Comparison of Spanish and Swedish Journal Indicators (Impact Factor and Self-citation Rate) in the *Journal Citation Reports*

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Abstract

The geographical and social differences between Spain and Sweden, two non-English language European countries, led to our review of the impact factors (IF) and self-citation rates of scientific journals published in these two countries. The study endeavours to compare the trends of citation rates and impact factors for all Spanish and Swedish journals indexed in the *Journal Citation Reports* during the time period 2000-2005.

Introduction

Using a map of Europe (Fig 1.: Appendix1), we see that Sweden, with a population of 9,016,596 and a constitutional monarchy, is located in northern Europe; on the opposite side of the continent, Spain is located in south-western Europe, with a population more than four times that of Sweden (40,397,842) and a parliamentary monarchy. Besides geographical differences, there are social differences (Table 12) between the two countries that led to our interest in comparing certain indicators for these countries' scientific journals that are indexed in the *Journal Citation Reports* (*JCR*).

A dominant research technique in library and information science, citation analysis is a well-known method in bibliometric studies for measuring the influence and impact of scholarly journals. Consequently, it is used as a quantitative tool for ranking, evaluating, categorizing, and comparing journals by librarians and information scientists. This form of analysis goes back to a study conducted in 1927 by Gross and Gross who discovered that only a few journals were cited in the *Journal of the American Chemical Society*, and many were cited only once. Their findings have shown similarities with the power law. Characterised by the phenomenon that Merton (1968) described as the Matthew Effect, it is interpreted as "the rich get richer and the poor get poorer". On July 15, 1955, Eugene Garfield published his groundbreaking paper on citation indexing. In this paper he suggested that the *Science Citation Index* (SCI) would be a great asset in measuring impact and facilitating historiography. Since then we have witnessed an increasing use of citation

analysis as an important tool in the hands of bibliometricians to determine the influence and impact of journals, authors, etc.

Researchers may use citation analysis for many reasons, including

> to find out how much impact a particular article has had, by showing which other authors based some work upon it or cited it as an example within their own papers
>
> to determine more about a field or topic (by reading the papers that cite a seminal work in that area)
>
> to find out how much impact a particular author has had (by looking at his/her total citations). (Bieber & Jacoby, 2002)

The tremendous growth of scientific literature, particularly in special fields in the scholarly world, and easy access to them cause researchers to use and cite more references in their works. Attempts among academic scientists and researchers to gain prestige may be another reason for the increase of the citation rate: authors can and do cite their prior work (self-citation).

> High rate of author self-citation may result from the fact that authors stick to their specific field of research and, naturally, rely on their previous results…Self-citation of journals, especially in the SCI, is getting high and higher. Nearly every journal in the *JCR-Science Edition* contains at least some reference to its own. (Kovačić & Mišak, 2004, np.)

Ken Hyland (2003) found that about 70% of articles contained a reference to an earlier publication of at least one of the authors. In another study, Gami, Montori, Wilczynski. & Haynes (2004) found that nearly one-fifth of all citations to articles about diabetes mellitus in clinical journals in the year 2000 were author self-citations. The frequency of self-citation was not associated with the quality of publications.

A study by Eugene Garfield (1979-80) based on information extracted from the SCI database found that, in terms of articles published, biochemical literature is growing faster than scientific literature as a whole. Garfield found that another growth indicator within the biochemical literature was the increase in the average number of references contained in a typical article. To examine this factor he developed an R/S value for each core journal. This is the number of

references contained in all of a journal's issues during a specified year (R) divided by the number of source articles (S) it published that year. The study showed that the average biochemistry article contained at least 70% more references than the average article in the SCI database. For example, in 1977 the average biochemistry article contained 23.4 references as compared to the average of 13.5 references for those in the SCI; the R/S for SCI articles as a whole will be lower than the R/S for biochemistry articles. However, this situation could only account for a very small part of the 70% difference.

