

Structure of the Impact Factor of Journals Included in the *Social Sciences Citation Index*: Citations From Documents Labeled “Editorial Material”

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We investigated how citations from documents labeled by the Institute for Scientific Information (ISI) as “editorial material” contribute to the impact factor of academic journals in which they were published. Our analysis is based on records corresponding to the documents classified by the ISI as editorial material published in journals covered by the *Social Sciences Citation Index* between 1999 and 2003 (50,273 records corresponding to editorial material published in 2,374 journals). The results appear to rule out widespread manipulation of the impact factor by academic journals publishing large amounts of editorial material with many citations to the journal itself as a strategy to increase the impact factor.

Introduction and Goals

The impact factor, developed by Eugene Garfield, is a fundamental citation-based measure of the significance and performance of scientific journals. It is perhaps the most popular bibliometric product currently in use. Millions of euros are allocated on the basis of this scientometric indicator, because research grants and academic promotion are often related to the impact factor of journals in which scientists publish their papers.

The impact factor was created in the Institute for Scientific Information (ISI). A journal’s impact factor is based on two elements: the numerator, which is the number of citations in the current year to any item published in a journal in the previous two years, and the denominator, which is the number of substantive articles (source items) published in the same two years (Garfield, 1999, p. 979). For example, the 2003 impact factor of a given journal is

computed as follows (Glanzel & Moed, 2002; Moed & Van Leeuwen, 1995):

$$\text{IF (2003)} = \frac{\text{Citations in 2003 to documents published in 2002 and 2001}}{\text{Citable items published in 2002 and 2001}}$$

Research papers and reports are counted as citable items, but editorials and letters to the editors are usually not. It has been noted that such “uncitables” have some effect on the impact factor, and, as a consequence, the impact factor ranking of a considerable number of journals, including some of the most prestigious ones, may be inflated by 30–40% (Glanzel & Moed, 2002; Moed & Van Leeuwen, 1995).

The impact factor was initially used as an internal indicator at the ISI. In 1975, the ISI began to publish the *Journal Citation Reports* (JCR) as a part of the *Science Citation Index* (SCI) and the *Social Sciences Citation Index* (SSCI). The impact factor was intended to normalize the number of citations received by a given journal by referring them to the number of papers published in that journal (Garfield, 2003). This approach took into account the size of the journal and was meant to counterbalance the tendency for journals that published the largest numbers of articles (and therefore receive the most citations) to predominate the ranking.

In recent years, the impact factor has become a fundamental indicator used to measure the international scope and diffusion of academic journals. This indicator determines the relative position of a given journal in the group (area) in which the journal is included. Some editors have acknowledged that one of their goals is to raise their journal’s impact factor (Lundberg, 2003; Shugan, 2002).

Much research has centered on the impact factor. However, some authors have raised doubts about the validity and usefulness of this indicator (see, for example, Amin & Mabe, 2000; Bordóns, Fernández, & Gómez, 2002; Walter, Bloch, Hunt, & Fisher 2003). Other authors have suggested alternatives to the impact factor (Coelho, Antunes, Costa, Kroon, Lima, & Linardi, 2003; Fassoulaki, Papilas, Paraskeva, & Patris, 2002; Sombatsompop, Markpin, & Premkamolnetr,

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2004) or have analyzed the impact of impact factor rewards in scientific productivity (Jiménez-Contreras, López-Cózar, Ruiz-Pérez, & Fernández, 2002).

Some critics argue that editors of academic journals can manipulate the impact factor. We have found reports in which possible manipulation of the impact factor was described in detail. The manipulations consisted of strategies intended to increase the numerator or decrease the denominator of the equation (or to do both) used to compute the impact factor. For example, according to Van Diest, Holzel, Burnett, and Crocker (1999) and Whitehouse (2001), the editor can use some of the following tactics:

- accepting preferential papers that cite articles published in the journal within the two previous years (increasing the numerator);
- disguising research articles as letters or short reports, which are not included in the denominator of the impact factor formula (decreasing the denominator); and
- publishing letters or editorials that cite items published in the journal during the two previous years. These letters and editorials are not taken into account in the denominator, although self-citations included in them increase the numerator.

