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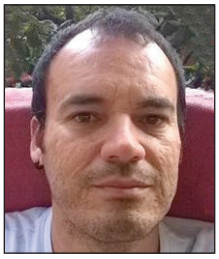
Ciencia regional y global: publicaciones de América Latina y el Caribe en el *SciELO Citation Index* y la *Web of Science*

Gabriel Vélez-Cuartas, Diana Lucio-Arias, and Loet Leydesdorff



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Abstract

In this article the authors compare the visibility of Latin American and Caribbean (LAC) publications in the *Core Collection* indexes of the *Web of Science* (*WoS*) including *Science Citation Index Expanded*, *Social Sciences Citation Index*, and *Arts & Humanities Citation Index*, and the *SciELO Citation Index* (*SciELO CI*) which was integrated into the larger *WoS* platform in 2014. The purpose of this comparison is to contribute to the broader understanding of the communication of scientific knowledge produced in Latin America and the Caribbean, and to provide some reflections on the potential benefits of the articulation of regional indexing exercises into *WoS* for a better understanding of geographic and disciplinary contributions. How is the regional level of *SciELO CI* related to the global range of *WoS*? In *WoS*, LAC authors are integrated at the global level in international networks, while *SciELO* has provided a platform for interactions among LAC researchers. The articulation of *SciELO* into *WoS* may improve the international visibility of the regional journals, but at the cost of own journal inclusion criteria independence.

Keywords

Journals; Databases; Index; *SciELO*; *WoS*; *Web of Science*; Latin America; Caribbean.

Resumen

Comparamos la visibilidad de las publicaciones de América Latina y el Caribe (LAC) en la colección principal de índices de *Web of Science* (*WoS*) –*Science Citation Index Expanded*, *Social Science Citation Index,* y *Arts & Humanities Citation Index* y *SciELO Citation Index* (*SciELO CI*), el cual fue integrado en la plataforma de *Web of Science* en 2014. El propósito de esta comparación es contribuir al entendimiento de la comunicación del conocimiento científico producido en Latinoamérica y el Caribe, y presentar algunas reflexiones sobre el potencial beneficio de la articulación entre los ejercicios de indexación regional con *Web of Science* para un mejor entendimiento de las contribuciones geográficas y disciplinarias. ¿Cómo está el nivel regional de *SciELO CI* comparado con el global de *WoS*? En *WoS*, los autores de Latinoamérica y el Caribe están integrados en el nivel global de las redes internacionales; *SciELO CI* ha provisto una plataforma de interacción entre investigadores de América Latina y el Caribe. La articulación de *SciELO* en la *Web of Science* podría mejorar la estandarización internacional (por ejemplo, de referenciación) en las revistas regionales, pero al precio de perder independencia en los criterios de inclusión de las propias revistas.

Palabras clave

Revistas; Bases de datos; Índice; *SciELO*; *WoS*; *Web of Science*; América Latina; Caribe.

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1. Introduction

The development of scientific capacities in Latin America and the Caribbean (LAC) face multiple challenges, including limited investments in R&D, low participation of researchers and qualified personnel in the labor force, insufficient infrastructure and specialized laboratories, and inadequate circulation and visibility of research results. *Nature's* (2014) special issue about research in the South American continent raised some of these issues, but also highlighted some elements that could be causing "underestimation" of LAC research. This issue was revisited again by *Nature* in 2015. In this latter article some promising fields of research were indicated, in which LAC researchers can improve their visibility in the short term.

Authors from Latin America and the Caribbean tend to publish in regional and local journals. Brazil, which accounts for half of the scientific output of the LAC region in the *Science Citation Index* (**Barrere**, 2013), publishes approximately 40% of its scientific production outside the *Core Collection* of the *Web of Science* (**Mugnaini**; **DiGiampetri**; **Mena-Chalco**, 2014). However, the inclusion of LAC-edited journals in *Thomson Reuter*'s and *Elsevier*'s main indexing services (*WoS* and *Scopus*) has increased over time (**Testa**, 2011). The number of publications with at least one author affiliated to an institution in LAC has also increased. The number of publications from all Latin American and Caribbean countries (with the exception of Venezuela) has increased during the last 15 years (**Van-Noorden**, 2014). However, part of

this growth can be explained by the increased number of regional journals included in the databases. The share of research articles from LAC countries is still approximately four percent in the indexing services, which is lower than the share of the region in the world population or world GDP. The latter has been estimated as between five and six percent (**Van-Noorden**, 2014).