The study showed that the average R/S for the core journals had increased 10.4% in ten years, from 21.2 in 1968 to 23.4 in 1977. Over a 16-year period, however, the years 1962–1977, some of the CEBJ journals (journals whose editors are full members of the Committee of Editors of Biochemical Journals of the International Union of Biochemistry) (Garfield, 1979-80, pp. 414-418) had increases in R/S as high as 64% (Biochim. Biophys, Acta). On average, the R/S value for CEBJ journals increased by 43% (18.2 to 26.1) from 1962 to 1977. As of 1977, biochemistry articles, on average, had 12% more references than botany articles (23.4 v. 21.0) and 85% more references than mathematics articles (23.4 v. 12.6). Mathematics and botany articles increased their R/S values by 8 and 7% respectively between 1968 and 1977; these increases are substantially less than the 10.4% growth in the biochemistry R/S over the same period. Nevertheless, all three fields did show an increase in the number of references contained in an average article.

Garfield also found that biochemical literature is the fastest growing of any field in science. He asserted that some CEBJ journals have increased their average number of references per source item by as much as 64% in 16 years.

This study endeavours to determine the trend of citation, impact factor, and references per article for all Spanish and Swedish journals that were indexed in the *JCR* and to show the differences between them. The analysis of data indicates that there is a significant difference between the self-citing rate and the self-cited rate of journals in Spain as well as in Sweden throughout the period of study.

Method and Materials

All journal self-citation and impact factor data were extracted from the 2000 and 2005 *Journal Citation Reports* (*JCR*). In order to determine the correlation between the Impact factor and self-citation of journals, all journals from the two countries focused on in this study were chosen from the Journal Citation report of ISI web of knowledge available at http://portal.isiknowledge.com/portal.cgi?DestApp=JCR&Func=Frame. The correlation between Impact factor and the rate of journals' self-citation were analysed by the software package of SPSS.

Finding and Results

Table 1
Distribution of journal self-citation rate in Spain (2000)

Citation rate	Self-cited		Self-citing	
	No. of journals	Percent	No. of journals	Percent
< 5%	8	29	25	89
5-10%	5	18	3	11
10-15%	3	11	-	0
15-20%	1	4	-	0
>20%	11	39	-	0
Total	28	100	28	100

Table 1 illustrates the Spanish journals' distribution based on self-cited rate as well as self-citing rate. The table indicates that the largest self-citing group is that with the lowest self-cited rate—less than 5%—which accounts for 25 (44%) of a total of 28 journals; the second largest group is that of journals with a citing rate of 5% to 10%. These two groups constitute 100% of the 28 journals studied. For the self-cited statistic, the largest group is that with a rate higher than 20%.

Table 2
Distribution of journal self-citation rate in Sweden (2000)

Citation rate	Self-cited		Self-citing	
	No. of journals	Percent	No. of journals	Percent
< 5%	8	42	13	69
5-10%	5	26	5	26
10-15%	-	0	1	5
15-20%	3	16	-	0
>20%	3	16	-	0
Total	19	100	19	100

Table 2 shows the Swedish journals' distribution based on the 2000 self-cited and self-citing rates. The table indicates that the largest self-citing group is that with the self-cited rate—less than 5%—which accounts for 13 (69%) of the 19 journals. The second largest group is that with a citing-rate from 5% to 10%. These two groups constitute about 95% of all studied Swedish journals. For the self-cited statistics, the large groups are the same as the two self-citing groups.

