

International versus national oriented Brazilian scientific journals. A scientometric analysis based on SciELO and JCR-ISI databases

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SciELO (Scientific Electronic Library on Line, www.scielo.bireme.br) is a program aimed at offering a core of Brazilian Scientific Journals in an open access mode at internet. This initiative has been followed by other Latin American, Caribbean and Iberian countries. Along with the development of the open accessed electronic library, a complementary scientometric/bibliometric database has been set up which permit to retrieve citation data of more than 40,000 articles. The robustness that this database has now achieved allows one to make important studies which were not possible before, using only the international Institute for Scientific Information (ISI) database.

Introduction

For over two decades the appropriateness of using the ISI (Institute of Scientific Information, ISI Thomson) database indicators for scientific studies in developing countries has received criticism from several scholars of different sectors in developing countries. In Latin America this issue has long been discussed,^{1,2} the main line of reasoning being that actors in the scientific scenery of these countries should avoid to make “wild” science analysis that copy procedures of the developed countries without doing the socio-economic and institutional pertinent fittings. Eugene Garfield has replied to these arguments saying that real and fictional failures of citation analysis have

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been philosophically raised by some investigators of developing countries without specifying concretely which the errors are.² He has advanced the need for the creation of a science citation index, the scope of which would be to cover Latin America or developing countries in general.

In 1997 the SciELO (Scientific Electronic Library Online) program was launched in Brazil by BIREME (Latin American and Caribbean Center on Health Science Information, PAHO and WHO) and FAPESP (Sao Paulo State Foundation for Support to Science). The three main objectives of the program were:

(i) to publish Brazilian Journals on line following the open access mode, according to which full-text articles could be freely accessed.^{3,4} This would bring a wider national and international visibility to these journals. Interestingly, a desire of some scientists of the developed countries along this line had already been put forward.⁵ This aim has been successfully achieved with 144 journals and 50,000 articles in November 2005 (www.scielo.br). The enterprise has spread over other Latin American and Iberian countries (www.scielo.org). In fact, SciELO is the first example ever of an open access initiative, introduced before the Budapest, Berlin and Bethesda declarations, and presently, one of the largest ones.⁶ The international visibility of SciELO-indexed Brazilian Journal has in fact increased as witnessed by the IF-JCR (Impact Factor – Journal Citation Reports) of some SciELO-Brazilian journals in a study recently published.⁷

(ii) to improve the quality of the Brazilian journals in respect to several attributes, like relevance of the articles, rigor in the methodology and carefulness in presentation. The incentive is provided by SciELO indexation, a Brazilian version of ISI indexation for international journals.⁴ The virtuous cycle of doing good science has in many aspects been accomplished in Brazil and in some other developing countries. However, a notorious gap is typically noticed in the making of good scientific journals, a failure that is explained by several factors not to be discussed here. Incentives as the ones afforded by SciELO have been playing a significant role in this respect.

(iii) finally, but not less important, to create a bibliometric/scientometric database, affording indicators similar to those provided by ISI for scientific and technological studies, not possible to be made using the international databases only.

The last topic is the subject of the present work; the database has been created and today has achieved a considerable robustness, with over one million citations registered. This allows studies on important issues, as the one described here, which refers to which public are the SciELO journals directed at.

The knowledge of the audience targeted is important for editors but also for the decision makers in the Brazilian scientific policy arena. With the increasing popularity of ISI citation records its use has been adopted by different panels involved in academic evaluation. For instance, the three main research funding institutions in Brazil have used very extensively JCR-IF of applicant's publications in order to make their decisions as

who to be awarded with grants. Part of the Brazilian scientific community argues that alternative complementary national indicators must be taken into account to reviewing the process of grant awarding. Hopefully, scientometric analysis using national reference indicators will help to bring some light to this discussion.

This article deals with the importance of SciELO bibliographic database in respect to this issue. Of the 144 Brazilian SciELO journals, 19 are currently indexed also by JCR. In the present work, 13 out of the 19 SciELO-JCR indexed journals have been chosen and scientometric indicators have been compared using SciELO and JCR databases in respect to each of the journals. The main purpose was to find whether there are different patterns of JCR and SciELO citations depending on the area of the journal. That means to perceive through the citations whether in certain areas a “national conversation” among the scientists existed and could be more relevant than an “international conversation”. In fact we found out that the journals could be divided into two clusters and that in one of them the Brazilian audience was equally or more important than the international audience.