Other authors have voiced different kinds of possible manipulation. For example, the editor can “suggest” to prospective authors that they cite articles published recently in the journal (Hemmingson, Edgren, Mygind, & Skjennald, 2002; Lemasters, 2003; Massie, 2002; Sevinc, 2004; Smith, 1997; Trayhurn, 2002; Whitehouse, 2001).

We were surprised to learn that, although the impact factor influences research and academic promotion (as noted above), it seems there have been no systematic attempts to study its structure. It should be recalled that the numerator of the impact factor formula is the sum of all citations and that this number can be obtained according to different criteria. For example, for a total number of 30 citations received by a given journal, this number may be considered the sum of citations in articles by a single author plus citations in articles with more than one author. In this article, we explore the possible influence of various sets of criteria for calculating the numerator.

In previous studies, we examined the structure of the impact factor from different viewpoints. One analysis centered on the relationship between the publication of papers in journals by their editorial board members and referees and the impact factors of these journals (Campanario, 1996). We found a positive relationship between impact factor and the publication of papers by editorial board members and referees in Educational Psychology journals. In a more recent study, we determined what percentage of the citations that contributed to the impact factor appeared in articles authored by editorial board members (Campanario, González, & Rodríguez, 2006). We analyzed the structure of the impact factors of 54 journals over three years, and we found that the percentage of citations from papers authored by editorial board members ranged from 0% to 61%.

Here, we present a new approach to the study of the structure of impact factors. We set out to ascertain the effect of journal self-citations included in documents labeled by the ISI as “editorial material.” Because of their privileged position, editors of academic journals can influence which research topics, methods, and approaches are published. Given that publication is a key ingredient of academic success, the role of editors as gatekeepers is a strategic area of research that can help us to understand the dynamics of science (Campanario, 1998a; Campanario, 1998b). The ultimate decision regarding what gets published in a journal is generally the responsibility of the editor-in-chief.

Most scientists believe that editors behave as effective gatekeepers; that is, editors are obliged to act without bias and to identify only those papers that make potentially useful contributions to the science. This makes it interesting to analyze the contribution to the impact factor of citations from editorial material, given that these documents are usually not peer reviewed. Our study thus contributes to previous research concerning the impact factor by suggesting a potentially fruitful new avenue of citation analysis. We examined a large set of documents labeled editorial material to search for artificially high numbers of citations contributing to the impact factor.

Method

The aim of this study is to determine how editorial material or editorials as citing documents contributed to the impact factor of academic journals. The first step was to download the documents labeled by the ISI as editorial material published in journals included in the *Social Sciences Citation Index* in the years 1999 to 2003. This was accomplished with the Web of Science (WOS) Web interface available for Spanish universities. Next, for each record we obtained the number of journal self-citations. Journal self-citations are citations to documents that were published in the same journal in which the citing document appeared.

In addition, for each record (citing document), we obtained the number of journal self-citations that contributed to the impact factor. For example, if a given document labeled editorial material was published in 2003 in journal X, we obtained the total number of citations to documents published in X in 2002 and 2001 from the field “cited references” (see Appendix). The same method was used for all the downloaded records. We note that the total number of journal self-citations contributing to the impact factor can differ from the number of journal self-citations; as the former are referred to the preceding two years (impact factor), whereas journal self-citations can refer to articles published (for example) five or ten years previously. These journal self-citations, obviously, do not contribute to the impact factor. In the present analysis, all citations contributing to the impact factor were journal self-citations. We only consider standard citations.

The downloads from WOS were saved to files with tabs to separate fields so that Microsoft Excel software could be used for the computations. The numbers of journal

self-citations that contributed to the impact factor were extracted with Excel's text functions. This produced a general file from which we obtained the following parameters for each downloaded record (representing a given document labeled editorial material):

- number of citations in each document (this number is also included in another field in the downloaded file)
- number of citations in each document that are journal self-citations
- number of citations in each document that contribute to the impact factor
- percentage of journal self-citations over the total number of citations
- percentage of journal self-citations that contribute to the impact factor (over the total number of citations and the total number of journal self-citations)

Results

Documents and Journals Studied

We downloaded 50,273 records, corresponding to documents labeled editorial material, that were published in 2,374 different journals. We note that the distribution of records across different journals was not homogeneous. For example, a given journal might enter the ISI database in 2002 and, consequently, no data were available for previous years. Other journals included in the ISI database for all the years studied here might not have published any documents labeled editorial material. If any editorial material was published, these documents might not have included citations that contributed to the impact factor.