Table 3
Distribution of journal self-citation rate in Spain (2005)

Citation rate	Self-cited		Self-citing	
	No. of journals	Percent	No. of journals	Percent
< 5%	9	30	18	60
5-10%	3	10	10	33
10-15%	1	3	2	7
15-20%	3	10	-	0
>20%	14	47	-	0
Total	30	100	30	100

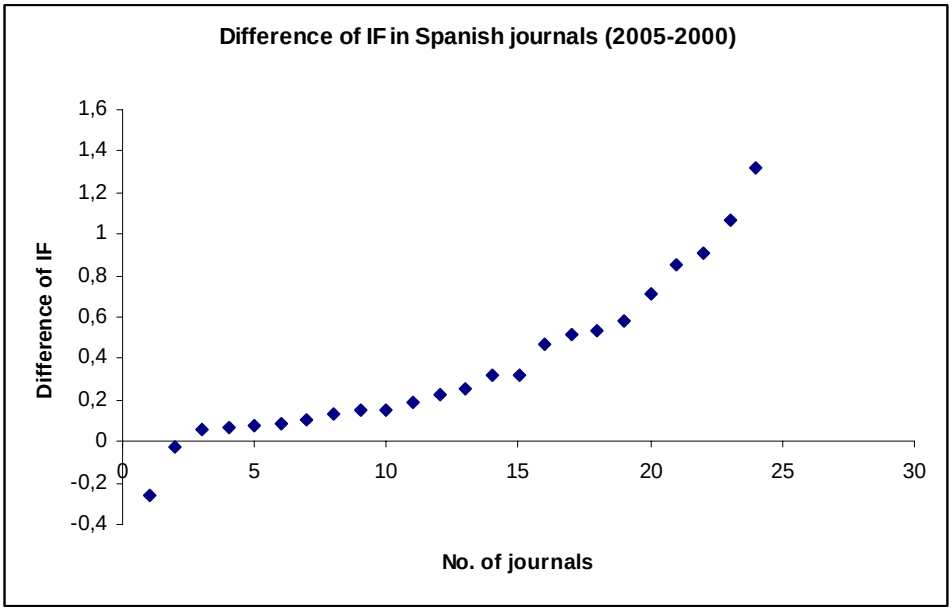
For 2005, the largest self-citing group is that with a self-cited rate of less than 5%, which accounts for 18 (60%) from a total of 30 journals; the second largest group is that with a citing rate of 5% to 10%. These two groups constitute 93% of all studied Spanish journals. The largest self-cited group is that with a self-cite rate higher than 20%.

Table 4
Distribution of journal self-citation rate in Sweden (2005)

Citation rate	Self-cited		Self-citing	
	No. of journals	Percent	No. of journals	Percent
< 5%	3	17	10	56
5-10%	8	44	8	44
10-15%	4	22	-	0
15-20%	2	11	-	0
>20%	1	6	-	0
Total	18	100	18	100

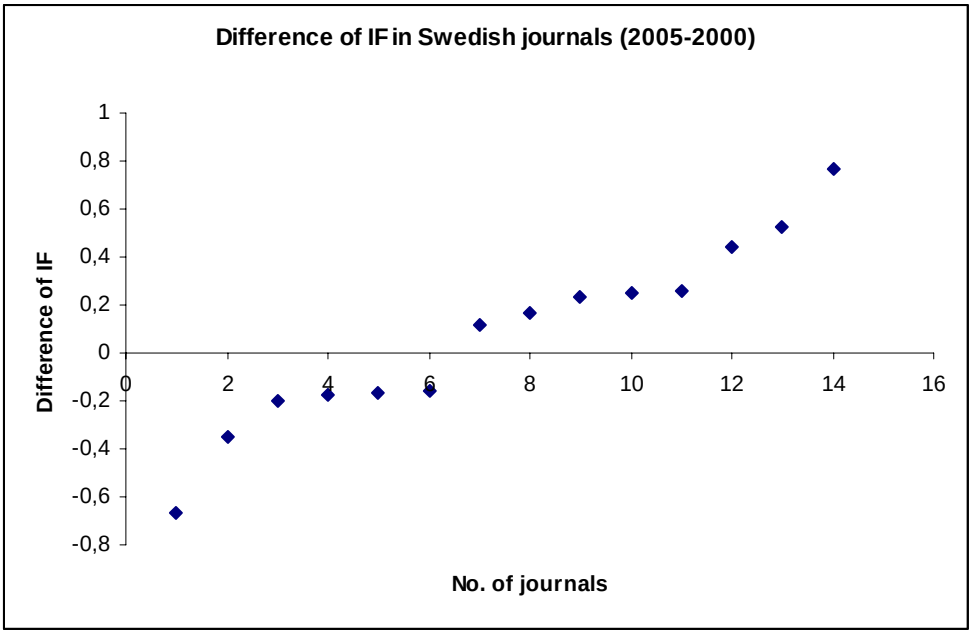
For 2005, the largest group in the self-citing column is that with a self-citing rate of below 10%. There is no journal with a self-citing rate higher than 10% in this group.