Data sources, processing and results

Different citation patterns of SciELO journals in terms of international and national citations

From the 19 SciELO-JCR journals, 5 have been dropped in this study due to the low number of citations attained in both databases, which would render manipulation of data meaningless. These journals were *Bulletin of the Brazilian Journal of Mathematic Society*, *Brazilian Archives of Biology and Technology*, *Brazilian Journal of Microbiology*, *Ecletica Quimica* and *Dados*. A sixth journal, *Revista Brasileira de Zootecnia*, was not included because the 2003 JCR version clearly presents the number of articles incorrect (61 instead of 240).

The results of 2003 citations to all years published articles were used because they are available in both databases. Impact factors are also available but a first examination showed that for some of the journals their values were too small to carry out a significant study, which the indicator of 2003 citation rendered possible for the purposes of this work. The fact that different journals cover a different period of time in the years before 2003 is of no concern since the point is to establish citing and cited ratios of SciELO database to JCR database.

In Table 1 and 2 results of SciELO-JCR cited and citing values of the journals are respectively shown. Journal cited means citations given to this specific journal by journals of a specified database. Journal citing means citations that this journal gives to journals of a specified database.

Table 1. Cited figures in 2003 obtained in SciELO and JCR databases

SciELO-JCR Journal	1-SciELO	2-JCR	3-JCR/non SciELO	4-ratio 1/3
<i>Pesquisa Agropecuária Brasileira</i> (Brazilian Agriculture and Animal Science Research)	733 (30)	205	237	3.093
<i>Arquivo Brasileiro de Medicina Veterinária e Zootecnia</i> (Brazilian Journal of Veterinary and Animal Sciences)	133 (16)	123	25	5.320
<i>Pesquisa Veterinária Brasileira</i> (Brazilian Journal of Veterinary Research)	55 (7)	98	52	1.058
<i>Memórias do Instituto Oswaldo Cruz</i> (Archives of the Oswaldo Cruz Institute)	859 (37)	1805	1288	0.667
<i>Revista de Saúde Pública</i> (Journal of Public Health)	581 (43)	355	121	4.802
<i>Brazilian Journal of Medical and Biological Research</i>	254 (47)	1830	1576	0.161
<i>Journal of the Brazilian Chemical Society</i>	106 (7)	523	430	0.247
<i>Anais da Academia Brasileira de Ciências</i> (Annals of the Brazilian Academy of Sciences)	101 (24)	396	347	0.291
<i>Arquivos de Neuropsiquiatria</i> (Archives of Neuropsychiatry)	224 (19)	575	393	0.570
<i>Química Nova</i> (New Chemistry)	316 (23)	636	350	0.930
<i>Brazilian Journal of Physics</i>	25 (1)	298	273	0.092
<i>Brazilian Journal of Chemical Engineering</i>	10 (3)	100	91	0.110
<i>Genetics and Molecular Biology</i>	67 (18)	214	167	0.401

Cited numbers were extracted from SciELO (entries 1 and 3) and JCR-Scientific and Social Sciences Editions-2003 databases (entries 2 and 3). In parentheses: number of journals citing. English titles of journals in parentheses are free translations of the Portuguese original.

In Table 1, that of SciELO-JCR journal cited, the first column corresponds to all 2003 citations given by the SciELO journals to each of the 13 SciELO-JCR journals published in all years (obtained from SciELO database); numbers in the second column correspond to 2003 citations given by the JCR journals to each of the 13 SciELO-JCR journals published in all years (JCR database); numbers in column 3 were obtained by subtracting the number of 2003 citations of SciELO journals (column 1) from the 2003 citations by JCR journals (column 2); therefore it corresponds to JCR citations to SciELO-JCR journals, excluding the citations that are common to both databases. In other words, indicator of column 3 can be envisaged as citations by international journals. As a consequence, the ratio shown in column 4 (value in column 1 /value in column 3) provides the magnitude of SciELO journal citations to that of JCR journal citations only (not including SciELO citations) for each of the 13 SciELO journals considered. It seems clear that the larger this ratio the higher is the visibility of each journal to SciELO journals (Brazilian visibility) as compared to JCR journals (international visibility). Therefore, the numbers of column 4 give an idea of how the Brazilian audience to each of the journals is as compared to the international audience.

