The Research Purpose, Methods and Results of the "Annual Report for International Citations of China's Academic Journals"

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Abstract

Before 2012, it was hard to come to a comprehensive evaluation of academic journals in China. For this reason the international influence of journals published in China hadn't been paid enough attention, leading to a bias in the Chinese research assessment system. Since 2012, China National Knowledge Infrastructure (CNKI) invested and carried out the project of the development of the "Annual Report for International Citations of Chinese Academic Journals ". In the same year, CNKI made a comprehensive study on the international citations of more than 6000 journals in China, and found that some journals had a certain international influence. In order to make a comprehensive assessment of the international influence of those journals, CNKI has developed a comprehensive indicator, named the CI index (clout index), combining the effect of both the impact factor and the citation counts. This article describes the purpose, methods and results of part of this project, providing a fresh idea for a comprehensive evaluation of the influence of Chinese academic journals.

Conference Topic

Methods and techniques

Background

In the era of big data and we-media as shown by Bowman & Willis (2003), direct publication and free access are all around, leading to the question: "how can academic journals survive"? It is known that journals, in particular journals sharing a scientific community compete in one market, but journals will survive as long as they have a function for a specific academic community. The main problem that Chinese journals, especially academic journals, are faced with, is the competition with huge international publishing companies. It has been a common knowledge that it is hard for the domestic journals to compete with those international academic journals.

According to Thomson Reuters' SCI data, as shown in Fig. 1, Chinese scholars published 114,130 papers in international journals in 2008. This number has greatly increased to 232.000 in 2013, which is a doubling of that in 2008. While Fig. 2 shows a comparison of the papers Chinese scholars published in the journals covered by the SCI with the papers Chinese scholars published in domestic academic journals in 2013. It can be seen in Fig. 2 that 1.035 million papers have been published in 3569 domestic academic journals in 2013. Compared to the 1,035,142 domestic papers, 206,598 academic papers were published in journals covered by the SCI. This means that one sixth of the Chinese academic papers had flowed overseas. There is also a rapid increase in quantity for the papers in the field of social sciences. The number of Chinese SSCI papers had increased from 4,430 in 2008 to 9,722 in 2013, which means a doubling over five years.

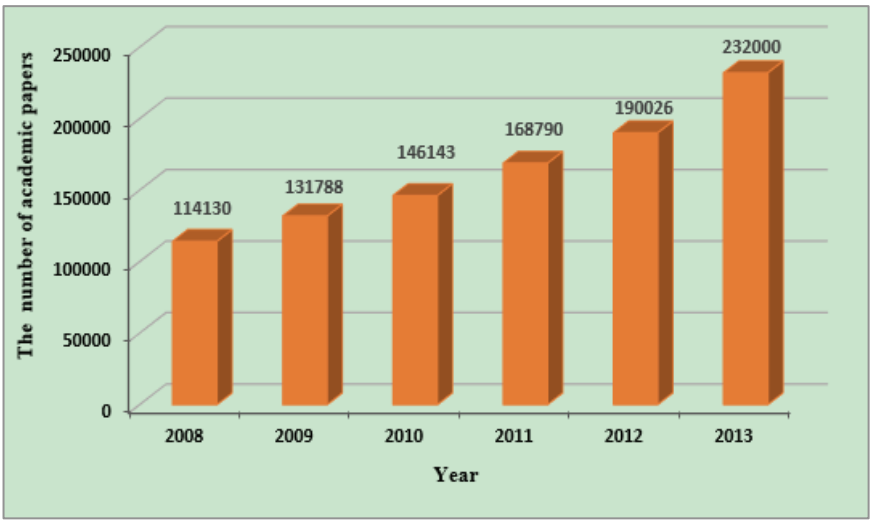

Figure 1. Evolution of the number of academic papers Chinese scholars published in international journals covered by the SCI during 2008-2013.