Figure 2: Difference of Spanish journals' IF (2005-2000)



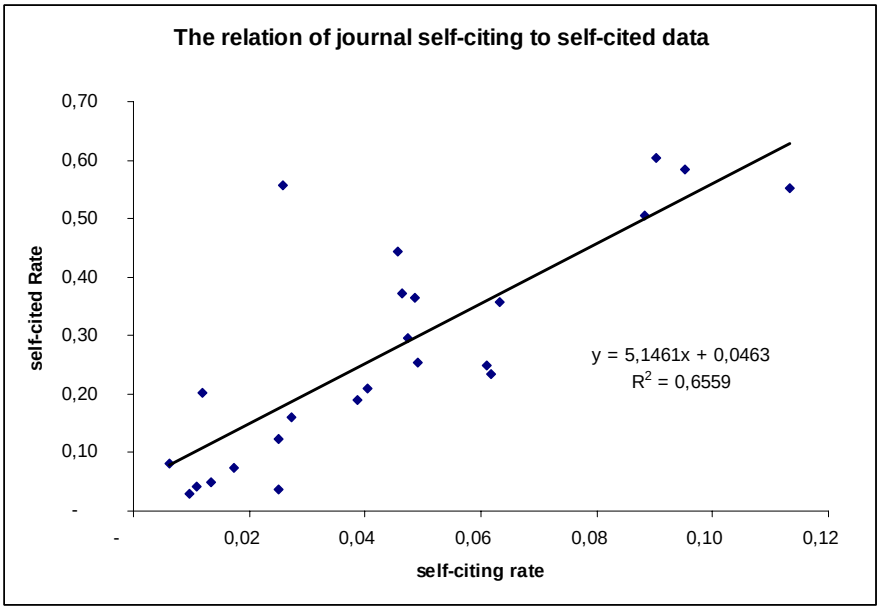
Comparing the IF for Spanish journals in 2000 and in 2005 in the same set of journals indicates that the IF is higher for 91.6% of Spanish journals in 2005 than in 2000.

Figure 3: Difference of Swedish journals' IF (2005-2000)



Comparing Figure 2 with Figure 3 indicates that Spanish journals are more productive than Swedish journals in the same period of study. As the graph illustrates, the IF for 50% of the Swedish journals in 2005 compared to the IF for the same set of journals in 2000 increased while the IF for the other 50% in the same set of journals decreased. This indicates that there was no significant growth in the IF for the Swedish journals for the time period studied.

Figure 4: The relation of journal self-citing to self-cited for Spanish journals in 2005