The average number of citations per document classified as editorial material was 6.93. The average number of journal self-citations per document was 0.54, while the average number of journal self-citations that contributed to impact factor was 0.16.

For 1,322 journals, there were no documents labeled editorial material that included journal self-citations contributing to the impact factor. We constructed a new working file that included only records that had at least one journal self-citation contributing to the impact factor. This new file included 4,295 records corresponding to 1,052 journals (44.3% of the initial set of journals). Any records lacking journal self-citations that contributed to the impact factor were excluded from our working file and were not taken into account in the computations described below.

Documents That Made the Greatest Absolute Contributions to the Impact Factor

Figure 1 shows the distribution of records according to the number of journal self-citations that contributed to the impact factor of the journal that published them. Most of the documents contained one or two such citations. We found 178 records with five or more journal self-citations that

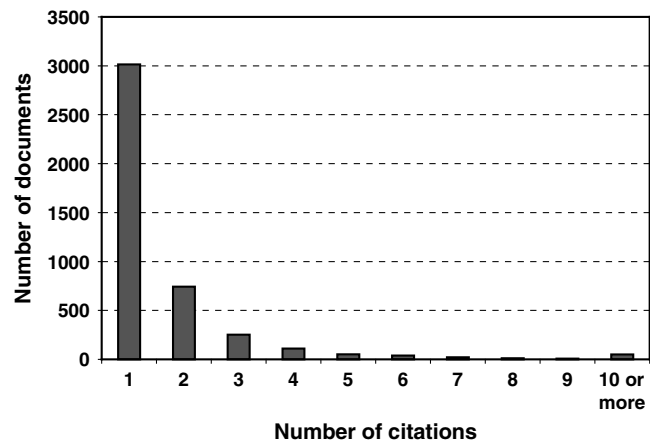


FIG. 1. Distribution of the number of documents labeled editorial material containing 1 to 10 or more journal self-citations that contributed to the impact factor.

contributed to impact factor, and these 178 documents represented 4.1% of all records in the file.

Table 1 shows the bibliographic data for the 25 documents containing more than 20 journal self-citations that contributed to the impact factor. These documents were published in nine different journals. As can be seen, the journal, *Journals Of Gerontology Series A: Biological Sciences And Medical Science*, published thirteen documents in two different years that contributed a significant number of citations to its own impact factor. Judging from the titles of these items, it seems that the documents deal with the journal's own status or recent developments in the discipline. The journal, *Diagnostica*, published four items that contributed a significant number of citations to the impact factor.

Documents That Made the Greatest Relative Contributions to the Impact Factor

We filtered all 4,295 records in our file to identify the documents in which the 25% or more of the citations contributed to the impact factor. This yielded 927 records published in 389 different journals. In 154 records from 100 different journals, 100% of the citations contributed to the impact factor, but 128 of these records contained only one citation, and 13 records contained two citations. Further filtering yielded three records with 56, 54, and 28 citations. These records are shown in Table 1.

Totals by Journal

The computations cited above refer to individual records. To determine the total contribution to the annual impact factor of journal self-citations published in all editorial material published in each journal, we collapsed the data by journal and year.

We obtained 402 cases of annual impact factors in which five or more journal self-citations contributed to the impact

TABLE 1. Bibliographic data for documents labeled "editorial material" that included more than 20 journal self-citations contributing to the impact factor.

