

Publication and citation patterns of Latin American & Caribbean journals in the SCI and SSCI from 1995 to 2004

F. COLLAZO-REYES,^a M. E. LUNA-MORALES,^b J. M. RUSSELL,^c
M. A. PÉREZ-ANGÓN^a

^a *Departamento de Física, Centro de Investigación y de Estudios Avanzados del IPN
Mexico City (Mexico)*

^b *Unidad de Servicios Bibliográficos, Centro de Investigación y de Estudios Avanzados del IPN
Mexico City (Mexico)*

^c *Centro Universitario de Investigaciones Bibliotecológicas, Universidad Nacional Autónoma de México
Mexico City (Mexico)*

Impact factors, publication-citation patterns and growth dynamics were analyzed for the Latin America and the Caribbean journals covered by the Science Citation Index (SCI) and Social Science Citation Index from 1995–2003. Two main journal groups were identified: those publishing mainly in English with substantial contributions from outside the region, and those publishing in local languages, principally by the local community and on subjects of local interest. We found little inter-citation among the local papers while the highest number of citations by extra-regional authors was to papers published in English. Quantitative indicators show that LA-C journals are better positioned in the mainstream literature than ever before.

Introduction

The widespread use of the Institute for Scientific Information (ISI) citation databases to monitor the scientific performance of countries can be explained by several, weighty arguments such as: the inclusion of the most highly cited journals worldwide; a relatively constant journal set over a period of some 30 years; annual production of indicators to monitor journal citation characteristics; the presence of searchable fields such as institutional names and the inclusion of all author addresses.

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Address for correspondence:

FRANCISCO COLLAZO REYES

Centro de Investigación y de Estudios Avanzados del IPN, Biblioteca de Ciencias Exactas

Av. IPN 2508, Col. San Pedro Zacatenco, c.p. 07000, México City, México

E-mail: fcollazo@fis.cinvestav.mx

0138–9130/US \$ 20.00

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Nonetheless, a serious constraint to using the ISI database to profile the production of developing countries is the poor coverage of journals edited in these regions of the world, notably Asia, Africa, and Latin America. In the case of Latin America and the Caribbean (LA-C) only eight of their journals were covered in the 1982 Science Citation Index (SCI) edition [GARFIELD, 1984A]. However, by 1995–1996 this situation had improved with 12 LA-C titles in the SCI and 16 in the Social Sciences, and Arts and Humanities Citation Indexes [GARCIA & SOTOLONGO-AGUILAR, 1999]. With the availability of the larger journal pool included in the expanded version of SCI accessible through the ISI's Web of Science, the situation is expected to have improved further. Nonetheless, these changes are unlikely to have altered to any considerable extent, the underrepresentation of LA-C journals in the mainstream databases. Mention has often been made of the importance of determining the international visibility of developing country research published in the mainstream journals of the ISI database, but at the same time, pointing out the limited vision obtained with respect to total scientific production (in the case of Latin America, see [FERNANDEZ & AL., 1998]). According to GAILLARD [1989] approximately 37% of scientific articles from developing countries in the fields of Biological and Agricultural Sciences, and Rural Technology are published in journals from the industrialized world and mainly those covered by the SCI, the rest being published via foreign journals not covered by ISI but principally, approximately 55%, in local journals edited within the developing world with only a limited presence in the international databases such as those produced by ISI. GIBBS [1995] later coined the phrase “Lost science in the Third World” to refer to this locally published and virtually inaccessible production.

Latin American journals tend to be predominantly parochial publishing papers mainly from their local researchers and, to a lesser extent, papers from outside the region [CETTO, 1996]. Therefore, the number of regional journals included in databases such as ISI at any one time, will significantly affect any analysis of LA research performance calculated using this international yardstick. The consequences of the relative language coverage of journals in the Science Citation Index for global comparisons of national research performance have already been discussed [VAN LEEUWEN & AL., 2001]. The number of citations papers receive will depend to a large extent on the language in which they are published, with documents in languages such as Spanish or Portuguese, less likely to be cited than those written in English which reach a wider audience. For this reason there is an increasing tendency for regional journals to publish papers in English.

On the one hand, as a way of improving the visibility of this lost science and its subsequent use and potential impact, important Open Access, full text information systems are rapidly being developed in Latin America, which not only provide increased access to the local and regional production much of which is published in either Spanish or Portuguese but also generate indicators which complement those of

ISI. Notable examples are the pioneering SciELO (Scientific Electronic Library Online) developed in Brazil [MENEGHINI & PACKER, 2007] and Redalyc in Mexico [AGUADO-LÓPEZ & ROGEL-SALAZAR, 2006].