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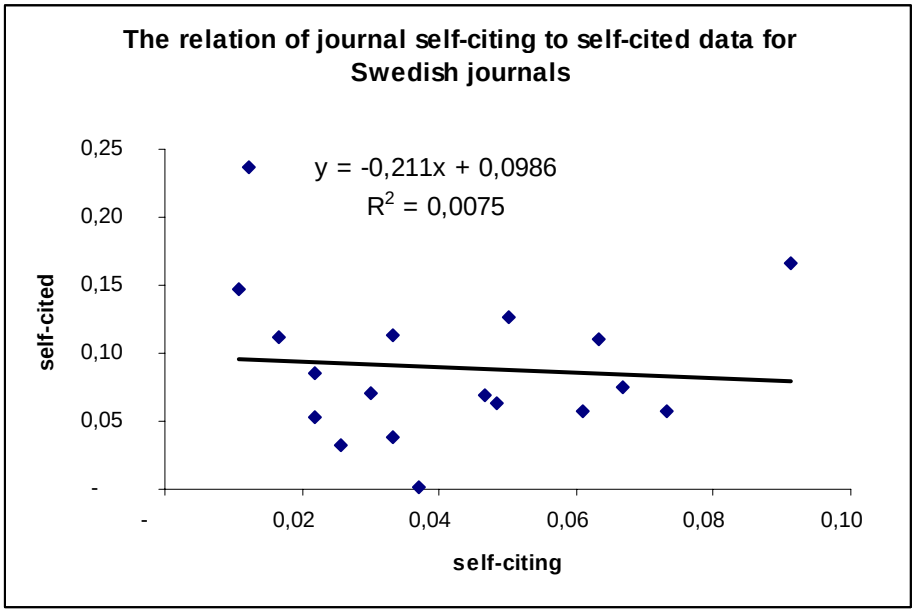
As the graph illustrates, there is a linear correlation between Spanish journal self-citing and self-cited values. The graph indicates that the more Spanish journals are citing their own, the more they are being cited by a factor of 5.15.

Figure 5: The relation of Swedish journals' self-citing and self-cited rate in 2005.



The graph illustrates that the more Swedish journals cite themselves the less they are cited.

Table 5
Number of articles and references for Spanish journals 2000-2005

Year	No. of articles	No. of references	Mean value of references per article
2000	2329	95093	40.82
2005	1998	98692	49.39

As Table 5 shows, the number of references per article in Spanish journals increased about 1.7 references per article annually.

Table 6
Number of articles and references for Swedish journals 2000-2005

Year	No. of articles	No. of references	Mean value of references per article
2000	1210	35931	29.69
2005	1151	37609	32.67

As Table 6 indicates, the number of references per article in Swedish journals increased about 0.6 references per article annually.

Table 7
List of Swedish journals based on self-citing rank (2000)

Rank	Journal titles (abbreviated)	Impact factor	Total citation	Self-cited rate	Self-citing rate
1	TELLUS B	3.256	1984	0.2	0.14
2	GEOGR ANN A	0.868	522	0.17	0.09
3	NORD PULP PAPER RES	0.759	384	0.25	0.09
4	SWED DENT J	0.914	561	0.07	0.09
5	J VEG SCI	1.589	1924	0.16	0.08
6	TELLUS A	1.178	1032	0.05	0.05
7	ACTA PHYSIOL SCAND	1.764	7707	0.03	0.04
8	ACTA RADIOL	0.785	2343	0.03	0.04
9	HEREDITAS	0.753	1392	0.05	0.04
10	PHYS SCRIPTA	0.578	4078	0.08	0.04
11	AMBIO	1.142	2109	0.04	0.03
12	GFF	0.756	200	0.26	0.03
13	SCAND J METALL	0.074	292	0.07	0.03
14	SCAND J STAT	0.655	634	0.04	0.03
15	J NONLINEAR MATH PHY	0.250	39	0.23	0.01
16	ACTA MATH-DJURSHOLM	1.941	1637	0.00	0.00
17	ARK MAT	0.511	357	0.00	0.00
18	SCAND J SOC MED	1.250	517	0.00	0.00
19	SWED J AGR RES	0.238	247	0.00	0.00

This table indicates that the journal *Tellus Series B: Chemical and Physical Meteorology* ranked first in self-citing in 2000. The mean self-cited rate is 9% and the mean self-citing rate is 5%.