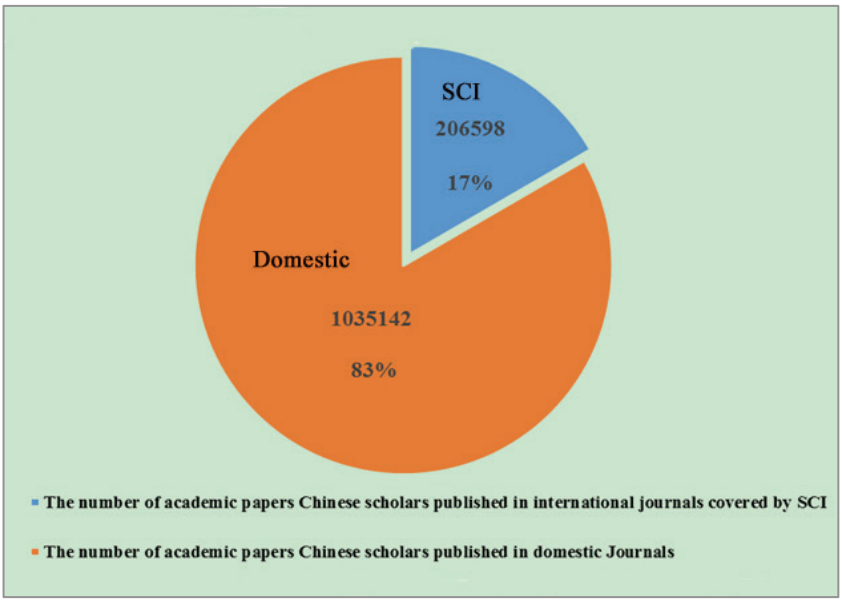

Figure 2. A comparison between Chinese papers published in journals covered by the SCI with papers published by Chinese scholars in domestic academic journals in 2013.

It is seen that so many China's qualified academic papers have flowed overseas and published in international journals, especially SCI journals. While the impact of China's academic journals on international audience was rarely revealed before. We think that, in the information era, with an increasing quantity of journals, the full importance of academic journals should be revealed through an objective evaluation based on a large amount of data. Journal management departments often use an "index set" of journal characteristics. This index set is used for the quantitative assessment of journal's quality. It has become a social consensus that "Scientific decision-making needs the support based on the big data". China's publishing management system, in particular, urgently needs a comprehensive, objective and impartial data set for the allocation of journal publishing resources.

Most scholars agree that publishing academic papers in the journals of a high academic standing is a means of academic communication and the success of a scholar in this can be used as a factor in evaluation exercises. The problem is where to draw the line between journals of high standing and journals of lower standing. In the past, data regarding

international journals were not taken into account for various evaluations of domestic journals. Therefore, it was hard for the domestic journals to compete with those international academic journals.

It is common that the reputation of Chinese scientific journals in the international community is measured by journal Impact factor (IF). Ren (1999) proposed the challenge for Chinese scientific journals using this indicator for the evaluation of Chinese journals. Based on the fact that a journal's international impact had not been adequately considered in the past, research management department such as that of CNKI could only take the SCI as evaluation standard. The Science Citation Index (SCI) initiated by Eugene Garfield is a unique retrieval and evaluation tool (Garfield, 1955). Yet it is known that it is not adequate for the local evaluations of less developed non-English speaking countries, or for the retrieval of these countries' publications (Ren & Rousseau, 2002). Since English is the most widely used language in science, journal publishers prefer to publishing in English to attract a larger reader base, resulting in more visibility, increased citations and higher IF, as shown in the study by Ren & Rousseau (2004). According to the above discussion, it is necessary for us to take an international perspective and a domestic view to evaluate the influence of China's academic journals, i.e. consider both domestic and international journals' citing citations to Chinese academic journals, in order to conduct scientific and reasonable evaluations of Chinese academic journals. For the citations by domestic journals, CNKI has developed "Annual Report for Chinese Academic Journal Impact Factors" since 2009. In this study, we focus on the citations by international journals, introducing the research purpose, methods and results of the "Annual Report for International Citations of Chinese Academic Journals".

Purpose

In this study, we conduct a quantitative assessment of academic journals published in Mainland China, either in Chinese or in English, in order to make an evaluation of their quality. Moreover, we analyze their world-wide influence by mining their cited records of citations by international journals. In the following we first give our understanding of an academic journal of high quality.