> "Some elements could be causing "underestimation" of Latin America and the Caribbean (LAC) research"

Growth in the number of LAC contributions in recognized databases of scientific publications has been interpreted as a successful integration of the region into the global system of scientific communication. This integration takes place despite a gap in the production of high-quality journals in LAC, which has been documented elsewhere (e.g. **Meneghini**; **Mugnaini**; **Packer**, 2006) and the predominance of Spanish and Portuguese as preferred languages by most researchers in the region. Through an Open Access platform, *SciELO* has provided visibility to LAC research results with important spillovers to improve the quality and reduce language barriers. First, by providing a set of clearly defined requirements to enter the platform, *SciELO* has disseminated international norms and quality standards among the region's editors. This has also been the case in Spain, where compliance with *SciELO*'s set of technical requirements and format norms requires editors to invest time in organizing their information and metadata (**Fraga-Medín**; **Bojo-Canales**; **Hernández-Villegas**, 2006). Second, by defining a classification and evaluation system for the journals in the region, *SciELO* has served as a communication system for researchers who prefer to publish in their mother tongue: in 2013, only 33.62% of the journals in *SciELO* had English as the main language.

SciELO's contribution to global science relies on its impact in the circulation and visibility of LAC's scientific production. Although the real impact of the *SciELO* exercise has yet to be measured, *SciELO* has become an important tool for the development of scientific capabilities in LAC during the last 15 years (**Delgado-Troncoso**, 2011). Its main goal has been to increase the participation of the region in "world class" scientific results, particularly through the consolidation of a regional base of high-quality scientific journals (**Packer** *et al.*, 2014). The financial requirements to maintain such an updated, expanding, and relevant exercise (**Aguillo**, 2014), together with the potential of journals indexed in *SciELO* to provide a representation of LAC science, may explain the interest behind the inclusion of the regional exercise in the databases owned by *Thomson Reuters* (**Testa**, 2011).

The inclusion of *SciELO* in *WoS* has had a mixed reception in the LAC scientific community. In 2007, an alliance between *Scopus* and *SciELO* first raised expectations that all *SciELO* information would be included in *Scopus* (*Elsevier*, 2007). The potential impacts of the inclusion of the journals, and the ambiguity of whether all *SciELO* journals would be included, raised concerns in the LAC scientific community[1]. The negotiations thereafter about *SciELO*'s inclusion either in *Scopus* or *WoS* were perceived by some editors of LAC journals as a "sell-out" of *SciELO*'s principles, which generated uncertainty about the future of the regional journal structure that *SciELO* had aimed to consolidate.

With this paper we hope to contribute to the discussion about the role of both indexes in LAC scientific communication. In the next section we introduce the data and methods employed in this study. The results section focuses on the differences among the indexes, specifically on the geographical and collaborative aspects, and on the disciplinary characteristics of the communications in each of them. We finish this contribution with some reflections on the challenges and opportunities of the integration of *SciELO* into *WoS*.

2. Data and methods

Using a search query for all LAC countries AND publication year 2013 in *WoS*, 92,900 documents were retrieved on June 6, 2015. We did not use 2014 in order to avoid indexation delays and incomplete pictures of the yearly results. The same information was downloaded for 29,729 documents that responded to the same search query in the *SciELO CI* online available through *WoS*. The organization of this information into relational databases was possible through dedicated routines, respectively available at: *http://www.leydesdorff.net/SciELO*

Table 1*. Differences in the sets of LAC publications from *SciELO CI* and *WoS Core Collection*

LAC publications	***SciELO CI***			***WoS* Core Collection**		
N. of records	29,654			92,900		
Statistics	N	μ	σ	N	μ	σ
Authors**	88,943	3.69	2.34	266,755	11.06	111.60
Addresses	10,666	2.33	1.57	187,036	3.60	11.68
Times cited	4,424	0.15	0.55	200,045	2.15	6.78
Cited references	694,935	28.29	18.80	2,252,759	36.56	30.10
Subject categories	190	1.24	0.74	285	1.50	0.70
Indexed sources ***	771	38.46	40.80	9,090	10.22	29.41

* This table shows the number of authors, addresses, citations, references, and subject categories listed in *WoS* and *SciELO CI*. Mean and standard deviation derive from distribution of the articles in each each of the indexes. Indexed sources are the total number of journals; mean and standard deviation represents the proportion of articles published in each source.