Table 2. Citing figures in 2003 obtained in SciELO database

SciELO-JCR Journal	1-SciELO	2-JCR	3-JCR/non SciELO	4-ratio 1/3
<i>Pesquisa Agropecuária Brasileira</i> (Brazilian Agriculture and Animal Science Research)	420 (23)	1696 (328)	1487 (325)	0.282
<i>Arquivo Brasileiro de Medicina Veterinária e Zootecnia</i> (Brazilian Journal of Veterinary and Animal Sciences)	140 (19)	1347 (370)	1240 (363)	0.113
<i>Pesquisa Veterinária Brasileira</i> (Brazilian Journal of Veterinary Research)	65 (10)	420 (133)	261 (129)	0.249
<i>Memórias do Instituto Oswaldo Cruz</i> (Archives of the Oswaldo Cruz Institute)	805 (33)	3782 (581)	3196 (570)	0.252
<i>Revista de Saúde Pública</i> (Journal of Public Health)	238 (26)	985 (381)	859 (375)	0.277
<i>Brazilian Journal of Medical and Biological Research</i>	170 (26)	5419 (1069)	5290 (1058)	0.032
<i>Journal of the Brazilian Chemical Society</i>	124 (12)	3516 (456)	3954 (430)	0.037
<i>Anais da Academia Brasileira de Ciências</i> (Annals of the Brazilian Academy of Sciences)	68 (16)	694 (241)	640 (187)	0.106
<i>Arquivos de Neuropsiquiatria</i> (Archives of Neuropsychiatry)	228 (13)	3119 (501)	2932 (497)	0.078
<i>Química Nova</i> (New Chemistry)	277 (20)	4450 (697)	4182 (686)	0.066
<i>Brazilian Journal of Physics</i>	25 (1)	2093 (43)	2068 (42)	0.012
<i>Brazilian Journal of Chemical Engineering</i>	14 (4)	485 (186)	473 (183)	0.030
<i>Genetics and Molecular Biology</i>	114 (18)	1864 (367)	1793 (359)	0.064

Citing numbers were obtained from SciELO database only, where SciELO and JCR journal names in citing lists are available. In parentheses: number of journals citing. English titles of journals in parentheses are free translations of the Portuguese original.

Table 2 shows SciELO journals citing other journals. The columns are organized in the same way as in Table 1, except that the numbers correspond to citations given, instead of received, by the 13 SciELO-JCR journals. In this case all data were obtained from SciELO database only. In the SciELO database it is possible to sort citing data into four groups: SciELO, SciELO-JCR, JCR and Brazilian-non SciELO (www.scielo.br). In this case, column 4 gives an estimation of how each of the 13 SciELO-JCR journals mirrors itself in the context of the Brazilian scientific literature as compared to the international one.

A clear territory is delimited between the journals that were significantly more cited by SciELO journals and those more cited by international (JCR) journals. The same statement applies to SciELO journal citing other journals. In both cases this is observed by comparing column 4 of the 13 journals in the cited and citing Tables 1 and 2, respectively. For both cases, the larger the value of column 4 the higher is the national (Brazilian) impact as compared to the international one. In fact, there is a close

connection between the order occupied in a sorting decreasing list of cited and citing values of columns 4 as shown in the diagram of Figure 1. In other words, there is a clear insertion of each of the 13 journals into clusters that either encompasses journals more oriented to national or to international science, as shown both by the cited and citing patterns.

Another aspect to be commented on the ratio SciELO /JCR-non SciELO values (column 4) is that the numbers are higher for cited than for citing. For instance, in the case of *Arquivo Brasileiro de Medicina Veterinária e Zootecnia* the value for SciELO journals cited is approximately 5 times higher in SciELO database than in JCR database whereas for SciELO journals citing the corresponding value is nearly 8.9 times lower.

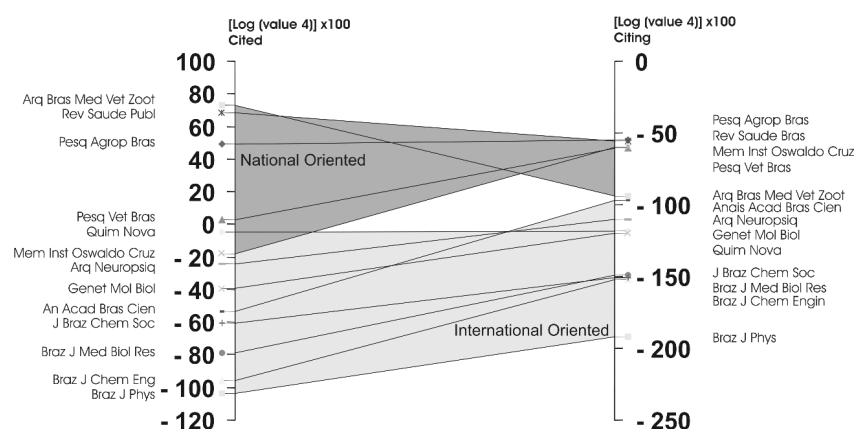


Figure 1. The diagram shows the links between cited and citing ratios, SciELO-JCR /non SciELO-JCR (values in column 4), for cited (left, Table 1) and citing (right, Table2) registers. Logarithm of the ratios permitted a better visualization of the two clusters than the ratios themselves. National oriented cluster is depicted in dark gray and International oriented cluster in light gray.