Table 8
List of Swedish journals based on self-citing rank (2005)

Rank	Journal titles (abbreviated)	Impact factor	Total citation	Self-cited rate	Self-citing rate
1	NORD PULP PAP RES J	0.600	798	0.17	0.09
2	J VEG SCI	2.112	3370	0.08	0.07
3	TELLUS B	2.592	2052	0.06	0.07
4	SWED DENT J	0.568	558	0.06	0.06
5	TELLUS A	1.947	1144	0.11	0.06
6	AMBIO	1.378	2609	0.07	0.05
7	GEOGR ANN A	0.667	753	0.13	0.05
8	PHYS SCRIPTA	1.240	4057	0.06	0.05
9	ACTA MATH-DJURSHOLM	1.778	1934	0.00	0.04
10	ACTA RADIOL	1.031	2379	0.03	0.03
11	APPL VEG SCI	1.517	319	0.11	0.03
12	SCAND J METALL	0.517	365	0.07	0.03
13	SCAND J STAT	0.822	914	0.04	0.03
14	ARK MAT	0.628	415	0.05	0.02
15	J REHABIL MED	1.799	455	0.09	0.02
16	NEUROENDOCRINOL LETT	1.005	614	0.11	0.02
17	GFF	0.581	80	0.24	0.01
18	J NONLINEAR MATH PHY	0.508	190	0.15	0.01

Table 8 shows that the journal *Nordic Pulp & Paper Research* with a 9% self-citing rate ranked first in 2005 and the journal *Tellus Series B: Chemical and Physical Meteorology* was lowered to third rank.

In 2005, the mean self-cited rate was 9%, and the mean self-citing rate was 4%.

Table 9
List of Spanish journals based on self-citing rank (2000)

No.	Journal titles (abbreviated)	Impact factor	Total citation	Self-cited rate	Self-citing rate
1	REV ESP CARDIOL	0.700	683	0.73	0.07
2	MED CLIN-BARCELONA	0.750	1628	0.42	0.06
3	NEFROLOGIA	0.310	277	0.68	0.05
4	GRASAS ACEITES	0.453	343	0.20	0.04
5	REV ESP ENFERM DIG	0.384	308	0.27	0.04
6	MATER CONSTRUCC	0.219	28	0.46	0.03
7	REV MAT IBEROAM	0.750	239	0.05	0.03
8	REV METAL MADRID	0.190	54	0.41	0.03
9	INT J DEV BIOL	1.963	1594	0.06	0.02
10	REV CLIN ESP	0.217	411	0.14	0.02
11	SCI MAR	0.521	516	0.16	0.02
12	AFINIDAD	0.152	95	0.15	0.01
13	BOL SOC ESP CERAM V	0.099	56	0.36	0.01
14	HISTOL HISTOPATHOL	1.553	1246	0.07	0.01
15	J INVEST ALLERG CLIN	0.537	279	0.05	0.01
16	J PHYSIOL BIOCHEM	0.958	85	0.11	0.01
17	METHOD FIND EXP CLIN	0.543	675	0.04	0.01
18	NEUROCIRUGIA	0.154	41	0.56	0.01
19	REV NEUROLOGIA	0.256	339	0.67	0.01
20	TEST	0.308	52	0.08	0.01
21	DRUG FUTURE	0.015	16	-	-
22	QUIM ANAL	0.246	183	-	-
23	ACTAS LUSO-ESP NEUR	0.302	80	-	-
24	AN QUIM-INT ED	0.312	331	-	-
25	ACTAS ESP PSIQUIATRI	0.098	5	0.4	0
26	ARCH COMPUT METHOD E	0.688	87	0.01	0
27	DRUG NEWS PERSPECT	0.835	256	0.01	0
28	DRUGS TODAY	0.339	273	0.04	0

Table 9 illustrates that the journal *Revista espanola de Cardiologia* with a 7% self-citing rate ranked first among Spanish journals in 2000. The mean self-cited rate was 22%, and the mean self-citing rate was 2%.