Title	Journal	Year	Vol	Iss	First Page	Last Page	A	B
Hot topics in geriatrics	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2003	58	1	30	36	206	129
Drugs, aging, and the future	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	57	1	M2	M6	114	77
Something about frailty	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	57	11	M698	M704	162	72
Memories are made of this: recent advances in understanding cognitive impairments and dementia	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2003	58	4	314	321	166	64
Which journals refer to "Diagnostica"?	DIAGNOSTICA	2001	47	1	1	5	56	56
Diagnostica: constancy within change	DIAGNOSTICA	2002	48	1	1	4	54	54
The German Journal of Educational Psychology at the end of the 20th century: themes and trends	ZEITSCHRIFT FÜR PÄDAGOGISCHE PSYCHOLOGIE	2000	14	1	1	4	66	54
Is there any need for German language journals on psychological assessment, personality and individual differences?	DIAGNOSTICA	1999	45	1	1	6	56	53
Citations, impact factor, and the Journal	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	57	12	M765	M769	83	52
Topics and trends in the years 2000 and 2001	ZEITSCHRIFT FÜR PÄDAGOGISCHE PSYCHOLOGIE	2002	16	1	1	5	65	50
It's never too late: health promotion and illness prevention in older persons	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	57	6	M338	M342	80	48
A fall is a major event in the life of an older person	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	57	8	M492	M495	98	47
Anorexia and weight loss in older persons	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2003	58	2	131	137	123	41
Mobility performance: A high-tech test for geriatricians	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2003	58	8	712	714	65	36

(Continued)

TABLE 1. (Continued)

Title	Journal	Year	Vol	Iss	First Page	Last Page	A	B
Geriatricians, continuous quality improvement, and improved care for older persons	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2003	58	9	809	812	81	31
Antiangiogenic medicine: the good, the bad, and the ugly	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	57	10	M636	M639	95	29
Untitled	DIAGNOSTICA	2003	49	1	1	3	28	28
Experimental psychology: quovadis?	EXPERIMENTAL PSYCHOLOGY	2003	50	1	1	3	30	27
A remarkable legacy of science review of AHRQ-funded articles published in Medical Care during John Eisenberg's directorship of AHRQ	MEDICAL CARE	2002	40	11	1003	1011	84	26
The need for a men's health initiative	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2003	58	7	614	617	89	26
Guest editors' introduction to the special issue—Strategic Entrepreneurship: entrepreneurial strategies for wealth creation	STRATEGIC MANAGEMENT JOURNAL	2001	22	6/jul	479	491	92	25
The first six years: culture's adventures in psychology	CULTURE & PSYCHOLOGY	2001	7	1	5	48	141	23
Editorial: identification and consideration of emerging research questions	JOURNAL OF PRODUCT INNOVATION MANAGEMENT	2003	20	3	193	201	74	23
Putting the "home" back in nursing home	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	57	7	M419	M421	39	22
Ten years after, decade to come—the contributions of theory to psychology	THEORY & PSYCHOLOGY	2000	10	1	5	21	78	22

Note. A: Number of citations included in the document. B: Number of journal self-citations contributing to the impact factor.

factor. This contribution, as noted above, comprised all citations in records published for a given journal in a given year. These 402 instances corresponded to 243 different journals representing 23.1% of the set of journals included in our file. Table 2 shows the 36 cases of annual impact factors from which we identified a contribution of more than 20 journal self-citations from editorial material. These 36 different annual impact factors corresponded to 21 different journals

(2.0% of the set of journals used in our computations). There are more annual impact factors than journals, because some journals appear two or three times in the list, with each appearance corresponding to a different annual impact factor. As it can be seen, in four journals and eight annual impact factors, the percent of journal self-citations that contributed to impact factor was higher than 40% of all citations used by the ISI to compute the impact factor.

TABLE 2. Years when journals published documents labeled "editorial material" totaling more than 20 journal self-citations that contributed to the impact factor.