A journal of high quality provides products and services meeting or exceeding its readers' expectations. As such the quality of an academic journal is a comprehensive reflection of its publication level as manifested through the importance of its articles for the advancement of science. Following national and international norms, timeliness of publication and a large reader base also contribute to a journal's quality.

Influence of an academic journal refers to the ability of the journal to arouse its readers' attention and thinking, obtain their recognition and even alter their thoughts, opinions and behavior. A high-level journal influences academic development, by the ideas, concepts, theories, methods, findings, inventions and facts it introduces to the scientific community. Besides these objective aspects, a high-level journal has also an emotional influence, associated with its brand name, on its reader community.

Influence is not only a reflection of quality, but also a function of time. High quality papers, including editorials, show their influence gradually over time. Dissemination of journals can be judged scientifically and objectively by the frequency of being cited in domestic and foreign academic literature.

Method

Index system

Some scholars have suggested that data including downloading and online comments should be considered. These ideas are related to the altmetrics, or social influmetrics, movement

(Rousseau & Ye, 2013). Even the new Nature Index includes altmetric data (refer to the website: www.natureindex.com). However, downloading is a complex issue. It ranges from results of web crawling to students' learning, or providing intelligence services, and does not only include use for academic research. Moreover, based on current data analysis technology, it is still a challenge to judge if online comments are scientific or rigorous. In contrast, citation is a reflection of academic norms. Each author is required to respect the intellectual property rights of the literature he or she cites. Otherwise his/her behavior might be considered as misconduct. Therefore, statistical analysis of citations is considered as a relatively reliable and quantifiable technique.

Citation and publication statistics may include the following items:

(1) Statistics related to received citations such as the total cites in a year. Citations may include mutual journal citations and a history of received citations over a period of several years.

(2) Quantity of published literature such as the amount of published papers (further subdivided into types such as 'normal' articles, reviews, editorials, etc.), proportion of funded papers and proportion of articles with foreign collaboration.

(3) "Calculated indicators for evaluation: Indicators related with cited frequency such as immediacy index, the 2-year impact factor, 3-, 4-, or 5-year impact factor, etc. Indicator related with mutual citations: mutual citation index. Indicators related to the life cycle of literature: citing half-life, cited half-life, etc."

(4) The composition of the editorial board and the prestige of the editor-in-chief.

Selection of statistical sources for the international citations report

Statistical sources for the international citation report must be journals selected according to the standard for the evaluation of the international influence. Besides the journals from American and European countries, representative journals from other countries should also be included. The list of source journals should be based on suggestions from domestic and foreign experts. It is known that SCI database includes the most representative journals from the American and European countries and, as such, may be acceptable for reflecting the international influence of Chinese academic journals. Hence, at least for the current year, we still use the SCI database as the statistical source to evaluate academic journals. This means that we consider 8,621 academic journals covered in this database.

The case for humanities and social science fields is more complicated. It is not enough to merely use the 6,429 journals of SSCI and the A&HCI to evaluate the humanities and social sciences journals. For a more comprehensive statistic of the international influence of China's humanities and social sciences journals, we add well-known databases as a supplement, including those of leading international publishing groups such as Elsevier, Springer, Wiley, and Emerald. In this way, 1483 source journals (non-WOS humanities or social science journals) are included, which are good supplements for the source journals. According to experts' recommendations, we have also supplied 441 journals in minor languages, which pay attention to Chinese issues. These journals have not been included in the worldwide major databases, but they are indispensable for the research of local social science experts (Ossenblok, Engels & Sivertsen, 2012).

Data standards

In order to ensure the accuracy of the statistical data, we have established data processing standards, procedures, as well as quality requirements. Accordingly, we normalized and standardized the raw data and set up a series of databases as follows:

(1) The document database of norms for titles of more than 7,000 Chinese and English journals in China.
(2) The bibliographic database of China's academic journals, a collection of about 8,000 domestic academic journals and more than 42 million publications, used for citation links.
(3) Set up "the Statistical Standards of the Published Paper Amount". According the norm, make the statistics on the amount of published papers, as well as the cited papers published in the recent six years.

