

Dimensions of the author citation potential

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Introduction

It is well known that in some fields the average number of citations per publication is much higher than in others (Moed, 2005).

For decades, the number of publications and the number of citations have been the two accepted indicators in ranking authors. Recently, alternative indicators which consider both production and impact have been proposed (Dorta-González & Dorta-González, 2011; Egghe, 2013). However, these indicators based on the h-index do not solve the problem when comparing authors from different fields of science. Given the large differences in citation practices, the development of bibliometric indicators that allow for between-field comparisons is clearly a critical issue (Waltman & Van Eck, 2013).

Traditionally, normalization of field differences has usually been based on a field classification system. In said approach, each publication belongs to one or more categories and the citation impact of a publication is calculated relative to the other publications in the same field.

In our topic normalization we use the aggregate impact factor of three different sets of journals as a measure of the different dimensions in the citation potential of an author.

Dimensions of the author citation potential

Even within the same field, each researcher is working on one or several research lines that have specific characteristics, in most cases very distant from those of other researchers.

Generally, the citation potential in a field is determined within a predefined group of journals. This approach requires a classification scheme for assigning publications to fields. Given the fuzziness of disciplinary boundaries and the multidisciplinary character of many research topics, such a scheme will always involve some arbitrariness and will never be completely satisfactory. Therefore, we propose measuring the citation potential in the specific topic of each author and using this measure as an indicator of the probability of being cited in that topic.

The problem underlying the characterization of the author citation potential is as follows. Given a set of publications from an author in different journals and years, we will try to obtain a measure of the author topic defined by some dimensions of these publications so it can be compared with that of a different author (with publications in different journals and years).

Let us consider a 5-year time window Y. In this paper, we propose characterizing the topic of an author in period Y using three different dimensions (see Figure 1): the weighted average of the impacts in the journals containing the author's papers in Y (production dimension P), the weighted average of the impacts in the journals citing the author's papers in Y (impact dimension I), and the weighted average of the impacts in the journals included as references in the author's papers in Y (reference dimension R).

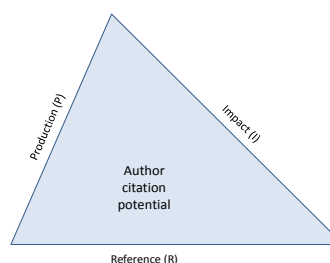


Figure 1: The three dimensions of the author citation potential

In this characterization we propose the use of journal impact indicators instead of number of citations received by a particular paper. This is because it is necessary that several years pass after the publication of a document, so that the number of citations can be a consistent indicator in comparing similar documents of the same type published in the same year with that of other researchers in the same field. In some fields (e.g., Economics) more than 5 years are needed to obtain a consistent measure of impact (Dorta-González & Dorta-González, 2013). In many fields of the Humanities it is necessary to wait even longer (Dorta-González & Ramírez-Sánchez, 2014).

Materials and Methods

The bibliometric data was obtained from the online version of the Scopus database. Only journal papers in the period 2009-2013 were included, considering for each journal the Scimago Journal Ranking – SJR–. Four subject areas were considered: Chemistry, Computer Science, Medicine, and Physics & Astronomy. This was motivated in order to obtain authors with systematic differences in publication and citation behaviour. We designed a random sample with a total of 120 authors (30 in each subject area). They were selected from the highly productive authors of the Consejo Superior de Investigaciones Científicas –CSIC– (Spain).

Results and discussion

The subject areas considered are very different in relation to the citation behavior. For this reason, in the sample there are important differences among the dimensions of the citation potential from one author to another. However, the proportion between production and impact dimensions is very close in all the subject areas considered (Figure 2).

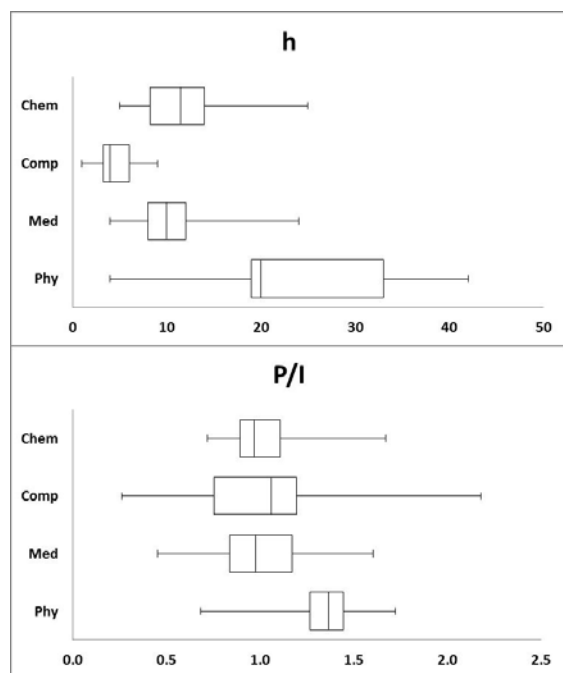


Figure 2: Box-plots comparing the subject areas

Within- and between-group variability are both components of the total variability in the combined distributions. So: within variability + between variability = total variability.

Note in Table 1 that the proportion between production and impact dimensions produces the greatest percentage reduction of the variance. A more detailed analysis of the results can be found in Dorta-González et al. (2015).

Table 1: Central-tendency and variability

	P	I	R	P/I
Median	1.521	1.526	2.564	1.065
Mean	1.719	1.546	2.759	1.093
Range of variation	3.692	3.776	7.527	1.915
Within-group variance	46.360	25.089	192.557	9.972
Between-group variance	39.434	17.325	54.463	2.358
Reduction in the variance	14.9%	30.9%	71.7%	76.3%

Conclusions

We have developed a measure of scientific performance whose distributional characteristics are invariant across scientific fields. Such a measure could be employed in the normalization of the impact at the author level in order to allow direct comparisons of scientists in different fields and permit a ranking of researchers that is not affected by differential publication and citation practices across fields.

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