In recent years there has been increasing interest in LA-C research from the bibliometric point of view. Most of the studies have focused on one field [VOGEL, 1997; PEREZ-ANGON & TORRES-VEGA, 1998; COLLAZO-REYES & LUNA-MORALES, 2002; COLLAZO-REYES & AL., 2004], one nation [KRAUSKOPF, 1992; GLÄNZEL & AL., 2006; LETA & AL., 2006; PEREZ-ANGON, 2006; REQUENA, 2006], one institution [DELGADO & RUSSELL, 1992; KRAUSKOPF & AL., 1995; PEREIRA-FRIEDICH & DOS SANTOS-RODRIGUEZ, 1998], or even in one specific topic like the Mexican involvement in the top-quark discovery [LUNA-MORALES & COLLAZO-REYES, 2005]. In 1982, Eugene Garfield analyzed the publication and citation patterns of LA-C research published in journals covered by SCI [GARFIELD, 1984B]. In particular, he detected that there was very little inter-citation between LA-C scientists: the SCI data indicated that LA researchers were not aware of, or choose not to cite papers from neighboring countries.

The general aim of our paper is to determine the presence, impact factors (IF), the publication-citation patterns and growth dynamics of LA-C journals indexed in SCI and SSCI over the last decade. We analyze the relationships between the local, regional and external origins of papers and their citations to determine (1) the citation behavior of journals showing endogamic publication and citation practices, and (2) the citation behavior of those journals showing a higher profile for English language and publishing more external papers, particularly from the larger scientific communities and in the more fundamental areas of study.

Material and methods

Papers published in LA-C journals covered by SCI and SSCI from 1995–2003 were classified into one of the following three groups according to geographical location of both author institutions and journals:

(a) Local papers: at least one of the authors affiliated to an institution situated in the same LA-C country where the publishing journal is edited.

(b) Regional papers: at least one of the authors is from a LA-C institution located in a country other than that where the respective publishing journal is edited.

(c) External papers: all authors of the published paper come from institutions located outside the LA-C geographical region.

Papers complying with both conditions (a) and (b) were assigned the more local classification of (a).

The data recovered from the Web of Science on the publication and citation patterns of the LA-C journals were analyzed with respect to the following variables:

- (1) Percentage of papers published in the period 1995–2003 for each one of the three categories of papers (a, b, c).
- (2) Percentage of citations generated by these papers in all SCI/SSCI journals from 1995–2004; data are grouped by the same three categories.
- (3) Endogamic correlations associated to the publishing-citation practices for all LA-C journals in the period under study. We identify two levels for these correlations: percentage of strictly self-citations (when at least one citing and one publishing author are from the same country) and the percentage corresponding to inter-regional self-citations, i.e., when at least one citing author and one publishing author come from different LA-C countries.
- (4) Correlations between the different publishing languages of the cited and citing papers.
- (5) Comparison between the growth dynamics of cited and citing papers in the principal publishing languages (English, Portuguese, Spanish).

Results

In Table 1 we present the basic data used in the present paper for each one of the 55 LA-C journals: title, editing country, language(s) used to publish their papers, the JCR categories and IF, number of papers published in the period 1995–2003, the respective number of citations generated by these papers in all SCI/SSCI journals, and finally a general impact factor defined as the ratio of the total number of citations (1995–2004) to the number of papers published by each journal in the period from 1995–2003.

The 55 LA-C journals in Table 1, organized by JCR categories, constitute the largest number of scientific journals edited in our region ever included: 46 in SCI y 9 in SSCI. In 1995, the SCI included only 35 LA-C journals, 32 of which have been listed continuously since then. Twenty new journals have been added in recent years in both indices. Four of the 55 journals changed their titles from local languages into English: three Brazilian journals, in Mathematics (24), in Biology and Technology (8), and in Microbiology (33) plus a Chilean journal in Chemistry (13). It is important to note that all LA-C journals included in the SSCI have conserved their original titles in the respective local language.

The 55 journals are published in 12 different LA-C countries: Brazil (19, 34.5%), Mexico (12, 21.8%), Chile (7, 12.7%), Argentina (6, 10.9%), Venezuela (4, 7.2%) and one journal in the following countries: Colombia, Costa Rica, Cuba, Ecuador, Jamaica, Trinidad & Tobago, Uruguay.