The development process

(1) Collection of data: including data retrieval in the WOS database, and the processing of data from supplementary journals.
(2) Standardized data processing: automatic processing of data such as citation links, and fuzzy title matching. If necessary these techniques were augmented by manual inspection to improve efficiency and accuracy.
(3) Detection: verification of data integrity and accuracy checks to ensure that the data meets the quality standards, plus an annual appraisal of a group of experts.
(4) Trial calculation, validation, and sample verification: indicator calculation must be double checked by several persons, and those journals with large inter-annual variations in one or more indices are the target of special attention.

Results

According to the method mentioned above, we developed the "International citation annual report" providing evaluation data of Chinese academic journals, first released in 2012. In December 2014, the 2014 Annual Report (Xiao & Du, 2014) was published and the evaluation data for more than 6000 academic journals were provided. These results were released in the "Database of Statistical Analysis of Individual Journal's Impact" available on the website of the CNKI (www.cnki.net).

Selection of highlights

Definition of a new international impact index: the clout index, denoted as CI

Several indicators like the journal impact factor and total cites are commonly used for the evaluation of a journal. Before continuing we first provide a short review of those indicators. The idea of a journal IF was first propagated by Eugene Garfield in the journal Science in 1955 (Garfield, 1955, 2006). Currently, the journal IF is generally regarded as representing the quality of academic journals in terms of citations received by its published articles. It is usually assumed that journals with a high IF carry meaningful, prominent, and quality research (Saxena, 2013). However, this single parameter is clearly not sufficient (Vanclay, 2012, Glaenzel, 2009). First of all, according to its definition, the IF reflects the performance of a journal in the most recent two years. The cited half-life for an academic journal is about 4 to 12 years, while the period of the most recent two years is merely the peak time for citation (and even that depends on the field), accounting for about 20% of the total citation amount, as shown in Fig.3. Second, the journal IF is independent of factors like the history and scale of journals and may reflect the popularity of published topics (Rousseau et al., 2013). Besides, journal IF depends on the research field: high journal IF is likely achieved for journals covering large areas of basic research with a rapidly expanding but short lived literature that use many references per article (Seglen, 1997). Using the IF as the single measure would lead to artificial constraints on the quantity of published work as well as the tendency to publish a large number of papers in line with the current popular trends without solving any

fundamental problem. Journals that act like this would lose their basic function as real academic communication platforms.

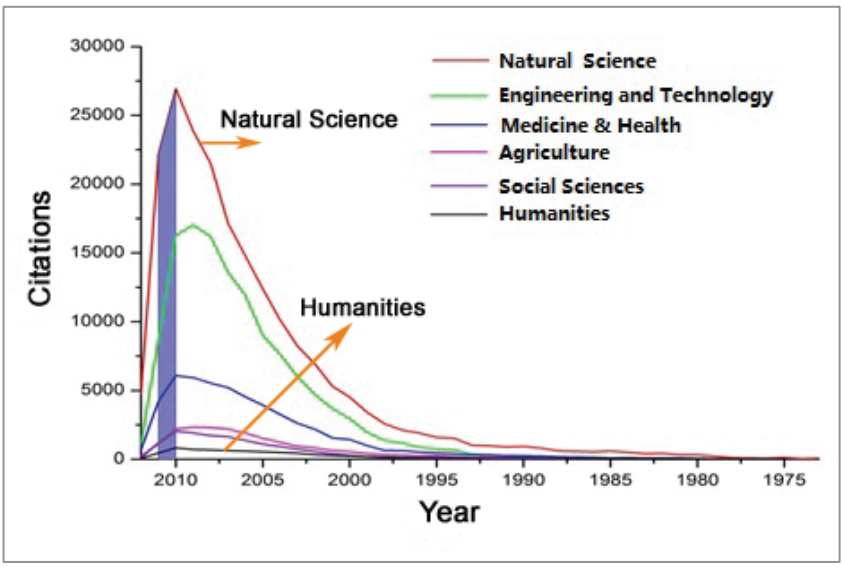

Figure 3. Cited half-life for different subject categories.

