4) per-teacher university spending, and 5) student-teacher ratio. Universities that grant non-monetary benefits such as free housing were awarded with an extra score (25 per cent of the total).
- Research: Derived from 1) citations in academic journals as tracked by ISI databases, 2) articles in peer-reviewed journals, 3) papers presented in international conferences, 4) published books, 5) research funding, and 6) graduate students (20 per cent of the total).
- Financial resources: Derived from 1) total spending per student, 2) library spending per student, 3) Internet bandwidth, 4) public computers and connection points, and 5) laboratory spending, only for science and technology schools (10 per cent of the total).

Scores on indicators were ranked from highest to lowest, with the top university given 100 points. The others were assigned points as a percentage of the highest score. When a piece of data is not available, ratios from the 1999 survey or the lowest score of a school from the same country were used.

Results

Comparative analyses of four international university rankings selected were done taking into account both the frequency of indicators and the assigned weights. Each indicator obtained a score as a result of adding the assigned weights to such indicator in the different rankings where it was considered. Next, according to the usual methodology in ranking systems, the highest scoring indicator was assigned a score of 100, and other indicators were calculated as a percentage of the top score. The indicators were then placed in descending order. Table 1 show the list of indicators used in internationally university ranking systems comparatively ranked according to its frequency and weight in descending order.

Table 1. List of indicators used in internationally university rankings comparatively ranked according to its frequency and weight in descending order

Rank	Indicators	Shanghai	*Times*	CEST	*Asia Week*	Overall score
1	Articles on ISI databases	20.0		100.0	3.3	100.0
2	Peer review		40.0		20.0	48.7
3	Bibliometric citations per rearchers on ISI databases	20.0	20.0			32.4
4	Faculty-to-student ratio		20.0		5.0	20.3
5	Staff of an institution winning Nobel Prizes and Fields Medals	20.0				16.2
	Articles published in *Science* and *Nature*	20.0				16.2
6	Alumni of an institution winning Nobel Prizes and Fields Medals	10.0				8.1
	Recruiters review		10.0			8.1
	Size of institution	10.0				8.1
7	First-year students accepted compared with total applicants				8.3	6.8
	Students enrolled compared with accepted students				8.3	6.8
	Median score of first-year students in university entrance test				8.3	6.8
8	International students		5.0			4.1
	International staff		5.0			4.1
	Full-time teachers/researchers with PhD degrees				5.0	4.1
	Full-time teachers/researchers with master's and PhD degrees				5.0	4.1
	Median pay of teachers/research				5.0	4.1
	Per-teacher university spending				5.0	4.1
9	Articles in peer-reviewed journals				3.3	2.7
	Papers presented in international conferences				3.3	2.7
	Published books				3.3	2.7
	Research funding				3.3	2.7
	Graduate students				3.3	2.7
10	Total spending per student				2.0	1.6
	Library spending per student				2.0	1.6
	Internet bandwidth				2.0	1.6
	Public computers and connection points				2.0	1.6
	Laboratory spending				2.0	1.6

As Table 1 shows, 28 different indicators have been identified. Some of these indicators are included in more than one ranking, but a considerable number are unique. No indicator is used by all 4; the closest is the indicator referred to the number of articles cited in ISI databases which is used by 3 of the 4 and received the highest weights. Peer review concerning universities quality and reputation through original surveys received as well a high weight in international academic rankings. Other indicator with a good position in the list is related again to scientific research and production, that is, the counting of citations got by active academic researchers on ISI databases.

Additional analyses involving the categorization of indicators into broader categories were done. Indicators were spread across seven broad categories, which were based in part on existing institutional systems of measuring quality[31,32]: Quality of research, reputation surveys, human resources, beginning characteristics, material resources, outputs, learning process.

In order to offer a list that allow knowing the importance of academic categories across selected rankings, calculations similar to those done with indicators were conducted. Weights of all indicators within a category are added and the category that obtains the highest score is assigned a score of 100. Other categories are calculated as a percentage of the top score. The categories are then placed in a table in descending order (see Table 2).

We can observe that all four selected international rankings include some indicator within the category "quality of research". The rankings also place heavy weight on category "reputation surveys". Comparatively, little weight is put on either human and material resources or final outputs. None of the rankings include any measures within the category "learning process".