Table 1. Latin-American and Caribbean journals in SCI and SSCI: 1995-2003

No.	Titles	Country	Language	Category	Papers		Citations	IF
					1994-2004	2004-1995-2003		
1	<i>Cuban Journal of Agricultural Science³</i>	Cuba	English	Agriculture, Dairy & Animal Science	0.046	598	523	0.875
2	<i>Revista Brasileira de Zootecnia³</i>	Brazil	Multilingual	Agriculture, Dairy & Animal Science	0.254	1109	811	0.731
3	<i>Pesquisa Agropecuaria Brasileira³</i>	Brazil	Portuguese	Agriculture, Multidisciplinary	0.167	1959	1176	0.6
4	<i>Tropical Agricultura</i>	Trinidad y Tobago	English	Agriculture, Multidisciplinary	0.024	575	434	0.755
5	<i>Revista Mexicana de Astronomía y Astrofísica³</i>	Mexico	English	Astronomy & Astrophysics	3.296	188	660	3.511
6	<i>Genetics and Molecular Biology³</i>	Brazil	Portuguese/English	Biochemistry & Molecular Biology	0.316	543	596	1.098
7	<i>Revista Chilena de Historia Natural³</i>	Chile	Multilingual	Biodiversity Conservation	0.583	591	1391	2.354
8	<i>Arquivos de Biologia e Tecnologia / Brazilian Archives of Biology and Technology³</i>	Brazil	Portuguese/English	Biology	0.143	772	465	0.602
9	<i>Biological Research³</i>	Chile	English/Spanish	Biology	2.173	266	617	2.32
10	<i>Brazilian Journal of Medical and Biological Research³</i>	Brazil	English	Biology	0.824	1875	5839	3.114
11	<i>Revista de Biología Tropical³</i>	Costa Rica	Multilingual	Biology	0.22	1367	1522	1.113
12	<i>Bioceff³</i>	Argentina	Spanish	Cell Biology	0.569	287	186	0.648
13	<i>Boletín de la Sociedad Chilena de Química / Journal of the Chilean Chemical Society³</i>	Chile	English	Chemistry, Multidisciplinary	0.386	705	908	1.287
14	<i>Esclética Química</i>	Brazil	Portuguese/English	Chemistry, Multidisciplinary	0.085	165	72	0.436
15	<i>Journal of the Brazilian Chemical Society³</i>	Brazil	Multilingual	Chemistry, Multidisciplinary	1.161	894	2074	1.161
16	<i>Química Nova³</i>	Brazil	Portuguese/Spanish	Chemistry, Multidisciplinary	0.627	1245	1960	1.574
17	<i>Brazilian Journal of Chemical Engineering³</i>	Brazil	English	Engineering, Chemical	0.212	312	192	0.615
18	<i>Ingeniería Química³</i>	Uruguay	Spanish	Engineering, Chemical	0.069	77	0	0
19	<i>Latin American Applied Research³</i>	Argentina	English	Engineering, Chemical	0.31	309	163	0.528
20	<i>Ingeniería Hidráulica en México³</i>	Mexico	Spanish	Engineering, Civil	0.232	207	57	0.0275
21	<i>Visión Tecnológica</i>	Venezuela	Spanish	Engineering, Petroleum	0.118	176	125	0.71
22	<i>Revista Geológica de Chile³</i>	Chile	Spanish/English	Geology	0.912	169	335	1.982
23	<i>Ciencias Marinas³</i>	Mexico	Spanish	Marine & Freshwater Biology	0.391	320	513	1.603
24	<i>Boletim da Sociedade Brasileira de Matemática / Bulletin of the Brazilian Mathematical Society³</i>	Brazil	English/French	Mathematics	0.235	71	52	0.732

Table 1. (cont.)

