Publication Analysis

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The increasing pressure for publication among academics has given rise to a debate whether the overall prestige gap between the more important scholarly journals (e.g., the top ten journals) and the less important ones (e.g., journals below the top ten) is widening. For example, a point of discussion may be whether it is true that, during the last decade, the less important journals were getting less influential; or whether, by the contrary, there was a significant reduction in the prestige gap between the top ten journals and the journals below the top ten, as a result of overall growth in the quality of publications. And, here we propose that it is important to study the overall prestige gap of journals below the top ten in different subject areas.

Given this debate, appropriate summary measures, which provide additional information beyond analyzing the inequality of the whole ranking-score distribution for academic journals in a given subject area, are of key importance for an empirical assessment of the development of the overall prestige gap.

The Scopus database, which is larger than the Web of Science, can be selected as representing the composition of world science on a large scale. The rank-

ing of the subject areas of Scopus can be expected to bring about a variety of behavioral changes, and have implications for: The allocation of research funding; the nature, form, quantity and quality of research activity undertaken within each subject area; human resource management, including performance management and remuneration policies; and the nature and quality of the teaching-research nexus. The journals and the subject areas (or fields) may be different concepts at different levels. And, it is problematic to rank subject areas via journals ranking scores. But it may be possible to accomplish the ranking of the subject areas by means of appropriate summary measures of the journal ranking scores, which provide additional information beyond analyzing the inequality of the whole ranking-score distribution for academic journals in each subject area.

Journal quartile rankings are derived for journals in each of their subject categories according to which quartile of the score distribution the journal occupies for that subject category. They can play an important role in performance-based funding of public research.

Giving the impact of performance-based funding schemes in countries like Spain and others, it follows that quartile ranking validation can be a very important issue because it needs to be established the soundness of journal quartile rankings for research evaluation systems. That is, assuming that journal impact relates to the recognition of the originality of research and its impact on the development of the same or related discipline areas from the multivariate viewpoint of several journal ranking models (e.g., ISI impact factor, SJR, etc), what is the link between quartile rankings and journal impact? In particular, are there first quartile journals in a given subject category which are not of

highest impact? And, which are the impact rankings of journals in the four quartiles for a subject category?

The Overall Prestige Gap of Journals with Ranking Score Below a Given Threshold

In Reference (*1*), we have presented a longitudinal analysis of the development of the prestige gap related to journals below a given threshold (below the top ten) during the period between 1999 and 2009, on the Subject areas of Scopus. To this aim, we proposed two different axiomatic measures of the prestige gap based on the ranking scores for the academic journals below the top ten. We do, however, favor one axiomatic index in particular, that of Theorem 2 in (*1*), i.e., $P2$. We believe this will be the most effective and the one promising the most beneficial impact in the study of the prestige gap.

Using the axiomatic measure $P2$, we have analyzed the prestige gap of journals below the top ten in 26 subject areas, plus a general subject area containing multidisciplinary journals, since the 1999. Our analysis is based on the SJR indicator, that was here selected to obtain the journal ranking scores.

We can conclude that, between 1999 and 2009, there was a high reduction in the overall prestige gap of journals below the top ten for the following subject areas: Arts and Humanities; Business, Management and Accounting; Computer Science; Decision Sciences; Dentistry; Economics, Econometrics and Finance; Mathematics; Nursing; and Social Sciences. Also, there was a high reduction in the general subject area containing multidisciplinary journals.

The overall prestige-gap reduction has been much slower in the following subjects areas: Agricultural and Biological Sciences; Biochemistry, Genetics and Molecular Biology; Chemistry; Earth and Planetary Sciences; Energy; Engineering; Environmental Science; Health Professions; Immunology and Microbiology; Medicine; Neuroscience; Pharmacology, Toxicology

and Pharmaceutics; Physics and Astronomy; Psychology; and Veterinary.

And there was no reduction in the prestige gap between 1999 and 2009 for the following areas: Chemical Engineering; and Materials Science.

Several subject areas showed a (relatively) huge overall prestige gap for the journals below the top ten during the complete period of time under analysis: Agricultural and Biological Sciences; Biochemistry, Genetics and Molecular Biology; Chemistry; Immunology and Microbiology; Materials Science; Medicine; Neuroscience; Pharmacology, Toxicology and Pharmaceutics; and, Physics and Astronomy.

Overall Prestige of Journals with Ranking Score Above a Given Threshold

In Reference (*2*), the basic assumption was that it should be possible to study different subject areas by means of appropriate summary measures of the journal ranking scores, which provide additional information beyond analysing the inequality of the whole ranking-score distribution. To this aim we proposed an axiomatic index R of the overall prestige of journals with ranking score above a given threshold.

From a longitudinal analysis of the overall prestige of first quartile journals, between 1999 and 2009, quite striking differences between subject areas have been shown. For instance, index R indicates a relatively low overall prestige since the 1999 for Arts and Humanities; Business, Management and Accounting; Decision Sciences; and Social Sciences. On the contrary, R showed a (relatively) high overall prestige for Agricultural and Biological Sciences; Biochemistry, Genetics and Molecular Biology; Chemistry; Earth and Planetary Sciences; Environmental Science; Immunology and Microbiology; Medicine; Neuroscience; Pharmacology, Toxicology and Pharmaceutics; Physics and Astronomy; and Multidisciplinary.

But even though we have that 2D-plots of index R showed distinct levels of overall prestige

for first quartile journals of different subject areas from 1999 to 2003, it follows that differences in overall prestige between subject areas decreased since the 2004.