Total cites is directly related to journals' publishing history and scale. As shown in Fig. 3, we should also mention that total cites, which include the other 80% of citations that are excluded from the calculation of the IF, reflect the total impact power. However, it is also unreasonable to only consider total cites as the single evaluation factor. It might encourage researchers to aggressively increase their publishing quantity at the expense of academic quality.

Here, we should mention the topic of self citations. Whenever citations are used as indicators to evaluate scientific research, self-citations are often considered controversial. Many scholars have studied self-citation and some suggest that self-citations should be removed from citation counts, at least at micro and meso levels (e.g. analyses of persons, research groups, departments, and institutions) (Aksnes, 2003, Thijs & Glaenzel, 2005). Today the indicator of self-citations has been widely used in the evaluation of scientific journals.

We all know that IF and citations are field dependent, and therefore, indicators which compare expections to observed values are also interesting, see the work of Glaenzel, Schubert and Braun to MOCR (The Mean Observed Citation Rate) and MECR (The Mean Excepted Citation Rate) (Braun et al., 1985, Schubert et al., 1989). While Bonitz et al. (1997) stuied the Matthew effect of countries and Matthew citation journals, and presented the established characteristic of the so-called Matthew Effect for countries: field-dependency, time-stability and order of magnitude. Boyack & Klavans (2014) made the analysis on non-source publications in a different context, including non-source items in a large-scale map of science. These studies have inspired our work on exploring a comprehensive indicator for the evaluation of non-WOS-source domestic academic journals.

Thus, we have developed a comprehensive indicator, named as the Clout Index (CI), which takes both the IF and total cites into account. To be precise, we replace the WOS IF and total citations with the non-self-cited IF and total non-self-cited citations in the calculation of the CI values, taking into account that most of Chinese journals are not covered by the WOS.

First, we normalize the non-self-cited IF and total non-self-cited cites by a linear normalization method (the same for the two indices) shown in Equation (1), where V represents the parameter that has to be normalized, while N represents the normalized value. In this way the two values are in the range [0, 1].

$$N_i = \frac{V_i - V_{\min}}{V_{\max} - V_{\min}} \quad (1)$$

For the next step, we apply Eq. 2 to calculate the CI value:

$$CI = \sqrt{2} - C = \sqrt{2} - \sqrt{(1-x)^2 + (1-y)^2} \quad (2)$$

Fig. 4 shows a schematic distribution of CI values calculated by Eq.2. The points scattered in Fig. 4 represent the CI values of the selected journals. It should be noted that, in Eq. 2 and in Fig. 4, *x* and *y* stand for the normalized non-self-cited IF and total non-self-cited cites, respectively. From Fig.4, it can been seen that the origin coincides with non-self-cited IF = 0 and total non-self-cited cites = 0, while the point (1, 1) represents that the journal has reached the maximum value in both the non-self-cited IF and total non-self-cited cites. If we take the point (1, 1) as the center and CI value as radius to draw circles, then points on the same circle have the same CI value. The points located in the bottom-left area have lower CI values while the ones in the up-right area have higher values.

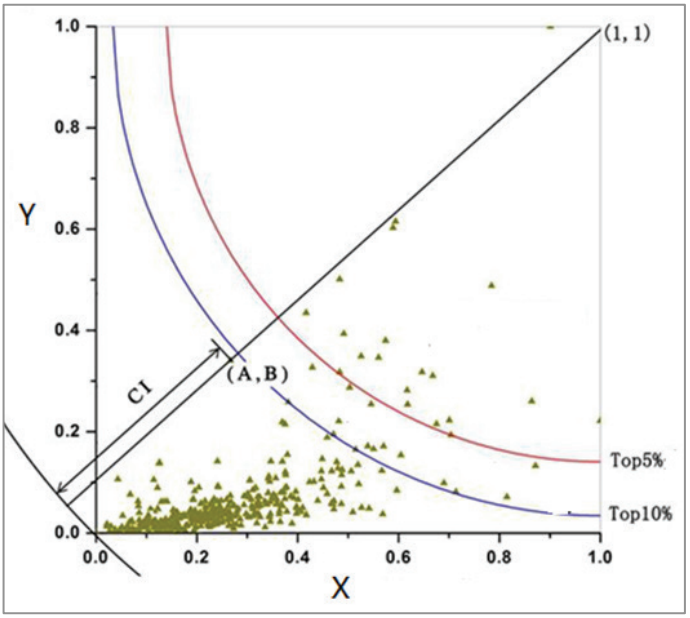

Figure 4. Schematic view of the Clout Index (CI) and selection of top journals in China.