No.	Titles	Country	Language	Category	IF		Citations	IF
					2004	1995-2003		
25	<i>Boletín de la Sociedad Matemática Mexicana</i> ^a	México	English/French	Mathematics	0.289	115	55	0.478
26	<i>Acta Bioquímica Clínica Latinoamericana</i> ^b	Argentina	Multilingual	Medical Laboratory Technology	0.069	349	77	0.221
27	<i>Medicina Buenos Aires</i> ^c	Argentina	Spanish	Medicine, General & Internal	0.324	1401	1465	1.046
28	<i>Revista de Investigación Clínica</i> ^d	México	Spanish	Medicine, General & Internal	0.227	785	665	0.847
29	<i>Revista Médica de Chile</i> ^d	Chile	Spanish/English	Medicine, General & Internal	0.273	2098	2131	1.016
30	<i>West Indian Medical Journal</i> ^e	Jamaica	English	Medicine, General & Internal	0.209	646	626	0.969
31	<i>Archives of Medical Research</i> ^f	México	English	Medicine, Research & Experimental	1.286	898	2141	2.384
32	<i>Atmosfera</i> ^g	México	Spanish	Meteorology & Atmospheric Sciences	0.281	143	165	1.154
33	<i>Revista de Microbiología / Brazilian Journal of Microbiology</i> ^h	Brazil	English	Microbiology	0.122	584	601	1.029
34	<i>Anais da Academia Brasileira De Ciências</i> ^h	Brazil	Multilingual	Multidisciplinary Sciences	0.435	196	230	1.173
35	<i>Interciencia</i> ^g	Venezuela	Multilingual	Multidisciplinary Sciences	0.21	649	475	0.732
36	<i>Arquivos de Neuro-Psiquiatria</i> ^h	Brazil	Multilingual	Neurosciences	0.401	1620	1497	0.924
37	<i>Revista Ecuatoriana de Neurología</i> ^h	Ecuador	Spanish	Neurosciences	0.125	147	60	0.408
38	<i>Archivos Latinoamericanos de Nutrición</i> ^h	Venezuela	Multilingual	Nutrition & Dietetics	0.108	602	547	0.909
39	<i>Ameghiniana</i> ^g	Argentina	Spanish	Paleontology	0.702	264	420	1.591
40	<i>Memorias do Instituto Oswaldo Cruz</i> ^h	Brazil	English	Parasitology	0.74	1925	4667	2.424
41	<i>Brazilian Journal of Physics</i> ^h	Brazil	English	Physics, Multidisciplinary	0.435	577	916	1.588
42	<i>Revista Mexicana de Física</i> ^h	México	Spanish/English	Physics, Multidisciplinary	0.229	1353	697	0.515
43	<i>Archivos de Medicina Veterinaria</i> ^h	Chile	Multilingual	Veterinary Science	0.1	348	250	0.718
44	<i>Arquivo Brasileiro de Medicina Veterinaria e Zootecnia</i> ^h	Brazil	Multilingual	Veterinary Science	0.092	791	332	0.42
45	<i>Pesquisa Veterinaria Brasileira</i> ^h	Brazil	Portuguese/English	Veterinary Science	0.373	175	190	1.086
46	<i>Revista Científico-Facultad de Ciencias Veterinarias</i> ^h	Venezuela	Multilingual	Veterinary Science	0.051	533	156	0.293
Totals:					20.434	30979	39034	50.301
Average:					0.444	673	848	1.093

Table 1. (cont.)

No.	Titles	Country	Language	Category	IF 2004	Papers 1995-2003	Citations 1994-2004	IF General
47	<i>Trimestre Económico</i> ^{1,3}	Mexico	English	Economy	0.067	251	38	0.151
48	<i>Desarrollo Económico-Revista de Ciencias Sociales</i> ^{2,3}	Argentina	Spanish	Economy, Social Sciences	0.119	304	67	0.22
49	<i>Salud Mental</i> ^{2,3}	Mexico	Spanish	Psychiatry, Medicine	0.726	471	561	1.191
50	<i>Revista Latinoamericana de Psicología</i> ^{2,3}	Colombia	Spanish	Psychology	0.15	443	139	0.314
51	<i>Revista Mexicana de Psicología</i> ^{2,3}	Mexico	Spanish	Psychology	0.159	558	104	0.186
52	<i>Salud Pública de México</i> ^{2,3}	Mexico	Spanish	Public Health, Medicine	0.266	856	1041	1.216
53	<i>Revista de Saude Pública</i> ^{2,3}	Brazil	Spanish	Public Health, Medicine	0.235	889	971	1.092
54	<i>Dados-Revista de Ciencias Sociais</i> ^{2,3}	Brazil	Multilingual	Social Sciences	0.037	201	121	0.602
55	<i>Eure-Revista Latinoamericana de Estudios Urbanos Regionales</i> ^{2,3}	Chile	Multilingual	Urbanism	0.439	125	13	0.104
Totals:					2.198	4098	3055	5.076
Average:					0.244	455	339	0.564

Source: Science Citation Index and Social Science Citation Index: 1995-2003

¹ Result of the division between citations (1995-2004) and published papers (1995-2003).

² Social Science Citation Index.

³ Current Titles

As far as the preferred publishing language is concerned, 16 publish their articles only in Spanish, 13 only in English, 1 only in Portuguese, 14 publish in English or French besides the respective local language, 11 use bilingual formats. It is interesting to note that LA-C journals in Mathematics have a long tradition of publishing only in English or French.

The 55 LA-C journals are spread over 33 different JCR categories: 26 correspond to SCI journals (mainly biology, chemistry, medicine, engineering, and multidisciplinary subjects), and 7 in the SSCI, the categories that dominate are public health, psychology, social sciences, and economics. Given this dispersion, overall data are presented, as well as those for the two separate indexes. The general data may be useful to characterize the performance of each of the 55 LA-C journals. The last column contains the general IF obtained for each journal in the period 1995–2003, while the last row includes regional averages 1995–2003 for each item: 637.7 papers/journal, 765.2 citations/journal, 0.411 for the average IF of the LA-C journals for 2004 and 1.006 for the general IF of the regional journals for the period 1995–2003. We can appreciate that most of the Brazilian journals are responsible for the highest values for each indicator, while a Mexican journal, *Revista Mexicana de Astronomía y Astrofísica* (RMAA), has been leading the whole LA-C group with the highest JCR IF during the last ten years. The RMAA has been situated in the top third of the rankings for all astronomy & astrophysics journals included in the SCI.