** We use author, addresses, and references data without normalization. Only for author forms, we assume that two author names which coincide completely in terms of the last name and at least two initial of the first name are the same form. Accent marks in author names were corrected as well.

*** We counted the number of sources containing scientific production with LAC addresses in each of the indexes; the mean and the standard deviation are based on the numbers of papers per source.

and
http://www.leydesdorff.net/software/isi

In order to assess some of the differences in the sets of data considered in this analysis, we provide some descriptive statistics in table 1. We include the mean (μ) and the standard deviation (σ) to provide some order of magnitude and dispersion among the attributes. The differences among the types of communications included in each set are considerable. Among other things, table 1 shows that the documents in journals indexed in *WoS* have on average more citations, and result more frequently from collaborations among larger numbers of authors. These are most often from European or American institutions. Furthermore, these documents are more codified (in terms of the cited references used) and, on average, have a significantly larger impact (in terms of citations received).

> The inclusion of *SciELO* in *WoS* has had a mixed reception in the LAC scientific community

The mean and standard deviation of the category "sources" provides the average number of documents with LAC authors per journal or source (proceedings and books are hereby included). Although there are fewer journals in *SciELO CI* than in *WoS* (771 *vs* 9,090; see table 1), the dispersion among the different source names is greater in *SciELO CI*. As expected, *SciELO CI* indexed journals have a larger participation of LAC authors than *WoS* journals: LAC authors (co-) author 75,1% of the publications in *SciELO CI*, while this participation is lower than 5% in *WoS* (in June 2015, a total of 2,352,374 documents were included in *WoS* with publication year 2013, and 39,477 in *SciELO CI*). A total of 163 of these journals are indexed in both *WoS* and *SciELO CI*.

We used the *Overlaymaps Toolkit* available at:

http://www.leydesdorff.net/overlaytoolkit (**Rafols**; **Porter**; **Leydesdorff**, 2010) to provide visualizations of the relations among disciplines in each of the document sets (*SciELO CI* and *WoS Core Collection*).

First, we retrieve a set of documents at the *WoS* and *SciELO CI*. Then a Subject Categorie (SC) is assigned through the function Analyze provided in the *Web of Science*. A list of the number of articles present in each category is generated. This list can generate a map of science using Pajek in which the size of a node (SC) is proportional to the logarithm of the number of documents in that category (**Rafols**; **Porter**; **Leydesdorff**, 2010).

> *SciELO* has served as a communication system for researchers who prefer to publish in their mother tongue

To reflect upon the distinctions in the collaborative nature of the communications in each index, we built co-authorship networks between countries using Pajek. Collaborations were retrieved from each pair of co-authorships present in documents. All addresses were aggregated in five different regions and contrasted with each LAC country. We rely on these visualizations and descriptive statistics to present: (1) the dynamics of the scientific workforce (authorship, country affiliation, nature of publishing sources); (2) social integration in regional and global science (co-authorship dynamics, country, and regional affiliations); and (3) intellectual organization (overlay maps) in each of the sets of documents. We expect that substantial differences between the two databases will reflect diverse goals and interests in the management of each of the indexes, as discussed above. Furthermore, these three aspects of the dynamics can explain differences between the visibility regimes of publications in both databases.

