International Competitiveness of Chinese Journals

Rongying Zhao
Center for Studies of Information Resources, Wuhan University, Wuhan, 430072, China

Ruixian Yang (Correspondence author)
Research Center for Science Evaluation, Wuhan University, Wuhan, 430072, China

Ke Dong
Research Center for Science Evaluation, Wuhan University, Wuhan, 430072, China

and

Qing Fang
Center for Studies of Information Resources, Wuhan University, Wuhan, 430072, China

ABSTRACT

Academic journals are the gatekeepers of new scientific breakthroughs and discoveries, reflecting and validating the scientific progress of research endeavors of educational institutions and corporate investigations. As China continues development as a world leader in many arenas, it is vital that educational and research progress does not lag behind. An analysis of the stature with which Chinese academic journals are held in the global academic community is one way to validate if the development of Chinese scientific technology is matching pace with the expectations of such development. The main purpose of this study was to analyze the Chinese academic journals which were indexed in Journal Citation Reports (JCR) from 2001 to 2005. In terms of subject distribution; Total Cites, Impact Factor, Immediacy Index, Articles, this paper studied the international competitiveness of these journals. During the five-year period, Chinese academic journals developed swiftly, but problems still exist.

Keywords: JCR; Academic journal; International competitiveness

1. Introduction

As a key foundation of knowledge for the scientific community, particularly for high-tech fields [1], academic journals are an important reflection of scientific productivity, containing academic papers, research reports, and reviews [2]. This category of journals, which generally rejects advertising with a serious attitude towards printing and binding, has specific content oriented to specific readers and is characterized by both small amount of output and high price in subscriptions [3]. With the growing influence of China, many journals have spread abroad successfully and become a channel of scholarly communication between China and the world. However, the position of these journals in the academic hierarchy of international prominence is rarely examined. Are Chinese journals internationally competitiveness? JCR provides a basis for a diagnostic comparison.

JCR, which offers data on comparative journal citation analysis, is a comprehensive and unique resource for evaluating and comparing journals at both journal level and subject category level. Five key indicators in testing journal relevance are: Total Cites, Impact Factor, Immediacy Index, Articles, and Cited Half-life [4].

1 Total Cites are the total number of citations to a journal in the JCR year.
2 Impact Factor (IF) of a journal is the average number of times articles from the journal were published in the past two years, and have been cited in the JCR year. [5].
3 Immediacy Index is the average number of times an article is cited in the year it is published. The journal Immediacy Index indicates how quickly articles in a journal are cited. [6].
4 Articles describe the capacity for journals to absorb documents outside in the journal published in the
Cited Half-life is not referred to for its little significance for this evaluation; average Journal Total Cites and average Journal Impact Factor (JIF) are employed instead.

2. International competitiveness

Table 1  Distribution of indexed journals in JCR (from 2001 to 2005)

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<tr>
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<tbody>
<tr>
<td>No. of indexed journals in JCR Science Edition</td>
<td>5752</td>
<td>5876</td>
<td>5907</td>
<td>5969</td>
<td>6088</td>
<td>5918</td>
</tr>
<tr>
<td>No. of Chinese journals in JCR Science Edition</td>
<td>57</td>
<td>60</td>
<td>67</td>
<td>71</td>
<td>75</td>
<td>66</td>
</tr>
<tr>
<td>No. of indexed journals in JCR Social Science Edition</td>
<td>1682</td>
<td>1709</td>
<td>1714</td>
<td>1712</td>
<td>1747</td>
<td>1713</td>
</tr>
<tr>
<td>No. of Chinese journals in JCR Social Science Edition</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Information can be concluded from table 1 that 57 Chinese journals were indexed in the 2001 JCR Science Edition, accounting for 0.99% of all 5752 journals. In 2002, 60 were included, 1.02% of all 5876 journals. In 2003, 67 Chinese journals represented 1.13% of all 5907 journals. In the year 2004, 1.19% of all 5969 journals, that is, 71 journals were of Chinese origin. The year of 2005 saw 75 Chinese journals contributing 1.23% of all 6088 journals. The averages of indexed journals over five years of several top-ranked countries are given in figure 1, illustrating that China contributed 1.12% of all journals.