From the results showed in this paper, the overall winner regarding absolute overall prestige of first quartile journals was the multidisciplinary subject area, even though it had strong oscillations since the 1999.

The lowest overall prestige in absolute terms was given by the Arts and Humanities. But the value of R for this area varied significantly over time, and thus, index R had a high increase from 1999 to 2009.

Ranking of the Subject Areas of Scopus

In Reference (*3*) we have presented a longitudinal analysis of the ranking of the 26 subject areas of Elsevier's Scopus, plus a general subject area containing multidisciplinary journals, since the 1999.

The subject area ranking was based on three summary measures: The prestige gap (PG) for the journals below the top ten ; the overall prestige (OP) for the first quartile journals; and the overall prestige to prestige gap ratio (OPGR). Our analysis is based on the SJR indicator, that was here selected to obtain the journal ranking scores.

For some subject areas quite striking differences between measures have been shown. For instance, the overall prestige for the first quartile journals indicates a higher ranking for the Multidisciplinary, Health Professions, Medicine, Bioch. Genetics and Mol. Biology, and Psychology in 2009. But when using the overall prestige to prestige gap ratio, the subject areas with a higher ranking were the Arts and Humanities, Decision Sciences, Multidisciplinary, Social Sciences, and Economics, Econometrics and Finance in 2009.

To sum up, our analysis showed that the ranking of subjects areas is a complex field. The results of cross subject areas comparisons and development over time depend on the chosen

summary measure (i.e., the OP, PG, or $OPGR$). Therefore several measures should be used for a distinct analysis of structural changes at the score distribution of journals in each subject area.

From the results showed in this paper, the overall winner when using both the overall prestige for the first quartile journals ($\#1$ in both 2009 and 1999) and the overall prestige to prestige gap ratio ($\#3$ in 2009 and $\#1$ in 1999) is the Multidisciplinary subject area.

Evaluation of Journal Quartile Rankings

In Reference (*4*) we have proposed that, giving the impact of performance-based funding schemes in countries like Spain and others, quartile ranking validation could be a very important issue since it needs to be established the soundness of journal quartile rankings for research evaluation systems. Hence we have introduced a novel methodology to the evaluation of journal quartile rankings. It is intended to measure the goodness of quartile rankings relative to other rankings that can be derived from a more objective division of the journal ranking score distribution into parts.

Thus, we first compute the overall prestige for the journals with ranking score above a threshold z, with z taking value across the SJR distribution of the subject category under analysis. The overall prestige above a ranking score is here used to characterize the journal quartile ranking in the evaluation process.

Next, in order to obtain an alternative ranking from a more objective division of the SJR distribution into parts, we perform the detection of transition regions on the overall prestige across z, by using scale space edge detection. Edges in the overall prestige across ranking scores may indicate a transition between journals. Then we analyse whether original journal quartiles correspond to regions of the overall-prestige signal with boundaries detected by using scale space edge detection. In other case, the quartile's boundaries are modified to match nearby

edges which were detected on the overall prestige. Here the modified ranking was called as the journal edge ranking. It is the reference ranking to be used in the evaluation.

Finally we perform the evaluation of the rankings using the original journal quartiles as well as the modified ones through different indices of ranking validity (e.g., the Davies Bouldin index). These methods for quartile ranking validation assign the best score to the technique that produces journal rankings with high similarity within a grouping and low similarity between groupings.

In Reference (*4*) we have presented the quartile ranking validity assessment for 12 subject categories of the Computer Science area in 2009. Our analysis was based on the SJR indicator that was selected as representing the journal ranking score. From these results we have shown, at a threshold value equal to 0.9, the soundness of journal quartile rankings for all subject categories of Computer Science with expection of Comp. Theory and Mathematics as well as Comp. Vision and Pattern Recognition.

On first quartile journals which are not of highest impact

In Reference (*5*) we study the relationship between journal quartile rankings of ISI Impact Factor (at the 2010) and journal classification in four impact classes, i.e., highest impact, medium highest impact, medium lowest impact, and lowest impact journals in subject category computer science artificial intelligence.

To this aim, we use fuzzy maximum likelihood estimation clustering in order to identify groups of journals sharing similar characteristics in a multivariate indicator space. The seven variables used in this analysis are: 1) Scimago Journal Ranking (SJR); 2) H-Index (H); 3) ISI Impact Factor (IF); 4) 5-Year Impact Factor (5IF); 5) Immediacy Index (II); 6) Eigenfactor Score (ES); and 7) Article Influence Score (AIS). The fuzzy clustering allows impact classes to overlap, thereby accommodating for uncertainty related to the confusion about the impact class

attribution for a journal and vagueness in impact classes definition.

Reference (*5*) demonstrates the complex relationship between quartiles of ISI Impact Factor and journal impact classes in the multivariate indicator space. And that several indicators should be used for a distinct analysis of structural changes at the score distribution of journals in a subject category. Reference (*5*) proposes that it can be performed in a multivariate indicator space using a fuzzy classifier.

We are developing a publicly available suite of Web-based tools designed to facilitate analysis of subject categories using the proposed approach, (*6*). It will be freely available to the scientific community at: $http://cvg.ugr.es/scientometrics$

References and Notes

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3. J.A. Garcia, Rosa Rodriguez-Sanchez, and J. Fdez-Valdivia (2011). Ranking of the Subject Areas of Scopus. Journal of the American Society for Information Science and Technology.

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Acknowledgments. This paper was sponsored by the Spanish Board for Science and Technology (MICINN) under grant TIN2010-15157 cofinanced with FEDER funds.