Nine of the 55 LA-C journals numbers 7, 10, 15, 16, 27, 31, 36, 40 and 41, in Table 1, have all their respective indicators above the regional averages. There is another group of 11 journals numbers 1, 2, 3, 11, 28, 29, 30, 35, 38, 42 and 44, with a high rate of published articles but very low IFs. As expected, the production and citation patterns of the SCI journals are distinct from those of the SSCI journals: 673 SCI papers/journal compared to 455 SSCI; 848 SCI citations/journal and 339 SSCI; 0.444 for the average SCI IF for 2004 and 0.244 for SSCI; 1.093 for the SCI general IF and 0.564 SSCI). There are two exceptions: *Revista de Saude Publica* and *Salud Publica de Mexico*, which have average numbers of papers, citations and general IFs greater than the averages for the group of SCI journals as a whole.

The highest IF values for the universe of 55 LA-C journals were obtained by the RMAA (3.296), *Biological Research* (BR, 2.173) and *Archives of Medical Research* (AMR, 1.286). These IF values correspond also to the top values ever obtained by any LA-C journal in the SCI/SSCI. RMAA reached in 2004, the 12th position among 45 journals in the JCR rankings for the category of astronomy and astrophysics. BR climbed from the 38th position out of 53 titles to the 17th position among 64, in the JCR biology category while AMR reached in only a few years, the 43rd ranking position out of 72 journals in the category of medicine, research and experimental. It is important to stress the latter case, since AMR occupied for several years the last places in this category until its editors decided to change their publishing policy. All papers are

now published in English and the original Spanish title *Archivos de Investigación Médica* changed to the current *Archives of Medical Research*. Specifically, this journal may be considered as one of the most successful cases where a LA-C journal attracts enough interest in the international research environment to allow a change from a purely local journal, publishing papers only in Spanish, to an English-only policy and publication by a renowned international publishing house, Elsevier. Due to the change of publisher *Archives of Medical Research* is no longer classified as a Mexican journal in the SCI. However, more than 50% of its papers and the citations they receive come from the Mexican scientific community.

In Table 2 we have organized the 35,077 papers published by all 55 journals as well as the 42,089 citations they received in this period according to the geographical classification already mentioned. A small proportion of papers (4%) do not have an explicit, identifiable institution or respective country in the SCI and SSCI records and thus it was not possible to assign them to any of the three geographical categories (a), (b) and (c).

Table 2. Origin of papers, cited papers and accumulated citations

Origin	Total papers	% total papers	Total cited papers	% cited papers	Total citations	% total citations
Local	27281	78	11302	76	30488	72
Regional	3649	10	1540	10	4025	10
External	2897	8	1362	9	5161	12
Unknown origin	1250	4	609	4	2415	6
Totals	35077	100	14813	100	42089	100

Of the total of 35,077 papers, 42% (14,813) had been cited at least once. Most of the published papers are of local origin (78%), with few of regional (10%) and external (8%) origin. Seventy-seven percent of those of external origin were in English, 20% in Spanish, 2% in Portuguese and 1% in French. Furthermore, 94% of the local papers are strictly local, in the sense that all the authors' institutions are located in the same country where the respective journal is edited. The other 6% correspond mainly to papers involving local authors publishing in international collaborations. The same pattern is reproduced for the 3,649 regional papers: 86% of them involve authors coming from a single LA-C country. While local or regional papers received on average one citation per article, the external papers attained 1.8 citations per paper in this period.

There is very low influence of the geographical origin of the authors on the publication/citation patterns shown in Table 2. In each case, about 3/4 of all papers come from local authors, about 10% of them are associated, respectively, to regional or external authors and finally about 5% did not have an identifiable geographical origin. Since the number of papers published in the 55 LA-C journals by foreign authors is rather small, they did not have an appreciable influence on the overall IF of each journal. However, there is a small group of journals which deviate from the above

patterns. Six journals, numbers 4, 24, 25, 32, 37 and 55, had more than 20% of their published papers associated to foreign authors. On the other hand, the following group numbers 1, 2, 3, 14, 16, 21, 33, 36, 39, 44, 45, 46, 49, 52 and 53, had more than 90% of their published papers coming from purely local authors. All these journals, with the exception of *Ameghiniana*, had very low IFs.