In terms of annual indexed journals, China ranked tenth in 2003 up from thirteenth in 2001 and had kept this position for three years in JCR Sciences Edition. China ranked sixteenth in JCR Social Sciences Edition for 5 years, with merely 3 journals each year, 0.18% of the total. See fig.1 and fig.2.

In general, Chinese journals listed in JCR Science Edition were increasing and ranking was enhanced every year, reflecting a positive trend in international visibility. In regard to JCR Social Sciences Edition, China had stayed around No.16 for years, whose fluctuation in ratio of indexed journals to the total was inevitable caused by larger quantity of indexed journals of such countries as the US, and the UK. It is noticeable that US had an absolute superiority over all other countries in terms of indexed journals, Total Cites, average Journal Cites, total IF, average JIF, Immediacy Index and Articles. The UK and Holland ranked second and third respectively.

Impact analysis

Total Cites of Chinese journals kept ascending steadily during the five years, receiving 51060 citations in 2005, increasing by 243.6% when compared to 2001. In addition, average Journal Cites had risen by 185.2%, total IF by 199.1%, average JIF by 153.8%, 5-year average Immediacy Index by 128.3%, and Articles by 167%, providing a convincing evidence that Chinese journals are being recognized internationally. Details are illustrated in figure 3.
As opposed to other leading countries, it is the larger number of indexed journals that has led to a rise in China’s ranking. Comparing with Russian, for example, China has exceeded Russia in all aspects. Specifically speaking, all the indicators are equal to those of Russia except a lower 5-year average Immediacy Index in 2001, in terms of which Russia was soon surpassed the next year.

The comparison between top 15 countries and China is listed in Table 2.

Table 2 Comparison of indicators between China and top 15 countries in JCR Science Edition

<table>
<thead>
<tr>
<th></th>
<th>Total Cites</th>
<th>5-year Avg. Journal Cites</th>
<th>Total IF</th>
<th>5-year Avg. JIF</th>
<th>5-year Avg. Immediacy Index</th>
<th>Total Articles</th>
<th>5-year Avg. Journal Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>36019.2</td>
<td>534.924</td>
<td>34.99</td>
<td>0.522</td>
<td>0.082</td>
<td>12628.2</td>
<td>189.712</td>
</tr>
<tr>
<td>Avg. Top 15</td>
<td>129404.7</td>
<td>1743.29</td>
<td>592.493</td>
<td>1.023</td>
<td>0.184</td>
<td>48362.347</td>
<td>114.77</td>
</tr>
<tr>
<td>Ratio</td>
<td>2.78%</td>
<td>30.68%</td>
<td>5.91%</td>
<td>51.02%</td>
<td>44.57%</td>
<td>26.11%</td>
<td>165.30%</td>
</tr>
</tbody>
</table>

Despite swift increase in Total Cites and total IF, Chinese journals' small base of the two indicators imply that the quality of indexed journals is still below the average level of the 15 top-ranked countries. Total Cites was 2.78% on the average, IF contributed just 5.91%, indicating that Chinese journals are still low in international impact and recognition. However, Articles are 60% greater indicating a need for emphasizing journal quality as foreign first-class journals.

Generally speaking, Chinese journals still are at an apparent disadvantage in comprehensive strength since the increases of most indicators were dragged by that of Articles. Therefore, it is appropriate to evaluate the competitiveness of Chinese journals based on JCR, premised on a collection of reasonable reference data.

3. Visibility analysis on Chinese journals

A group of Chinese journals that had been continuously indexed in JCR Science Edition for five years are the objects we analyzed, since it is more logical to select ones with steady performance in the long term to reveal their international visibility. 52 journals met this condition, considered to be both high and steady in quality, all of which are common in a steadily rising IF. 16 of these journals had an IF 1 time higher than that of 2001 in 2005. As is shown in the second part, the Immediacy Index of Chinese journals from 2001 to 2005 increased slightly; on the contrary, most of the 52 journals had updated their content in time, which was presented by their equable Immediacy Index, however, the speed of the average times journals cited is still slow. In a word, these journals developed smoothly, representing the core competitiveness of Chinese journals.