Table 2. List of academic categories used in internationally university rankings comparatively ranked according to its frequency and weight in descending order

Rank	Academic categories	Shanghai	*Times*	CEST	*Asia Week*	Overall score
1	Quality of research	80.0	20.0	100.0	16.5	100.0
2	Reputation surveys		50.0		20.0	32.3
3	Human resources	10.0	25.0		15.0	23.1
4	Beginning characteristics		5.0		25.0	13.9
5	Material resources				20.0	9.2
6	Outputs	10.0			3.3	6.1
7	Learning process					0.0

Discussion

Although it is quite clear that "ranking systems and league tables are a growing phenomenon in higher education around the globe" (p. 97)[33], the offer is considerably

diminished when a strict selection of international rankings of multidisciplinary institutions of higher education that meet certain methodological criteria of construction is conducted. Specifically, results obtained in this study are four international university rankings selected. The four rankings we have examined have commonalities and differences in their producers, structure, indicators and weights and next it will be discussed.

While the origins of ranking systems are traditionally associated to mass media and commercial publishing enterprises, only the half of international university rankings that met selection criteria of this study are products of magazines or newspapers (World University Ranking[28] and Asia's best universities ranking[30]); the other half of selected rankings are produced by non-profit research centres (Academic Ranking of World Universities[27] and International Champions League of Research Institutions[29]). It does show the increasing interest that higher education institutions are placing into ranking systems, not only as a strategy for institutional marketing but also as a basic tool to assurance academic quality in the growing international educational market. In fact, the results of comparative studies of university rankings have become a key component of university's strategic plans.

It is important to highlight that selected international university rankings that are produced by magazines or newspapers[28,30] have increased its efforts to explain their methodology on last editions (mainly, *The Times Higher Education Supplement*[28]), which would undermines some of the suspicions reported in certain academic contexts. It must be appreciated as well that newspapers consult more and more with advisory boards and companies (i.e. QS Quacquarelli Symonds). Perhaps the approach that will end up imposing is that of CHE/*Stern*[3] which combines the best of both avenues: the Center for Higher Educational Development, a non-profif consulting group, is responsible for its ranking's concept and data, while the weekly news magazine, *Der Stern*, is responsible for marketing and distribution.

Other controversial aspect of ranking systems discussed on specialized meetings is referred to its structure (i.e., numerical or clustering approach).[1,34] Every selected rankings except one (Center for Science and Technology Studies, 2004) rank universities according to a numerical approach. The main criticism to this structure is that the differences among closely ranked universities can be due to statistical artefacts rather than true differences. However, solution adopted by the Center for Science and Technology Studies (clustering into quarters) is not free of methodological difficulties, since the apparent distinction between the lowest-rated university in the first quarter and, for example, that of the highest-rated one in the second quarter may not be significant. A possible solution is to use numerical rankings, but provide the consumer with easily understood information about the extent to which apparent differences in rankings reflect true statistical differences. Further research on this direction is needed.

Other aspect subject to debate in specialized ranking literature is the arbitrariness in assigning weights to the various indicators included in the ranking.[13] Data from present study confirm variability on this feature. Thus, for example, the indicator referred to number of articles on ISI databases is given a weight of 100.0 percent by a particular ranking (International Champions League of Research Institutions[29]), whereas *Asiaweek*[30] only places a 3.3 percent of its weighting on the same indicator. The difficulty is how to report results without assigning weights, since the various scores on different indicators cannot then combine into any single score that reflects overall quality of a given institution. One option is to rank universities separately on each indicator, as is done by Recruit Ltd. that publishes eighty-eight separate rankings of Japanese universities for each indicator.[10] Although this option overcomes the assignment of weights to the various measures included in the ranking, it is quite clear that a system that offers so many aspects of university performance, it is scarcely handy for students looking for information to decide the best university. This individualized ranking approach seems more appropriate for the purposes of staff members, institutions and government. Other alternative is to survey experts regarding what weights to apply to the different measures. Besides surveying academic experts about the quality and reputation of universities as different rankings have been doing, it can be highly useful as well to know their opinions concerning the weighting to assign to indicators for international comparative evaluations.[35] Given interactive possibilities that allow actual software applications, other solution is that the own consumer can make a personal ranking by selecting and weighting indicators according to individual priorities and preferences. CHE-*Stern* ranking system already permits German-speaking consumers create a ranking of Germany universities based on his or her own selected criteria. On the Internet it is announced availability of an English translation of the ranking shortly (http://www.daad.de/deutschland/en/2.2.9.html).