Indeed, this is expected given the much higher editorial space (number of articles) for an area or sub-area in JCR database as compared to SciELO database. This is a difference that tends to diminish as more journals are added and previous issues are retrieved to SciELO database (an ongoing operation).

Clearly, if the 13 journals are grouped in ranges of SciELO/JCR-non SciELO values in the way depicted in the diagram of Figure 1 the resulting clusters have a very important meaning in terms of scientific communication in distinct areas or sub-areas. This point will be retaken in the discussion.

The size of SciELO database: SciELO journals as compared to all Brazilian journals

There are more than one thousand scientific journals in Brazil, most of them parochial and centered in small colleges, faculties and societies, spread all over the country. The journals that submit an application to be indexed in SciELO have to go through a process that involves technical assessment and *ad hoc* reviewer's examination. This operation is a key component of the SciELO methodology and aims to gathering into the SciELO collection the core of the best journals in each country that have adopted the SciELO Program.

Results showing that this aim is being achieved are presented in what follows. The SciELO/Brazil journals have cited about five hundred Brazilian journals in 2003 (data not shown), four times the number of SciELO journals. Each of the 13 SciELO-JCR journals studied in the present report cited in average 17 other SciELO journals and 26 Brazilian-non SciELO journals in 2003, the corresponding average number of citations being 233 and 55, respectively. Therefore the number of citations to SciELO journals surpasses that of non SciELO journals by four times, achieving 80% of the total of citations. Thus, although comprising a minority of the Brazilian scientific journals, the SciELO journals constitute a core of cited journals in the country. As an illustration, examining the list of the three more cited SciELO journals by each of the 13 journals studied in this report the journal *Memórias do Instituto Oswaldo Cruz* appears in five of them (see SciELO URL).

Also interesting is to notice that the journals of major national visibility (top five of Figure 1) cites significantly more non SciELO Brazilian journals than the ones with lower national visibility (bottom seven of Figure 1): an average of 85 citations per journal and 41 non SciELO journal titles versus 30 citations and 23 journal titles, respectively (data not shown). Again, this seems to indicate a greater concern of these journals to national topics as opposed to the ones more internationally oriented.

Discussion

Internet has made it possible to turn information into a much more accessible commodity, bringing about a reduction in the distance between developed and developing countries' capacities to share it out across the world. SciELO database structure has been conceived to achieve two main requirements. One oriented to the international audience, enabling it to access readily, and in an open access mode, Brazilian journals that publish articles on topics that are inserted in the frame of international interest. This implies to render results more visible to this community, meeting the interest that had already been put forward.⁵ The second is to provide the national community of scientists with a wider audience in areas further oriented to

national issues, in relation to which the international community has in general a marginal interest (the concept of marginal interest should be considered with caution as will be better qualified below). Concerning the first requirement previous investigation⁷ has shown that international visibility of SciELO-indexed Brazilian journal has in fact increased as witnessed by the IF-JCR (Impact Factor – Journal of Citation Reports) of some SciELO-Brazilian journals. An updated and expanded study in this same direction has confirmed this fact and its results will be published elsewhere (R. Meneghini and A. L. Packer, unpublished).

The main conclusion to be driven from the present study is that there are two main clusters of SciELO-JCR journals: the first one is represented by the journals that we called national oriented, characterized by a pattern of citations, received and given, that is more connected to national journals (top journals in diagram of Figure 1, dark gray area). In the other cluster, the international oriented one, received and given citations are prevalently related to international journals (bottom journals in Figure 1, light gray area).

Four points referred to this conclusion seem to be appropriate to call the attention upon:

Firstly, even that a small sample has been examined, imposed by the low number of SciELO journals that are indexed in JCR database, it seems clear that the different trends of citation pattern is due to the areas of investigation covered by the journals. Thus, from the five national oriented journals in Figure 1 three belong to the area of agriculture and animal sciences and two to the area of public health and tropical medicine. It is not difficult to rationalize this fitting since these are areas that tend to deal with subjects of prevalent national interest. However, although the existence of the two clusters is clear, the limit between them is somewhat arbitrary. Thus, the journal *Memorias do Instituto Oswaldo Cruz*, one of the most well known Brazilian scientific journal, was included in the national oriented cluster; it covers both applied subjects of tropical diseases and reports on basic investigation on parasitology. Not surprisingly it presents very expressive figures of citations received from JCR journals (Table 1). The journal *Quimica Nova* lies on a limit between the two clusters and was not assigned to either one. It sets a blank area between the two clusters.