Table 2. Country affiliation of papers in *WoS Core Collection* and *SciELO CI*

Country	*SciELO CI*			*WoS*		
	Records	Fractional	First author	Records	Fractional	First autor
Brazil	18,178	6,514.47	17,281	51,135	13,515.96	44,110
Colombia	2,801	1,467.52	2,516	4,996	1,586.22	3,369
Chile	2,438	1,315.47	2,154	8,146	2,628.24	5,402
Mexico	2,339	1,133.04	2,089	16,098	4,386.14	12,468
Cuba	1,852	947.85	1,666	1,268	359.5	870
Argentina	1,728	708.01	1,521	11,261	3,366.1	8,542
Venezuela	502	248.63	403	1,399	411.65	920
Peru	415	186.27	350	1,148	305.52	467
Costa Rica	387	200.60	295	588	171.05	267
Uruguay	92	43.98	61	1,005	278.52	591
Ecuador	57	22.90	32	597	154	233
Bolivia	34	21.57	21	101	14.54	10
Guatemala	10	3.70	7	70	9.02	9
Panama	26	7.34	15	439	120.42	124
Puerto Rico	19	11.13	14	n/a	n/a	n/a
Paraguay	20	5.78	15	51	6.62	
El Salvador	10	4.18	6	23	2.94	
Nicaragua	15	7.90	10	27	3.93	5
Honduras	3	0.78	2	32	3.67	5
Dominican Rep.	4	0.98	2	30	3.69	4

3. Results

Authorship and country affiliation

In this section, we provide some results about the differences between communications in the *Core Collection* of *WoS* and the recently integrated *SciELO CI*, focusing on the regional, collaborative and cognitive aspects underlying these communications (**Whitley**, 2000). In table 2, the number of records is provided in each of the sets by country of origin of the authors. In order to normalize for documents with co-authorships, we include a fractional count of the documents considering the total number of signing authors. To reflect on the position of the researcher in the list of authors, we included a column where the amount of records had an address in LAC as the affiliation of the first author.

The divergence in the countries' participation in the scientific production of LAC can result from the degree to which a specific country has been articulated in the *SciELO* program and the efforts to increase the *SciELO* journal list of each country. The most important *SciELO* journal collection comes from Brazil and includes 337 journal titles; Colombia follows with a total of 184 journal titles; Mexico has 149 titles; Argentina and Chile 107 and 106 journal titles, respectively. Another explanation is the specific countries' policies and the importance attributed to national scientific journals in this context. **Collazo-Reyes** (2014) provides a third explanation for this divergence. He states that in the period of 2006-2009 *WoS* increased the number of LAC journals included in the database from 69 to 248 titles. *Latindex*, which is the most comprehensive catalog of academic journals edited in LAC, allows one to certify the differences within the region in terms of the formalization of the academic journal structure. Considering *Latindex* and the incremental inclusion of LAC journals in the databases, we can observe differences in the participation of countries: Colombia has around 63% of its journals either in *SciELO* or *Scopus*, Mexico has 47%, Chile 39%, and each Argentina and Brazil just 29% of the journals listed in *Latindex* are in either *SciELO* or *Scopus* (**Codner**; **Miguel**, 2014; **Miguel**, 2011).

Policy efforts to support national scientific journals vary in the region; some countries privilege international publication while others aim at balancing international visibility with support to local journals and local publishers (**Vessuri**; **Guédon**; **Cetto**, 2013). Different publication strategies are also evident from table 2, where the effect of fractional counting seems to be more drastic for communications in journals indexed in the *WoS Core Collection* than in *SciELO CI*. In Colombia, for example, collaboration with international peers has increased the participation of authors based in the country in high-quality journals (**Lucio-Arias**, 2013). If we take into account the number of records, one can nonetheless argue that Colombia and Cuba envision a regional strategy due to the number of records available in *SciELO CI* in comparison with those available in *WoS* (half for Colombia and an even larger percentage for Cuba). Other countries show at least one-third or more entries in *SciELO CI* compared with those in *WoS*.

With respect to the first-author column in table 2, it is remarkable that more than 2/3 of the papers have a LAC researcher as first author. The participation of LAC researchers as first authors in the global production seems to be due to former post-doc and PhD students working in large international groups, and to the collaboration between research institutes in LAC and North American and European programs. LAC researchers participate in global research by participating in large research programs.

Publishing sources

We expect some of the differences in the communications to result from differences in the journals included in each of the indexes. Open access journals, which are supported by *SciELO*, are an outcome of the lack of interest by commercial publishers in the LAC region (**Vessuri**; **Guédon**; **Cetto**, 2013). To explore this issue further, we derive table 3 from the publisher's data available in both *WoS Core Collection* and *SciELO CI*. The classification is based on a search strategy for semantic elements that could distinguish companies (Ltd., Pub., Press, Edit., Verlag, Inc.), popular commercial publishers (*Springer*, *Elsevier*, *Wiley*, *Taylor & Francis*), and academic sources (Univ, Asso, Inst). This search strategy allowed us to classify almost all the publishing sources available in the databases and compare them in terms of overall frequencies and participation.