Focused now on the results concerning the indicators included in the selected rankings, it is found that measures regarding "quality of research" are the most frequently used and receive the highest weights across the international university rankings. These findings are consistent with the results of other study that compares academic institutions on a national basis.[36] That study showed that the category of "Quality of Academic Staff/Faculty" received the highest weights across the ten national rankings selected. When separate analyses were done broking down "Quality of Academic Staff/Faculty" into two sub-categories ("research/prestige" and "teaching"), it was found that 75 per cent of selected national rankings placed all its weights onto "Research/Prestige", while teaching quality got much less attention. These last data are also congruent with the results from present study: all four selected rankings do not include any measure within the category of learning process. In contrast to scarce influence of the teaching and learning process across independent university rankings, other empirical study that we have conducted and that compares institutional

agencies of accreditation and quality assurance on a global basis shows a different perspective.[37] That study shows that the institutional approach to measuring quality gives a more prominent role to factors having to do with learning and teaching process. It seems that exist different views on some aspects of the definition of academic quality between the institutional-based approach and the more independent and commercial-based orientation of rankings. These results may be of maximum interest for both parts. On one hand, an apparently important contributor to the most effective university ranking is government policy. By highlighting relevant measures related to university processes and outputs and specifying the performance indicators that will be publicly available, government may help improve the reliability and validity of university rankings.[38] On the order hand, official auditors assessing the quality of higher education institutions should know main elements on the measurement of the academic quality across independent university rankings since they reflect major consumer demands, which, as shown, are related to the faculty orientation to research. This feedback will help assure the more effective functioning of competitive academic markets.

Other result to discuss is that the only indicators used by all selected rankings are measures related to ISI databases (publications and citations). Although the catalogue *Journal Citation Reports*, which automatically assigns to journals an Impact Factor based on citation analysis, is the most used guide to evaluate the quality of scientific publications,[39] this does not mean that there is a casual relationship between citation impact and internationality. In the construction of international university rankings, further internationality criteria like, article's contents that involve several countries (e.g., cross-cultural studies) or multinational distribution of authors, should be included.[40,41] In this direction, Buela-Casal, Perakakis, Taylor and Checa[42] have proposed the so-called Journal Internationality Index based on the interaction of many interdependent criteria represented by a neuro-fuzzy system. Extension of this kind of measures to the methodology of international university rankings may yield promising results in the short term.

Beyond the "quality of research" has a prominent role across selected rankings, there exists less agreement regarding remaining measures included. In fact, results show that a considerable number of indicators are unique. However, despite variability found for these indicators, there is a considerable level of agreement between ranking systems as to which universities worldwide are "the best". This suggests that there exists quite consistency on the indicators that must receive higher weights through international university rankings; however, the concordance regarding those indicators with lower weights is smaller. These data are also congruent with those from the mentioned national rankings study.[36] Differences among higher education systems and national standards in collecting or reporting data seem to explain variations found in that study, but talking about international comparisons, the existence of differing indicators across

global rankings is more worrying. Additional studies to determine indicators useful for cross-national comparative purposes are needed.

In sum, the comparison of the four international rakings suggests that, in spite of all the differences, a common approach to measuring quality in higher education is emerging internationally. There is a growing international convergence on the measurement of academic quality based primarily on research and production and on academic reputation. However, other indicators included differ considerably across selected rankings. It proves that important advances in ranking approaches have been made in recent years, but there are still considerable aspects to get better. Even being imperfect systems, international university rankings are offering essential information for both students and parents who demand independent analysis of universities and for universities and higher education policy-makers who need to know strengths and weakness of academic institutions in the growing global educational market. It justifies that the researchers engage in further efforts to advance in the ranking approaches.[43] Quality assessment of universities is a difficult task that requires the employment of diverse methods and techniques, as well as, the establishment of international alliances among higher education institutions.[44] Well-designated international university rankings that follow rigorous methodological criteria may constitute effective instruments for this important labour.

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