In Figure 4, we drew two curves with the point (1,1) as their center, and CI(1) and CI(2) as radius, respectively. Here, CI(1) and CI(2), represent the critical CI values of selected Top 5% and Top 10% journals, respectively. We consider journals with CI values above the Top 5% as "The Highest International Impact Academic Journals of China", while CI values between CI(1) and CI(2) as "The Excellent International Impact Academic Journals of China". Here, China's academic journals published either in English or in Chinese are both considered.

At this point, we would like to explain why we choose a vector sum method for the calculation of the CI value instead of using a simple linear sum. Figure 5 shows a comparison of the linear sum and the vector sum method. The scatterplot itself in Figure 5 is the same as in Figure 4. First, we consider that IF and cites have the same weight as evaluation indicators. If we take the linear sum method, i.e. CI=*x*+*y*, we obtain oblique straight lines with different lengths to show equal CI values. Here, *x* and *y* have the same definition as those for Figure 5. Compared to the result obtained from the linear sum method, the CI value is smaller by the vector sum method, when the points closed to x or y axes. In this system, journals with higher single index, either IF or cites are easily excluded. Thus, our algorithm gives a better way to match the evaluation principle: "not only quality but also quantity matters".

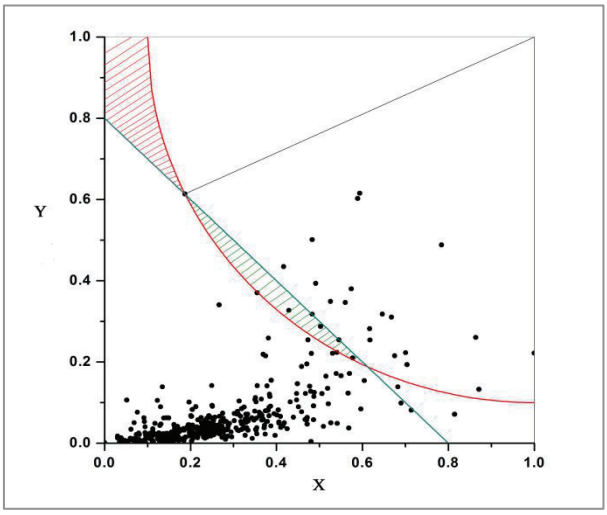

Figure 5. A comparison of the linear sum and the vector sum method.

In our system, we consider that journals with both higher IF and higher cites are journals of high-quality. Those journals commonly have higher influences in their scientific field. Fig. 6 shows the schematic view of the scatterplot of the CI value for both the SCI journals as well as Chinese domestic journals. We use double logarithmic coord. system in Fig. 6, where our developed vector sum method is applied to calculated the CI values for SCI journals and China's domestic journals. Both of the statistical sources are WOS database. The green triangles represent the CI values for the international SCI journals, while the black ones show the domestic journals covered by SCI. Those related to the Top 5% journals are shown in red, while for Top 5-10% journals in dark blue. Lower CI values for other domestic journal are shown in orange. It is clear that the majority of international journals covered by the SCI is situated in the area with both higher IF and higher citations. Situations are similar for the Top 5% and Top 5-10% domestic journals. Thus justifies that our vector sum method is a good method for the evaluation of the journals, and the CI index can be considered as an effective and reasonable indicator for the quantitative assessment of journal impact.