Journal	Year	Journal self-citations that contributed to the impact factor	Total number of citations used by the ISI to compute the impact factor	%
ADDICTION	1999	44	531	8.3
ADDICTION	2000	27	616	4.4
AMERICAN PSYCHOLOGIST	1999	61	813	7.5
AMERICAN PSYCHOLOGIST	2000	70	816	8.6
AMERICAN PSYCHOLOGIST	2001	78	970	8.0
AMERICAN PSYCHOLOGIST	2002	96	921	10.4
AMERICAN PSYCHOLOGIST	2003	32	510	6.3
BEHAVIORAL AND BRAIN SCIENCES	1999	29	327	8.9
BEHAVIORAL AND BRAIN SCIENCES	2000	24	399	6.0
BRITISH JOURNAL OF PSYCHIATRY	1999	25	1592	1.6
BRITISH JOURNAL OF PSYCHIATRY	2001	21	1421	1.5
BRITISH JOURNAL OF PSYCHIATRY	2002	22	1544	1.4
BRITISH JOURNAL OF PSYCHIATRY	2003	23	1512	1.5
CULTURE & PSYCHOLOGY	2001	23	49	46.9
CURRENT ANTHROPOLOGY	2000	29	204	14.2
DIAGNOSTICA	1999	53	79	67.1
DIAGNOSTICA	2001	56	74	75.7
DIAGNOSTICA	2002	54	80	67.5
DIAGNOSTICA	2003	28	61	45.9
ECOLOGICAL ECONOMICS	2000	37	249	14.9
EXPERIMENTAL PSYCHOLOGY	2003	27	51	52.9
INTERNATIONAL ORGANIZATION	2003	21	186	11.3
JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION	2000	23	13215	0.2
JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2001	32	651	4.9
JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2002	376	1299	28.9
JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2003	385	1573	24.5
JOURNAL OF HUMAN EVOLUTION	1999	23	272	8.5
JOURNAL OF PRODUCT INNOVATION MANAGEMENT	2003	23	86	26.7
JOURNAL OF THE OPERATIONAL RESEARCH SOCIETY	2000	24	169	14.2
MARKETING SCIENCE	2003	23	93	24.7
MEDICAL CARE	2002	34	862	3.9
PSYCHOTHERAPY AND PSYCHOSOMATICS	2002	22	255	8.6
STRATEGIC MANAGEMENT JOURNAL	2001	25	354	7.1
THEORY & PSYCHOLOGY	2000	22	107	20.6
ZEITSCHRIFT FUR PADAGOGISCHE PSYCHOLOGIE	2000	54	61	88.5
ZEITSCHRIFT FUR PADAGOGISCHE PSYCHOLOGIE	2002	50	109	45.9

Percentage of Journal Self-Citations

Because journal self-citations may or may not contribute to the impact factor depending on the year of publication of the cited reference, we computed the percentage of journal self-citations that contributed to the impact factor. To avoid artificially inflating the results, we deleted from our file of 4,295 records those journals for which the total number of citations that contributed to the annual impact factor was fewer than five. As noted above, the final number of cases after deleting these records was 402 cases corresponding to annual impact factors for 243 different journals.

For each record, we obtained the percentage of journal self-citations that contributed to the impact factor relative to the journal-self citations. Next, we obtained the mean percentage for each journal in a given year. Thus, note that for each record (representing a single citing document), we

obtained the percentage of journal self-citations that contributed to the impact factor and then computed the mean percentage for each journal.

The mean percentage of journal self-citations that contributed to the impact factor was 68.2%. Table 3 shows the instances of contributions to the annual impact factors in which the mean percentage of journal self-citations contributing to the impact factors was higher than 90%. This was the case for 61 annual impact factors corresponding to 53 different journals, which represented 5.0% of the set in the working file. Again, some journals appear two or more times in the list. We also detected 120 annual impact factors corresponding to 94 different journals (which represented 8.9% of the set) in which the mean percentage of journal self-citations contributing to the impact factors was higher than 80% (not shown in Table 3).

TABLE 3. Journals in which more than the 90% of the journal self-citations that appeared in documents labeled “editorial material” contributed to the impact factor.

Heading: Journal	1999	2000	2001	2002	2003
ACADEMY OF MANAGEMENT REVIEW					93,8
					8
AMERICAN ANTHROPOLOGIST					100,0
					5
AMERICAN JOURNAL OF ECONOMICS AND SOCIOLOGY	100,0				
	7				
AMERICAN JOURNAL OF EVALUATION	93,3			93,8	
	6			9	
ARCHIVES OF INTERNAL MEDICINE			100,0		
			7		
AUSTRALIAN JOURNAL OF PUBLIC ADMINISTRATION	100,0				
	5				
BEHAVIOR ANALYST				93,3	
				6	
BEHAVIOR THERAPY			100,0		
			5		
BEHAVIORAL AND BRAIN SCIENCES	94,2				
	29				
BRITISH JOURNAL OF SOCIAL WORK				100,0	
				6	
CONSCIOUSNESS AND COGNITION					92,3
					12
DIAGNOSTICA	98,1		100,0	100,0	100,0
	53		56	54	28
DISCOURSE & SOCIETY	100,0				
	10				
ENERGY POLICY				93,3	
				6	
EXPERIMENTAL PSYCHOLOGY					100,0
					27
FOLIA PHONIATRICA ET LOGOPAEDICA				100,0	
				6	
HEALTH AFFAIRS			91,7		
			6		
HEALTH PROMOTION INTERNATIONAL	95,0				
	9				
HOUSING POLICY DEBATE	100,0				
	5				
INTERNATIONAL JOURNAL	91,7				
	5				