Secondly, these results help to bring light to the discussion of why to publish in national journals. Not rarely, scientists who choose this way are accused of trying to avoid the barriers and difficulties of publishing in more prestigious international journals. Although this may be the case when the article contemplates subjects of broad international interest (light gray area in Figure 1), this is clearly an allegation that should not be generalized. It is patent that for some areas the main scientific audience targeted is the national one. Therefore the SciELO citation database allows to endorse that publications in national journal of some areas do not fall into the void as sometimes has been presumed. On the contrary, a vivid conversation is possible to be established, as witnessed by citations.

It is possible that similar conclusions would be attained for other countries, if scientometric databases like SciELO/Brazil were available. Other bibliometric SciELO database are now being built up in Chile, Cuba and Venezuela and may soon be suitable for a similar analysis.

Thirdly, SciELO database has indexed a core of Brazilian scientific journals. They represent about 20% of Brazilian journals and receive 80% of the national citations. Undoubtedly, these 144 journals represent a collection of the best in Brazil in their areas and it is likely that a significant fraction of them pertains to the top part of Figure 1, that is, of journals more targeted to national audience. However, this should not prevent their editors of seeking indexation in international databases, like JCR/ISI. In fact, it has been reported that, not rarely, scientists of developed countries are interested in scientific topics that at a first sight would be only concerned to developing countries.⁵ Although SciELO is becoming increasingly known worldwide, international databases are important routes to achieve freely accessible full texts of SciELO through links.

It seems also appropriate to warn international database managers, responsible for indexation of journals, that a strict adhesion to subjects considered to belong to the main stream literature circle of interest may lead to the loss of information that might be useful to establish connections between topics of interest of scientists in developing and developed countries. Recently, Brazilian scientists cracked the genome sequencing of a phytopathogenic bacteria that causes a disease in orange in Brazil. Scientists of the United States, becoming aware of that, asked for a collaboration of Brazilian scientist to crack the genome sequencing of a similar bacteria that causes a widespread disease in grape plants in California.⁸ Facts like this show that a clear limit between interests of scientists of developed and developing countries may be illusory.

Finally, and very important, the results of this work should be taken into consideration by funding agencies in Brazil which in recent years have used ISI indicators to assess scientific projects and scientist performance, regardless the area they pertained to. Very clearly, in some areas a legitimate interest of achieving a national audience exists and profitable exchange of information is established as demonstrated by citations that are not captured by international databases.

References

1. L. VELHO, Indicadores Brasileiros. *Intersciencia*, 15 (1990) 139–144.
2. E. SPINAK, Los análisis cuantitativos de la literatura científica y su validez para juzgar la producción latinoamericana. *Bol. Oficina Sanit. Panam.*, 120 (1996) 139–147.
3. A. L. PACKER, M. R. BIOJONE, I. ANTONIO, R. M. TAKENAKA, A. P. GARCIA, A. C. DA SILVA, R. T. MURASAKI, C. MILEKY, O. C. REIS, H. C. R. F. DELBUCIO, *Cienc. Infor.*, 27 (1998) 109–121.
4. R. MENEGHINI, Scielo (scientific electronic library on line) project and the visibility of “peripheral” scientific literature, *Quimica Nova*, 26 (2003) 156.
5. W. W. GIBBS, Lost science in the Third World, *Scientific American*, August (1995) 92–99.

6. P. F. UHLIR, *Issues in Providing Open Availability to Public Scientific Information Resources in Developing Countries*, 2005, InterAcademy Panel on International Issues, <http://www4.nationalacademies.org/iap/iaphome.nsf>
7. W. J. ALONSO, E. FERNANDEZ-JURICIC, Regional network raises profile of local journals. *Nature*, 415 (2002) 471–472.
8. E. L. CIVEROLO, M. VAN SLUYS, M. C. OLIVEIRA, J. P. KITAJIMA, Genome sequence of a strain of *Xyllela fastidiosa* associated with Pierce's disease in California. *Proceedings of Pierce's Disease Research Symposium*, (2001) 27–28, <http://134.186.235.120/phps/pdcp/docs/Proceedings1126a.pdf>.