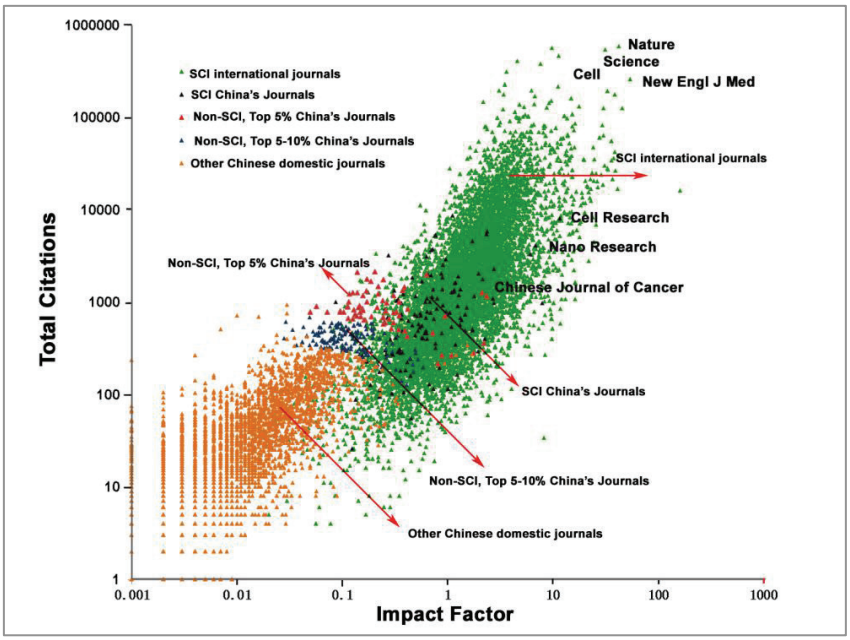

Figure 6. A schematic view of the scatterplot of the CI values for both the SCI journals and China's domestic journals.

Problems in the selection of top journals

Division of subjects

There is, among domestic journals in various disciplines, a large imbalance in the level of international influence and the extent of "going global". If top journals were selected per discipline, excellent journals in highly visible disciplines may be excluded, while journals with less international influence in disadvantaged disciplines may come into the list. This is not the way we want to highlight the most influential journals. As time goes by, we expect that the international influence of various disciplines will be improved and developed in a balanced way. At that time we will be able to perform sub-discipline rankings.

Comprehensive consideration of domestic and international influence

In the evaluation of international influence we should consider domestic and international influences as two sides of the same coin. However, first, a separate evaluation is more helpful for understanding the situation of the journals in both domestic and international market. Secondly, there is no recognized method showing how to merge these two reports, however, see Jin & Rousseau's study for an earlier merging attempts (Jin et al., 1999, Jin & Rousseau, 2004). The main difficulty lies in the point that there are different opinions on the issue of whether "a domestic citation is equal to an international citation." Considering the fact that "the annual report of the impact factors of China's academic journals" has been well developed for years, in this article, we mainly discuss the research method of the annual report of the international citations.

The selection process and resulting top list

To highlight the most influential journals, this year we continue selecting "The Highest International Impact Academic Journals of China" and "The Excellent International Impact Academic Journals of China". By ranking the journals of STM (Science/ Technology/ Medicine) and AH&SS (Humanities and Social Sciences) according to the CI values, we selected the Top 5% and the Top 5-10% journals; then sent the selection method, data of indicators and the primary list to more than 70 experts for peer review.

Some journals were removed from the list for their bad reputation evaluated by peer reviewers, while other ones were supplemented in sequence. This was done in such a way as to make sure that the total number of selected journals stayed the same. Finally we determined 176 STM journals and 61 AH&SS journals as "The Highest International Impact Academic Journals of China", and 174 STM journals and 60 AH&SS journals as "The Excellent International Impact Academic Journals of China" Among these 471 Top 5-10% journals, 458 are core journals selected by various domestic institutions, and most of the other 13 are journals in English or newly created ones.

Summary and outlook

(1) An international report has been issued for three successive years and approved by government departments in charge of journals, editorial department of journals and academic circles. This encourages us to keep this work going.

(2) With the accumulation of data, many meaningful conclusions can be drawn from the analysis of inter-annual variations in data.

(3) There is certainly room to improve the evaluation methods, including the selection criteria of the international source journals, possible improvement of the determination of the CI indicator and the integration of domestic and international lists.

(4) The main points of this article have been written in a manuscript submitted to Acta Editologica in Chinese language (Wu et al., 2014).

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