According to the 2001 JCR Science Edition, there were 21 Chinese journals with an IF>20, 52 had an IF between 10 and 20, 42% had an IF>1, accounting for merely 3.5 % (2/57) of the total. In 2002, there were 20 journals with an IF>20, 60 had an IF between 10 and 20, 43.5% had an IF>1 accounting for 8.3 % (5/60) of the total. In 2003, there were 24 journals with an IF>20, 62 had an IF between 10 and 20, 46.7% had an IF>1 accounting for 16.4 % (11/67) of the total. In 2004, there were 24 journals with an IF>20, 62 had an IF between 10 and 20, 49.2% had an IF>1, accounting for 14.1 % (10/71) of the total. In 2005, there were 23 journals with an IF>20, 73 had an IF between 10 and 20, 51.7% of the
total that year had an IF>1 world wide, China making up 16 % (12/75). This indicates a positive trend in the development of Chinese journals, with an IF>1 well in sight.

**Avg. Total Cites**

Total Cites serves as an important measure of journal quality, through which we can identify those most frequently cited journals. 4 journals had a 5-year average Total Cites>2000, 4 were between 1000 and 2000, 44 had a 5-year average Total Cites<1000. 4 journals are found to dominate the others at an absolute advantage. *ACTA PHYSICA SINICA*, which ranked No.1 (2611), is the first comprehensive academic journal on Physics established in 1953 [7]. *CHEMICAL JOURNAL OF CHINESE UNIVERSITIES-CHEMICAL* which took the second position (2405.6) [8], is one of the most productive journals in China. *CHINESE SCIENCE BULLETIN*, a comprehensive academic journal on Science [9], followed closely (2388.6). *CHINESE PHYSICS LETTERS* stood at the fourth place (2068.4). It is noteworthy that *ACTA PHYSICA SINICA* and *ACTAPHYSICA SINICA* were both Chinese-language and among the top 3, *CHINESE SCIENCE BULLETIN* was lowest in self-citing and self-cited rates.

**Average Impact Factor**

5 journals had a 5-year average JIF ≥ 1, representing 9.6% of the total. 13 had a 5-year average JIF between 0.5 and 1, contributing 25% of the total. 34 had a 5-year average JIF<0.5, at 65.4% of the total. *CELL RESEARCH* (1.978), which was administrated by Shanghai Institutes for Biological Sciences [10], was positioned in first place with a cited rate as high as 95%. It is an international journal engaging in publishing original English-language papers, reviews and newsletters on Cell Biology written by both domestic and foreign authors. It is a journal of international visibility which has been covered by a number of prestigious databases and libraries abroad [11]. At the second place was *CHINESE PHYSICS* which, together with *ACTA PHYSICA SINICA*, is managed by the Chinese Physics Society and the Institute of Physics, CAS. *ACTAGEOLOGICA SINICA-ENGLISH EDITION* ranked third with a 5-year average JIF at 1.092. The forth place was taken by *CHINESE PHYSICS LETTERS* with a 5-year average JIF at 1.082 whose high quality is well confirmed by its top-ranked 5-year average Total Cites and JIF.

**Average Immediacy Index**

Among the 52 journals, 4 had a 5-year average Immediacy Index>0.2, representing 0.7% of the total. 7 had a 5-year average Immediacy Index between 0.1 and 0.2, accounting for 13.5% of the total. The majority had a 5-year average Immediacy Index<0.1. Respectively, the first four positions were taken by *CELL RESEARCH* (0.29), *CHINESE PHYSICS* (0.22), *CHINESE PHYSICS LETTERS* (0.21), and *ACTAGEOLOGICA SINICA-ENGLISH EDITION* (0.20). Meanwhile, it is noticeable that the four journals also ranked the top four in relation to 5-year average JIF, which suggests their high quality and leading-edge content.

**Average Article**

3 journals had an average Articles>500, accounting for 5.8% of the total. 7 had an average Articles>400, representing 13.5% of the total. 13 journals had an average Articles>300, contributing 25%, 21 had an average Articles>200, making up 40.4% of the total. 35 had an average Articles>100, at the 67.3% of the total. Most journals concentrated on the lowest two levels. *CHINESE PHYSICS LETTERS* took the first position (680.4), which was followed by *ACTA PHYSICA SINICA* (671.4) and *HEMICAL JOURNAL OF CHINESE UNIVERSITIES-CHEMICAL* (550.6) respectively.