There is another group of LA-C journals, numbers 11, 18, 19, 30, 35, 37, 38 and 43, with a predominantly regional market and which are linked to regional scientific communities. All these journals also have very low IFs. Table 3 contains the relation of the citations generated by all the LA-C papers involved in this study, according to the geographical origin of the authors' institutions of the citing papers.

Table 3. Origin of citing papers

Citing origin	No. of citations	% citations
Local	21191	50
Regional	4488	11
External	15975	38
Unknown origin	435	1
Totals	42089	100

The total numbers of citations (42,089) are distributed over approximately 4,000 SCI/SSCI journals. About 50% came from the same set of LA-C journals and a healthy 38% from foreign journals. We can appreciate that there is no direct correlation among the three geographical zones: for example, local communities published 78% of the papers, received about 72% of the citations but generated only 50% of the total number of citations, while the external communities, which published 8% of the papers, received 12% of the citations but produced 38% of the citations. The regional communities had contributions of about 10% in each category. We can see once again that the local papers received proportionally many more citations from foreign authors than those from their local communities. With respect to the overall origin of the citations, 50% are local citations, 11% regional and 38% external. Nonetheless, some titles show specific patterns. For instance, papers published in the following journals: numbers 4, 11, 30, 35, 38, 50 and 55, are cited mainly by the regional community. The following journals: numbers 4, 9, 24, 25 33 and 50, received most of their citations from foreign authors. Finally, the following set of journals: numbers 1, 21, 26, 29, 39, 46 and 49, got more than 90% of their citations from local authors.

In Table 4 we include the 9 relations obtained for the cited/citing patterns according to the origin of the respective papers. The most frequent relation is obtained for papers having the same geographical origin. For example, the combinations (1) external-external, (4) local-local and (7) regional-regional represent, respectively, 60%, 57% and 44% of the possible combinations.

Table 4. Relations between origin of the cited and citing papers

Relation	Origin papers cited	Papers	%	Origin papers citing	Citations	Average citation	% general
1	External	1101	60	External	3596	70	3.27
2	External	500	27	Local	1122	22	2.24
3	External	244	13	Regional	405	8	1.66
	Total 1	1845	100		5123	100	0.36
4	Local	8282	57	Local	18340	61	2.21
5	Local	5009	34	External	9704	32	1.94
6	Local	1362	9	Regional	2160	7	1.59
	Total 2	14653	100		30204	100	0.49
7	Regional	946	44	Regional	1739	43	1.84
8	Regional	789	37	External	1569	39	1.99
9	Regional	398	19	Local	702	18	1.76
	Total 3	2133	100		4010		0.53

The combination external-external for published/citing papers has the highest international visibility with 3.27 citations per paper, while the local-local combination generated 2.21 citations/paper. The majority (67%) of the local papers cited locally are in English and 32.5% in the local languages (16.36% in Portuguese and 16.15% in Spanish). *Tropical Agriculture* has the highest percentage (over 50%) of published papers and citations coming from external authors. However, it had the lowest JCR IF in the period (0.024) and this fact could have influenced its disappearance from the SCI.

The journals with clear endogamic patterns for published/citing papers are the following: numbers 1, 2, 3, 26, 29, 39, 44, 45, 46, 49 and 54. All of them, except *Ameghiniana* (39) and *Salud Mental* (49), have the lowest IFs among the group of 55 LA-C journals.

The preferred languages for publication are 47% of papers in English, 34% in Spanish, 18.5% in Portuguese and 0.5% in other languages. Citations were predominantly in English (79.8%) with 11% in Spanish, 7.8% in Portuguese and the remaining 1.5% in other languages.

Table 5 shows the relationships between the languages of the published papers (cited language) and those of the citing papers (cited language) ranked by frequency of the total number of citations pertaining to each combination of languages. The most frequent relationship is between cited and citing papers in English (61.19%) and between cited papers in Spanish and citing papers in English (12.24%). The dual combination of cited and citing papers in the local languages is 8.78% for Spanish and 6.30% for Portuguese. We found little cross-language citing between papers written in these two local languages, less than 1% of all citations.