Table 10
List of Spanish journals based on self-citing rank (2005)

Rank	Journal titles (abbreviated)	Impact factor	Total citation	Self-cited rate	Self-citing rate
1	REV METAL MADRID	0.414	152	0.55	0.11
2	ARCH BRONCONEUMOL	1.401	660	0.58	0.1
3	BOL SOC ESP CERAM V	0.684	287	0.6	0.09
4	REV ESP CARDIOL	1.769	993	0.5	0.09
5	GRASAS ACEITES	0.194	426	0.25	0.06
6	MATER CONSTRUCC	0.542	98	0.23	0.06
7	MED CLIN-BARCELONA	1.074	2084	0.36	0.06
8	ARDEOLA	0.509	219	0.37	0.05
9	ENFERM INFEC MICR CL	0.905	550	0.29	0.05
10	NEFROLOGIA	0.466	390	0.44	0.05
11	REV ESP ENFERM DIG	0.535	365	0.25	0.05
12	REV NEUROLOGIA	0.391	1157	0.37	0.05
13	NEUROLOGIA	0.571	416	0.21	0.04
14	SCI MAR	1.036	1247	0.19	0.04
15	J PHYSIOL BIOCHEM	0.934	177	0.12	0.03
16	NEUROCIRUGIA	0.232	104	0.56	0.03
17	REV CLIN ESP	0.273	428	0.16	0.03
18	REV MAT IBEROAM	0.855	367	0.04	0.03
19	INT MICROBIOL	1.868	337	0.07	0.02
20	ACTAS ESP PSIQUIATRI	0.286	109	0.2	0.01
21	AFINIDAD	0.220	148	0.08	0.01
22	HISTOL HISTOPATHOL	2.023	2152	0.05	0.01
23	INT J DEV BIOL	2.051	2258	0.03	0.01
24	TEST	1.163	163	0.04	0.01
25	ARCH COMPUT METHOD E	1.400	122	-	-
26	DRUG FUTURE	0.547	355	0.01	0
27	DRUG NEWS PERSPECT	2.159	516	0.02	0
28	DRUGS TODAY	1.248	592	0.01	0
29	METHOD FIND EXP CLIN	0.798	823	0.01	0
30	PUBL MAT	0.659	129	-	-

The journal *Revista de Metalurgia*, with a 6% self-citing rate, rose to the first rank among Spanish journals in 2005, and the journal *Revista espanola de Cardiologia* fell to fourth rank. The mean self-cited rate was 22%, and the mean self-citing rate was 4%.

Table 11
The portion of Spanish and Swedish journals entering material in the *JCR* data bank in 2005

Origin of journals	No. of journal	percent	Articles	percent	Citations	percent
Spanish journals in the *JCR*	30	0.5%	1,151	0.1%	17,824	0.08%
Swedish journals in the *JCR*	19	0.3%	1,998	0.2%	23,006	0.10%
All journals in the *JCR*	6,088	100.0%	847,114	100.0%	22, 353,992	100.00%

Reverse order of highlighted items. Statistics must be wrong.

Table 11 illustrates that from a total number of 6,088 journals in the *JCR* in 2005, 30 (0.5%) were published in Spain, and 19 (0.3%) were published in Sweden. The 6,088 journals in the *JCR* produced 847,114 articles, 1,998 (0.2%) appeared in Swedish journals and 1,151 (0.1%) in Spanish journals. Of the 22,353,992 citations in 2005, 23,006 (0.10%) came from Swedish journals and 17,824 (0.08%) from Spanish journals.