According to the analysis above, we find that 6 journals ranked among top ten in respect of every indicator. According to Garfield [12], they are core journals in China among which *ACTA PHYSICA SINICA* and *CHINESE PHYSICS LETTERS* ranked among top ten in respect of the four indicators, in other words, they are the best journals. However, it should be realized that majority of their articles originated from China. For example, in 2005, all the articles in *ACTA PHYSICA SINICA* reflected Chinese researchers’ participation, more than 95% of which were purely written by Chinese researchers. In the same year, 96% of the articles in *CHINESE PHYSICS LETTERS* were based on Chinese researchers’ participation, about 90% of which were purely written by Chinese researchers. This indicates that on one hand, the two journals have provided a significant platform to announce domestic scholarly production, but on the other hand, it should be recognized that as international journals, they have fallen short of integrating foreign research of note. Incorporating non-Chinese research as well as Chinese research should be highlighted as a goal and a guide for direction. *CELL RESEARCH*, with only 50% of its studies based on Chinese research, performed best in relation to 5-year average JIF and 5-year average Immediacy Index. The origin of the articles *CELL RESEARCH* are reasonably distributed around the world, and it has been recognized to be high in article quality.

**4. Visibility analysis on subject category**

We go a further step to classify the 52 journals into their very subjects, using the four indicators again to analyze from a different perspective.

**Average Total Cites**
40 subjects to which the 52 journals belonged were continuously involved in JCR Science Edition for five years. Mostly, those subjects were low in average Total Cites, gathering on the level of below 1000, which might be attributed to low article quality. The subjects of CHEMISTRY, MULTIDISCIPLINARY (7963.2), PHYSICS, MULTIDISCIPLINARY (6385.8) were relatively noticeable. MULTIDISCIPLINARY SCIENCES (3019.2) was the last subject with an average Total Cites>3000, showing that Chinese journals of quality will be internationally recognized.

Average Impact Factor

Generally, the subjects involved stayed at a low level in terms of median IF. 28 subjects had a median IF>1, most of the rest of the subjects had a median IF<0.5, among which the median IF of some subjects such as mathematics were extremely low, indicating that such subjects are weak disciplines in Chinese journals. There were 2 subjects with a median IF>2, which were GEO SCIENCES, MULTIDISCIPLINARY (2.4396) and MATTERS SCIENCE, MULTIDISCIPLINARY (2.703). 4 subjects had a median IF>4, which were CHEMISTRY, MULTIDISCIPLINARY (4.7316) and PHYSICS, MULTIDISCIPLINARY (4.1534), reflecting that China had strong competitiveness on those subjects in both aspects of quantity and quality.

Average Immediacy Index

According to a collection of average Immediacy Index, 19 subjects had an average Immediacy Index<0.1, accounting for half of all the subjects. These subjects are still weak in research, and lack attention. 8 had an average Immediacy Index>0.2, representing 20% of the total. PHYSICS, MULTIDISCIPLINARY (0.8362) and CHEMISTRY, MULTIDISCIPLINARY (0.578) were on the top of the rankings, playing a leading role in their own fields. In addition, the average Immediacy Index of PHYSICS, MULTIDISCIPLINARY was above the average across the fields in accord with the 2005 JCR Science Edition.

Average Articles

Subjects distributed evenly to different levels of Articles. 9 had an average Articles<100, 6 had an average Articles between 100 and 200, 11 had an average Articles between 200 and 300, 8 had an average Articles between 300 and 500, 6 had an average Articles>500. CHEMISTRY, MULTIDISCIPLINARY (2144.4) and PHYSICS, MULTIDISCIPLINARY (182.8) ranked first and second respectively, both of which also had outstanding performance on other indicators, confirming that they dominate the other subjects in China.

There were 4 subjects with number of cited journals above 5 in 2001, 3 subjects in 2002, 5 in both 2003 and 2004, 6 in 2005, displaying a positive trend.

CHEMISTRY, MULTIDISCIPLINARY was highest in the parameter, 7 in 2001 and 2002, and 8 during the other three years. In addition, its average Journal Cites ascended from 844.29 in 2001 to 1216.25 in 2005, with average Journal Immediacy Index dropping from 0.09 to 0.04, average JIF amounting from 0.58 to 0.68, and average Journal Articles increasing from 269.43 up to 282.25. It is noteworthy that average Journal Articles of CHEMISTRY, MULTIDISCIPLINARY increased by 100% with limited increment in average Journal Articles, witnessing a great enhancement in journal quality as well as greater visibility of its field. Despite much progress, obvious decrease in average Journal Immediacy Index reminds us to speed up to convert research results into productivity.

