

Bibliometric Rankings of World Universities

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August 2006

CWTS Report 2006-01

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EXECUTIVE SUMMARY

This paper analyses a series of bibliometric indicators of the research performance of universities, derived from the *Web of Science*, published by *Thomson Scientific*. It highlights important factors that should be taken into account in the interpretation of bibliometric rankings of universities, and presents general patterns in two partly overlapping sets: a set of the 386 most frequently publishing world universities, and a set of 529 European universities. It describes data collection and data handling. It illustrates research policy questions that may be addressed in secondary analyses, and proposes further steps towards the creation of a reliable information system on world universities, useful in research management and policy at the institutional, national and supra-national level, and for the wider public. Key notions and findings presented in this paper are:

- The need for policy makers and the wider public to obtain insight into the scholarly quality of research activities in universities is legitimate, but scholarly research quality is not as straightforwardly measured and ranked as performance in many other societal domains.
- Rankings are in a sense one-dimensional: entities are ordered by descending score on one particular statistic. They disregard relationships among entities, particularly how the performance of one entity depends upon that of other entities.
- Differences may exist among countries, and even among institutions within a particular country, with respect to the criteria that are applied in assigning the name ‘university’ to an institution of higher education.
- A research university is defined as a university of which the size of research activity exceeds a certain level. However, it is extremely difficult to define a precise threshold for a university’s number of published papers above which it is to be considered as a research university.
- It is useful to distinguish between general and specialised universities, even though it is difficult to draw a sharp borderline between the two. A disciplinary specialisation index is proposed to measure the degree of disciplinary specialisation in a university’s research activities, applying a classification of published articles into 15 disciplines.
- In order to define a university’s article output, all papers were selected in which its name or that its major departments is mentioned *explicitly* in the address, taking into account all sorts of name variants. Moreover, papers were added from hospitals affiliated to a university, published by authors who revealed strong collaboration links with that university. Accuracy levels are between 90 and 95 per cent.
- Indicators were calculated of the size of a university’s article output and its citation impact per published article, compared to a world average and corrected for differences in citation practices among disciplines. Data were extracted from the *Web of Science (WoS)*, created by *Thomson Scientific*.

- *WoS* coverage is excellent or good in most disciplines, except in parts of social sciences and humanities. Therefore, the indicators calculated in this study may not properly reflect a university's position in the latter domains of scholarship, especially when it is located in a non-English speaking country.
- US universities are highly overrepresented in the top of the world ranking based on published article output, and particularly in that based on citation impact. But it needs emphasising that an European 'top' university tends to be among the best 25 per cent in the world in at least one discipline, although the number of disciplines in which it is world leader is on average substantially lower than that calculated for a US top university.
- A distinction is made between two models for distributing 'top' research among universities: a concentration model in which a limited number of big research universities carries out research at a top level in a wide range of disciplines, and a distributed model, in which top research is more evenly distributed among universities, and a strong link between teaching and research is maintained.
- It is proposed to conduct more empirical studies on the structure of (supra-)national academic systems, analysing the extent to which they are structured according to one of the models described above, and to address the question which model provides the most optimal conditions for 'top' research in the various countries.
- Results for an individual university can only be interpreted properly when one takes into account the structure of the national academic system in which it is embedded, and the particular role of the university therein.
- Historical, political and cultural factors – including national or regional rivalry, different religious traditions or different concepts of academic education – may account for structural differences across national academic systems.
- Bigger universities in terms of numbers of published articles tend to generate per paper a higher normalised citation impact, and tend to be more general than smaller ones. Universities with a higher share of their papers published jointly with institutions from the private sector tend to publish more papers and to generate a higher citation impact per paper than universities that have less co-publications with the private sector.
- In Europe there is no tendency that national academic systems showing more concentration of research activities among its universities generate – as a whole – a higher citation impact per paper than national systems in which the article output is more evenly distributed among academic institutions.
- No linear correlation was found between a university's degree of disciplinary specialisation and its overall citation impact per paper. General and specialised universities show similar citation impacts per paper.
- The claim that universities specializing in a discipline tend to perform in their areas of specialisation better than general universities do *in the same areas*, was found to be valid in 4 disciplines: *biological sciences primarily related to humans, clinical medicine, molecular biology and biochemistry*, and in *physics*.

- In all other disciplines, no significant correlation was found between a university's degree of activity in a discipline and the average citation impact of its papers in that discipline. Perhaps these outcomes indicate that the concept of 'critical mass' in research activity is more relevant in 'big science' than it is in other domains of scholarship.
- Maps based on a *series* of bibliometric *and* network indicators are useful tools to analyse the structure of national academic systems and the position of a university in its international, national and regional environment.
- The publication data per university analysed in this paper were *not* verified by representatives of the institutions involved, except in a few cases. A main future task will be to find ways to enable them to verify the data.
- Combining 'output' with 'input' data, applying compatible classification systems, further contributes to the creation of a public information system on world research universities, that is not only useful for the general public, but also constitutes a database for further research on research performance and its determinants.