(Continued)

TABLE 3. (Continued)

Heading: Journal	1999	2000	2001	2002	2003
INTERNATIONAL JOURNAL OF HEALTH SERVICES			96,7 12		
JOURNAL FOR RESEARCH IN MATHEMATICS EDUCATION			100,0 5		
JOURNAL FOR THE SCIENTIFIC STUDY OF RELIGION				100,0 5	
JOURNAL OF ANALYTICAL PSYCHOLOGY			100,0 5		
JOURNAL OF APPLIED COMMUNICATION RESEARCH		91,7 8			
JOURNAL OF ECONOMIC ISSUES				100,0 6	
JOURNAL OF ECT				94,4 9	
JOURNAL OF EPIDEMIOLOGY AND COMMUNITY HEALTH	100,0 7				
JOURNAL OF LEARNING DISABILITIES			100,0 5		
JOURNAL OF MIDWIFERY & WOMENS HEALTH			100,0 6		
JOURNAL OF PEDIATRIC PSYCHOLOGY		100,0 5			
JOURNAL OF SEX & MARITAL THERAPY			91,7 6		
JOURNAL OF THE ROYAL ANTHROPOLOGICAL INSTITUTE	92,9 7		100,0 8		
JOURNAL OF VOCATIONAL BEHAVIOR				100,0 5	
MAYO CLINIC PROCEEDINGS					100,0 8
MENTAL RETARDATION	96,7 12				
NATURAL LANGUAGE & LINGUISTIC THEORY			100,0 7		
PS-POLITICAL SCIENCE & POLITICS				91,2 18	
PSYCHIATRIC SERVICES					100,0 6
PSYCHIATRISCHE PRAXIS			94,2 19		
PSYCHOANALYTIC DIALOGUES			100,0 6		
PSYCHOLOGICAL INQUIRY	100,0 6	100,0 6			
PSYCHOLOGISCHE RUNDSCHAU			100,0 5		
PSYCHOLOGIST			91,7 5		
PSYCHOPATHOLOGY					100,0 10
SCHOOL EFFECTIVENESS AND SCHOOL IMPROVEMENT				100,0 6	
SCIENTIST	93,6 20				96,4 16
SOCIOLOGY OF EDUCATION			93,8 6		
STRATEGIC MANAGEMENT JOURNAL				91,7 7	
THEORY AND RESEARCH IN SOCIAL EDUCATION	100,0 6				
TRENDS IN COGNITIVE SCIENCES		93,8 8			
WESTERN JOURNAL OF COMMUNICATION		100,0 6			
ZEITSCHRIFT FUR PADAGOGISCHE PSYCHOLOGIE		100,0 54		98,0 50	

Note. To avoid artificially inflating the numbers we excluded journals for which fewer than five of the total number of journal self-citations appearing in editorial material contributed to the impact factor. First Line: Percentage of journal self-citations contributing to the annual impact factor (referred to the number of journal self-citations). Second line: Number of journal self-citations contributing to the annual impact factor.

Conclusions

The large-scale analysis of the structure of the impact factor in academic journals is an unexplored area of bibliometrics. Given the relevance of impact factor in current science, more in-depth studies of the structure of citations that are used to compute the impact factor hold the potential to reveal useful information about editors' gatekeeping functions and publication trends. In other areas, attempts are under way to determine what factors go into the structure of specific indicators. For example, gross national product (GNP) is a widely used indicator in economics. Although the GNP of two different countries may be similar, their economies may differ considerably as a result of differences in the influence of the agricultural, industrial, or service sectors.

We believe our analysis points toward new perspectives in scientometrics, because it provides a method for the very large-scale analysis of different types of contributions to the impact factor. The method used can be applied to other fields or types of documents.