Table 12
Geographical and social differences between Spain and Sweden[i]

	Spain	Sweden
Location	South-western Europe, bordering the Bay of Biscay, Mediterranean Sea, North Atlantic Ocean, and Pyrenees Mountains, southwest of France	Northern Europe, bordering the Baltic Sea, Gulf of Bothnia, Kattegat, and Skagerrak, between Finland and Norway
Area	*total:* 504,782 sq km *land:* 499,542 sq km *water:* 5,240 sq km	*total:* 449,964 sq km *land:* 410,934 sq km *water:* 39,030 sq km
Climate	temperate; clear, hot summers in interior, more moderate and cloudy along coast; cloudy, cold winters in interior, partly cloudy and cool along coast	temperate; in south with cold, cloudy winters and cool, partly cloudy summers; subarctic in north
Natural resources	coal, lignite, iron ore, copper, lead, zinc, uranium, tungsten, mercury, pyrites, magnesite, fluorspar, gypsum, sepiolite, kaolin, potash, hydropower, arable land	iron ore, copper, lead, zinc, gold, silver, tungsten, uranium, arsenic, feldspar, timber, hydropower
Population growth rate	0.13% (2006 est.)	-
Birth rate	10.06 births/1,000 population (2006 est.)	10.27 births/1,000 population (2006 est.)
HIV/AIDS – deaths	9.72 deaths/1,000 population (2006 est.)	less than 100 (2003 est.)
Sex rate	*At birth:* 1.07 male(s)/female *under 15 years:* 1.06 male(s)/female *15-64 years:* 1.01 male(s)/female *65 years and over:* 0.72 male(s)/female *total population:* 0.96 male(s)/female (2006 est.)	*At birth:* 1.06 male(s)/female *under 15 years:* 1.06 male(s)/female *15-64 years:* 1.03 male(s)/female *65 years and over:* 0.77 male(s)/female *total population:* 0.98 male(s)/female (2006 est.)
Life expectancy at birth	*Total population:* 79.65 years *male:* 76.32 years *female:* 83.2 years (2006 est.)	*Total population:* 80.51 years *male:* 78.29 years *female:* 82.87 years (2006 est.)
people living with HIV/AIDS	140,000 (2001 est.)	3,600 (2001 est.)
Religion	Roman Catholic 94%, other 6%	Lutheran 87%, Roman Catholic, Orthodox, Baptist, Muslim, Jewish, Buddhist
Language	Castilian Spanish 74%, Catalan 17%, Galician 7%, Basque 2%; note - Castilian is the official language nationwide; the other languages are official regionally	Swedish, small Sami- and Finnish-speaking minorities
GDP - real growth rate	3.5% (2005 est.)	2.7% (2005 est.)

Conclusion

In spite of significant geographical and social differences between Spain and Sweden (Table 12), there are similarities in journals' indicators published in these two European countries.

From a total number of 6,088 journals in the *JCR* in 2005, 30 (0.5%) were published in Spain, and 19 (0.3%) were published in Sweden. The 6,088 journals in the *JCR* produced 847,114

articles, 1,998 (0.2%) appeared in Swedish journals and 1,151 (0.1%) in Spanish journals. Of the 22,353,992 citations in 2005, 23,006 (0.10%) came from Swedish journals and 17,824 (0.08%) from Spanish journals.

We have noticed that 4 journals from a total of 28 journals published in 2000 in Spain were cancelled in 2005 and 6 new journals published in 2006, and 5 journals from a total 19 journals published in 2000 in Sweden were cancelled and 5 new journals published in 2005.

The comparison of Spanish journals with Swedish journals for the 2000-2005 period showed that the mean value of references per article in Spanish journals is higher than in Swedish journals: 40.82 in 2000 and 49.39 in 2005 respectively for Spanish journals versus 29.69 in 2000 and 32.67 in 2005 for Swedish journals.

The study showed that there is a significant difference between the self-citing rate and the self-cited rate of journals in Spain as well as in Sweden throughout the period of study. Analysis of data indicated that the more the Spanish journals cite themselves, the more tend to be cited (Figure 4). The IF of Spanish journals in 2005 showed significant growth in comparison to the same set of journals in 2000. Such differences were not found among Swedish journals, however.

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Appendix 1: Fig 1
The European countries map