Table 5. Relations between publishing languages of the cited and citing papers

Ranking	Cited language	Citing language	Citations	% citations
1	English	English	25750	61.19
2	Spanish	English	5151	12.24
3	Spanish	Spanish	3693	8.78
4	Portuguese	Portuguese	2651	6.30
5	Portuguese	English	2631	6.25
6	English	Spanish	793	1.88
7	English	Portuguese	443	1.05
8	Spanish	Portuguese	207	0.49
9	Portuguese	Spanish	154	0.37
10	English	French	134	0.32
11	Spanish	French	111	0.26
12	English	German	69	0.16
13	French	English	50	0.12
14	Spanish	German	32	0.08
15	English	Russian	31	0.07
16	French	Spanish	25	0.06
17	Others	Others	164	0.38
		Totals	42089	100.00

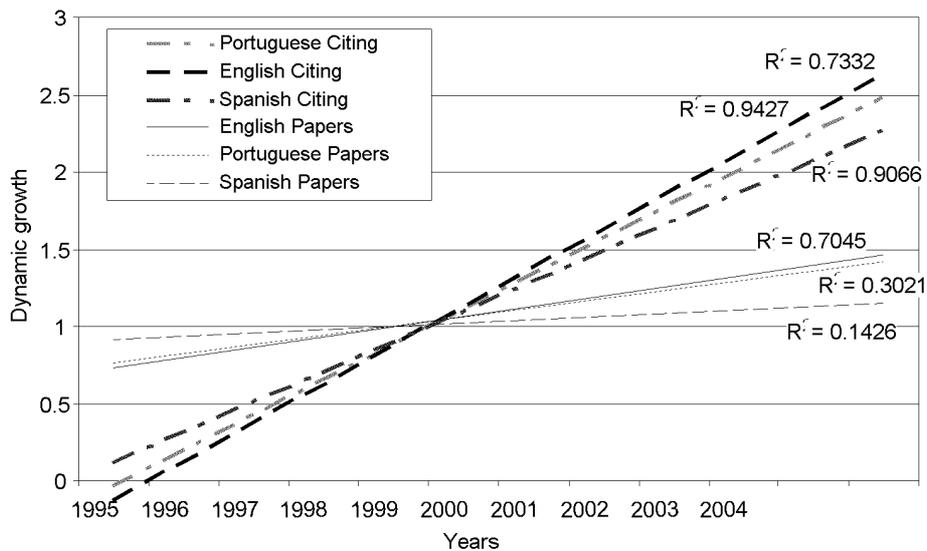


Figure 1. Growth dynamics of papers and citing papers with respect to language of publication

Finally, in Figure 1 we depict the dynamical growth obtained during this period for the papers published in the 55 LA-C journals, as well as their respective citations. We have organized this information according to the language used in each case. Here we can also appreciate the change in preference from publication in local languages to

English. The best growth dynamics in the number of citations is obtained for the citing papers in English ($r^2 = 0.9427$) and the worst is obtained for citing papers in Portuguese ($r^2 = 0.7332$). This means that the citing relation became weaker for papers published in Portuguese. The growth dynamics of published papers show a clear loss of preference for local languages in favor of English. This is especially true in the case of Spanish ($r^2 = 0.1426$).

Discussion

The increase in the number of journals from LA-C in the SCI and SSCI, from 35 titles in 1995 to 55 titles in 2004, represents a percentage increase of 36%, more than twice the 22% increase for all journals covered by the ISI, from 4625 to 5969 in the same period [INSTITUTE FOR SCIENTIFIC INFORMATION, 1995, 2004]. Quantitative indicators show the LA-C journals are better positioned in the ISI rankings than ever before, as shown by improvements in IFs achieved by some titles. The increased presence of LA-C journals, the continuity of these journals in the indexes, and a global increase in production are some of the factors which might be responsible for this trend [LUNA-MORALES & COLLAZO-REYES, 2007]. This growth stage is more the result of a history of important individual efforts [KRAUSKOPF, 1992] and institutional initiatives, rather than a generalized success of this group of journals, resulting from the implementation of appropriate national and regional policies. However, in the particular case of the Mexican journals, a policy to create a list of quality national journals and offer financial assistance dating from 1993 has helped to improve their international visibility and impact [BONILLA & PEREZ-ANGON, 1999]. Likewise, authors such as MENEGHINI & PACKER [2007], attribute the increased visibility and impact of LA-C research to the development of the regional information system SciELO, principally with respect to the Brazilian publications which make up the bulk of the full text titles offered. These changes have brought about increased diversity in the journals which characterize the region, thus adding to the difficulty of identifying common publication and citation patterns.

Nonetheless, the increased presence of LA-C journals is seen as poor [SANCHO & AL., 2006] when considering the dynamic growth experienced by Latin American science in the same period. LA increased its production in ISI from 10,805 documents in 1990, to 42,085 in 2005 [INSTITUTE FOR SCIENTIFIC INFORMATION, 2006] increasing its contribution to world science from 1.9% in 1995, to 3.5% in 2003 [CONSEJO NACIONAL DE CIENCIA Y TECNOLOGÍA, 2006]. This suggests that the improvement seen in the ISI coverage of LA-C journals is associated with an historic escalation in the scientific publication activity of the region.