We should remember that the impact factor depends on both the citations to journals and the type of documents published. Thus, although the ISI counts citations received by all documents published in a given journal, it only considers articles, notes, and reviews as citable items (Glanzel & Moed, 2002, p. 11). One possible way for editors of academic journals to manipulate the impact factor is to publish large amounts of editorial material that includes journal self-citations that contribute to the impact factor. These documents are not taken in account by the ISI when computing the impact factor, because they are not considered citable items. As a result, the numerator of the impact factor formula increases while the denominator stays the same, and the arithmetical result would be an increase in the impact factor.

In the present study journal self-citations that contributed to the impact factor that were included in published documents labeled editorial material were found in only 44% of the journals. When we identified documents with a large number of journal self-citations that contributed to the impact factor, it seems that these items dealt with the development of the journal, the research field, or other related topics. Thus, the apparently large number of journal self-citations that contributed to the impact factor does not suggest a suspicious pattern of intentional impact-raising strategies, given the total number of journals in the Social Science Citation Index.

When we computed the results by journal and by year, the number of annual journal self-citations that contributed to the impact factor was five or more in only 23% of the journals. In the journal set analyzed here, more of 80% of all journal self-citations were found to contribute to the impact factor in only 8.9% of the journals (considering only journals for which five or more citations contributed to the annual impact factor).

Our results can be considered accurate to the extent that the ISI computes the impact factors on the basis of all citations to all documents published in a given journal. As noted

by Eugene Garfield, former president of ISI, "the JCR numerator includes citations to any item published in these journals" (Garfield, 1999, p. 979). If some citations from documents labeled as editorial material were excluded by the ISI, the influence of these citations on the impact factor would be even less than what our calculations suggest.

To conclude, our analysis does not appear to offer any clear evidence of widespread manipulation of the impact factor of academic journals included in the Social Science Citation Index between 1999 and 2003. In editorial material published in the journal itself, the occurrence of large numbers of journal self-citations that contributed to the impact factor was low, although the frequency of the practice of including small number of impact-factor-enhancing journal self-citations was somewhat higher. Our findings tend to support the robustness of the impact factor as a bibliometric indicator, at least in the area of the social sciences.

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Appendix: An Example of a Record Showing Different Fields of Interest

Author	Title	Journal	References	Publication year	Vol	First page	Last page	Citations IF	Journal self-citations	Cited references
Tyrer, P	Are small case-loads beautiful in severe mental illness?	BRITISH JOURNAL OF PSYCHIATRY	20	2000	177	386	387	5	8	*DEP HLTH, 1998, 1 CLASS SERV QUAL NE; *DEP HLTH, 1999, NAT SERV FRAMMENT H; *UK700 GROUP, 1999, LANCET, V353, P2185; BURNS T, 1993, BRIT J PSYCHIAT, V163, P49; BURNS T, 1993, BRIT J PSYCHIAT, V163, P55; BURNS T, 2000, BRIT J PSYCHIAT, V177, P427; HASSIOTIS A, 1999, BRIT J PSYCHIAT, V175, P135; KEMP R, 1996, BRIT MED J, V312, P345; KEMP R, 1998, BRIT J PSYCHIAT, V172, P413; LOMAX M, 1921, EXPERIENCES ASYMLUM; MACMILLAN D, 1963, LANCET, VI, P567; PERRY A, 1999, BRIT MED J, V318, P149; SAINSBURY P, 1966, MILBANK MEMFUND Q, V44, P243; STEIN LI, 1998, ASSERTIVE COMMUNITY; TARRIER N, 1999, BRIT J PSYCHIAT, V174, P500; THORNICROFT G, 1998, BRIT J PSYCHIAT, V173, P423; TYRER P, 1995, LANCET, V345, P756; TYRER P, 1999, LANCET, V354, P999; WEAVER T, 1990, THESIS U LONDON; WYKES T, 1998, BRIT J PSYCHIAT, V173, P385

Note. Citations IF = Number of citations that contribute to the impact factors (citations to articles published in the journal in either of the two years—1998 or 1999—before the year 2000 when the item was published). In the Cited references field, journal self-citations that did not contribute to the impact factor are shown in bold, and journal self-citations that did contribute to the impact factor are shown in **italics**.