According to table 3, most publishing sources in *WoS* with documents from LAC authors come from commercial publishing houses. While the four largest companies publish almost 50% of the *WoS* journals with contributions from LAC authors, publication media issued by universities and professional associations roughly explain 13.6% of these journals. It is worth mentioning that in the case of *WoS*, journals from professional associations are often published by commercial publishing houses, for example *Wiley* for the case of *Jasist*, and therefore are considered in table 1 as commercial publishing rather than professional. This is opposite to what we find in *SciELO*, where journals from universities,

Table 3. Nature of publishing sources

Semantic root*	WoS	%	SciELO	%
Ltd	1,307	16.61	2	0.25
Pub	905	11.50	4	0.50
Press	640	8.13	1	0.13
Edit	93	1.18	34	4.28
Verlag	182	2.31	0	0.00
Inc	1,027	13.05	0	0.00
Springer	941	11.96	0	0.00
Elsevier	1,299	16.50	1	0.13
Wiley	840	10.67	0	0.00
Taylor & Francis	406	5.16	0	0.00
Univ	278	3.53	381	47.92
Asso, Soc	793	10.07	222	27.92
Inst	77	0.98	106	13.33
Total journals	7.871		795	

* Although the semantic roots could overlap (for example, "Wiley-Blackwell Inc." or "Springer Verlag"), we assigned only one of the semantic roots to each journal).

institutions, and associations contain the majority of contributions by LAC authors (89.1%).

This difference in the nature of publishing houses can have important effects on the nature of the scientific communications in each set of documents. Commercial publishing companies may be more willing to invest in communication strategies to increase visibility and prestige and improve indexation probabilities and positions. For academic institutions, similar strategies based on public relations and communication may well be less common. In this sense, the inclusion of *SciELO CI* into *WoS* appears as a win-win strategy: *SciELO*-indexed journals gain in visibility, while *WoS* gains in regional coverage.

> Most publishing sources in *WoS* with documents from LAC authors come from commercial publishing companies

Co-authorship dynamics and affiliations

The alliances and collaborations are reflected in important differences in the networks of collaboration that emerge from scientific communications with at least one author from LAC in each of the two indexes (see figures 1 and 2; tables 4 and 5). The co-authorship map based on *WoS* data (figure 1) shows a stronger integration of researchers from LAC with European and Asiatic peers than with the USA and Canada. The mediation of North American and European countries in the production of scientific knowledge in the region suggests a predominance of *global* topics of research in the *WoS* database. This is also suggested in table 1, where the average number of authors in *WoS* announces the participation of LAC in the highly collaborative science common in research projects of considerable magnitude, like the projects in the context of *CERN*'s accelerator. In many cases, these relations are maintained by (former) post-docs and PhD students who have spent time in these host countries.

In other words, collaboration of LAC countries with peers "from the North" dominates the scientific communications in which LAC scholars participate. Regional (LAC-LAC) collaboration seems not very relevant and even less important than collaborations with Asia, Africa, and Oceania. South-South collaboration has received a lot of attention in the political discourse (**Arunchalam**; **Doss**, 2000; **Chandiwana**; **Ornbjerg**, 2003) and has become an important issue in the development policy agenda (there is a *United Nations Office for South-South cooperation* with a website at: *http://ssc.undp.org/content/ssc.html*

Nevertheless, South-South collaboration, as depicted in figure 1, is mostly mediated by developed countries and does not necessarily represent a transfer and exchange of resources and knowledge among developing nations. Across-border collaboration among LAC countries appears weak in *WoS*.

In tables 4 and 5, we aggregated the LAC contribution in order to obtain a network of publications among world regions (LAC, Europe, Asia, USA+Canada, Africa, and Oceania) for the *WoS Core Collection* and *SciELO CI*, respectively. Table 4 first shows that the participation of LAC researchers in intra-European networks of collaborations is the main category in *WoS*. Secondly, LAC authors participate in collaboration networks with authors from Asia and Europe. Intra-LAC collaboration follows only at the 10th place.