MATERIALS SCIENCE, MULTIDISCIPLINARY and METALLURGY & METALLURGICAL ENGINEERING both had more than five journals indexed each year from 2001 to 2005. Average Journal Cites of MATERIALS SCIENCE, MULTIDISCIPLINARY amounted from 104.85 in 2001 to 350.88 in 2005, together with average JIF increasing from 0.22 to 0.48, average Journal Immediacy Index increasing from 0.03 to 0.11, and average Journal Articles increasing from 99 up to 183.45. Average Journal Articles of METALLURGY & METALLURGICAL ENGINEERING increased from 132.50 in 2001 to 395.25 in 2005, together with average JIF increasing from 0.22 to 0.29, average Journal Immediacy Index remaining constant, and average Journal Articles increasing from 99 to 183.45. MATERIALS SCIENCE, MULTIDISCIPLINARY augmented evidently in the first three parameters. Although average Journal Articles increased by nearly 100%, its increase lagged far behind that of the other indicators, indicating that the article quality had improved dramatically. The indicators of METALLURGY & METALLURGICAL ENGINEERING didn’t achieve much augmentation except average Journal Cites and average Journal Articles, and made limited progress in journal quality in comparison with MATERIALS SCIENCE, MULTIDISCIPLINARY. Overall, the three subjects had great an advantage over the others and are definitely of international competitiveness.

5. Distribution in JCR Social Science Edition

From 2001 to 2005, the number of Chinese journals indexed in JCR Social Science Edition stayed constant at 3; CHINESE SOC ANTHROP, CHINESE EDUC SOC and CHINESE LAW GOV, covering 5 subjects including ANTHROPOLOGY, EDUCATION & Educational Research, Law, Political Science and Sociology. Indicators changed slightly. Although small in quantity, the 3 journals’ high quality was beyond dispute. In terms of 5-year average JIF, these journals were at the bottom of rankings around the world.

In general, it is urgent for Chinese social science
journals to keep up with the international pace by increasing the number of indexed journals and covered subjects, and to continue moving forward in international rankings.

6. Conclusions

Quantity vs. quality

During the five-year period between 2001 and 2005, Chinese journals indexed in JCR Science Edition had increased from 57 to 75 in terms of quantity, and improved from 13th to 10th in terms of ranking. Despite these improvements, there remain some problems.

These findings strongly suggest that although China has seen a spectacular leap forward in the number of journals and articles written, the increase in actual quality of these journals and articles has lagged behind. Chinese journals must also strive to be more inclusive of international research conducted by other nationalities. Between China and other developed countries, a gap still exists.

Subjects increasing, ranking to be improved

Each year there were new subjects going into the coverage of JCR Science Edition in China, with number of covered subjects increasing from 42 to 52 during five years. However, few journals which belonged to these subjects were able to stand at the first half of rankings; journals which are classified to some internationally outstanding subjects such as CHEMISTRY, MULTIDISCIPLINARY had a 5-year average JIF at a medium level or even lower. The same issues are disturbing Chinese journals in JCR Social Science Edition, appearing to be more serious.

Great progress achieved

Each year there were new journals going into the coverage of JCR Science Edition in China, with number of indexed journals increasing from 57 to 75, among which 52 had been indexed for five years evidencing the enhancement of quality of Chinese journals.

According to JCR Social Science Edition, the number of Chinese journals and corresponding subjects almost stood at the same low level, so did the four indicators, reflecting urgent need for improving international competitiveness of Chinese social science journals and modifying guideline and strategy of operating them.

In general, the analysis based on JCR Science Edition shows us that for China the number of both journals and subjects in JCR kept increasing, making up a greater portion. However, we should realize that is still limited with regard to visibility and international recognition of Chinese journals which emphasize on quantity rather than quality, whose augmentation of most indicators were dragged by that of Articles, inevitably resulting in a poor comprehensive strength. When confronting fierce competition from neighboring countries like Japan and Korea, and competition from traditional powers such as America and Britain, Chinese journals should carefully examine how to develop, promoting a successful transformation from quantity-developing type of journals to quality-developing type of journals.

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