Some regional journals show a tendency towards endogamic practices with a marked preference for publishing papers of authors from the same countries that edit the

journals and, to a lesser extent, from other countries of the region. The little opening given to publication by specialists from other areas of the world, either as individual authors or collectively with or without participation of regional scientists, or perhaps the inability of regional titles to attract contributions of this kind, has resulted in an insignificant presence of communities from outside the region. These trends are not in keeping with the increases found in the collaboration of LA scientists in mainstream journals as a whole. For instance, an increase of 2000% was found from 1975 to 2004, in the number of mainstream papers resulting from intraregional collaborations between two or more LA countries [RUSSELL & AL., 2007] as well as an increase of 36.6% in ISI papers published between 1999 and 2002 by LA-C scientists in international collaboration generally [SANCHO & AL., 2006]. This same level of international collaboration is also reported for one of LA most productive institutions [RUSSELL & AL., 2006].

When we consider the averages of 1.1 citations for local and regional papers, and 1.8 for those in international collaboration, the scarcity of the latter has afforded them little influence in the overall citation patterns of the LA-C journals.

In the present study, more than 50% of papers published by the LA-C journals were found to be uncited in comparison with the 33% reported for the same types of papers published by LA scientists in the mainstream literature from 1973 to 2005 [COLLAZO, 2006].¹ This implies that papers sent by local, regional and external researchers to LA-C journals are less likely to be cited than those sent to other mainstream titles. For example, only one paper of the 775 most cited mainstream papers, all having 100 citations or more, from the LA-C scientific community and published between 1995 and 2003, was published in a local journal: *Brazilian Journal of Physics*, in 1999 [COLLAZO, 2006]. Additionally, of the 63 mainstream papers published by Mexican physicists with more than 100 citations from 1959 to 2000, not one was published in a LA-C title [GOTTDINER, 2006].

The LA-C journals covered by ISI represent, in practice, a subdivision of mainstream journals destined to publish studies of minor importance in terms of the number of citations they receive. Our results show that papers from LA-C journals are proportionally less cited by their own local and regional communities. The number of papers published by local scientists in the period under study was greater than the number of citations they gave. The majority of these papers are disregarded by their own communities as shown by the fact that only 8,282 citations were given to the 27,281 papers published during the nine years analyzed.

¹ COLLAZO-REYES, F. Ciencia visible y “escondida” de América Latina y el Caribe. Paper presented in the Colloquium of the Department of Physics, CINVESTAV, Mexico City. December 6, 2006.

The most productive relationships between cited and citing papers was, firstly, with respect to external papers in both categories; secondly, between external citations and local papers and, thirdly, between local papers and local citations. The relation between regional citations and papers was the least frequent and the least productive.

Among the more established journals in terms of IF, are those who deviate most from the generalized publication patterns. These titles show greater publication in English and an increased presence of papers from outside the region, mainly from the larger scientific communities and more traditional topic areas.

The lesser consolidated journals in terms of the average number of citations and IFs, are the clearest cases of endogamic publication-citation practices with publication coming mainly from local communities and the citations from the same journal. Journals in the fields of agriculture, veterinary science, and social science are cases in point, as are the titles that publish predominantly regional papers. Journals in engineering, technology, chemistry, biology, microbiology, mathematics, clinical medicine, and public health are also among the least cited titles.

The communication patterns resulting from the production and citation process of the LA-C journals present a publication structure concentrated on papers written in Spanish, Portuguese and English, as well as a citation structure based on 16 combinations dominated by the English language: English-English, English-Spanish, Spanish-Spanish, Portuguese-Portuguese and English-Portuguese. The relationships Portuguese-Spanish and Spanish-Portuguese are among the least common and occur only occasionally.

Changes were found in the preferred languages for publication between the first and second half of the study, due to a continuing loss to English of the two local languages of the LA region. This was more marked in the case of Spanish which has fallen from its first position during this growth period and is likely to continue to lose importance as the principal language for local scientific communication in the region. On the other hand, Portuguese shows an increase in its levels of publication and citation proportional to the growth dynamics in the preference for English.

In conclusion, the present study has drawn the following correlations: the LA-C journals with the highest impact factors (IF) also have the highest percentage of citations and papers published by authors coming from foreign countries, i.e. countries located outside the LA-C geographical region. The lowest IFs correspond to the LA-C journals with the highest percentage of self-citations and, most of the time, these journals have a large percentage of published papers in local languages (Portuguese or Spanish). It is thus not surprising to verify that the papers published in English in the 55 LA-C journals generated the largest percentage of citations in all the SCI/SSCI journals.

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