In summary, international collaboration at the global level has a higher frequency than regional collaboration within LAC (**Wagner**; **Park**; **Leydesdorff**, 2015) on the basis of *WoS* data. Therefore, the role of geographical proximity in research

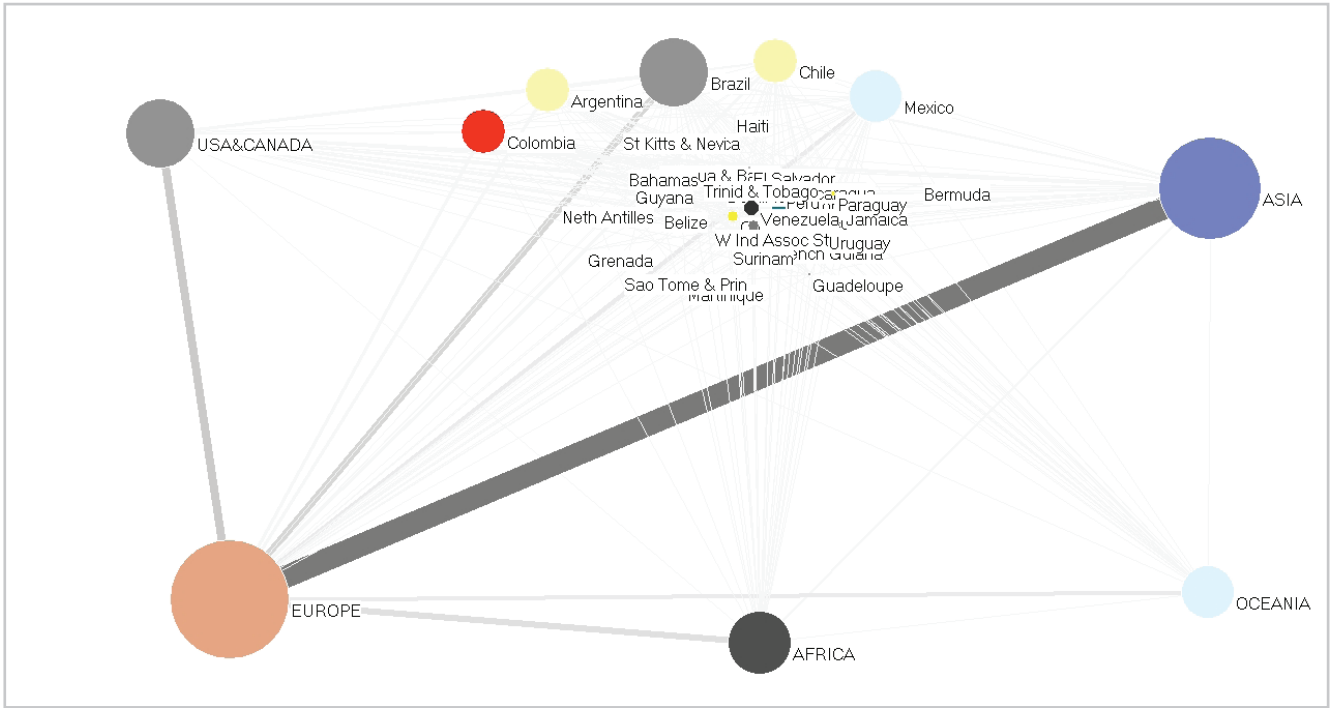

Figure 1. International collaboration including LAC authors in the *WoS Core Collection*.

Table 4. Collaborations in *WoS* documents with at least one address in LAC

Rank	Number	Collaboration
1	83,224	Europe-Europe
2	52,701	Asia-Europe
3	51,277	Europe-LAC
4	20,442	Europe-USA & Canada
5	17,925	USA & Canada-LAC
6	14,986	Europe-Africa
7	13,268	Asia-LAC
8	8,926	Europe-Oceania
9	8,841	Asia-Asia
10	8,384	LAC-LAC
11	6,131	Asia-USA & Canada
12	5,465	Asia-Africa
13	4,155	Africa-LAC
14	3,181	Oceania-LAC
15	3,014	Asia-Oceania
16	1,739	Africa-USA & Canada
17	1,655	Oceania-USA & Canada
18	1,080	USA & Canada-USA & Canada
19	936	Africa-Oceania
20	840	Africa-Africa
21	181	Oceania-Oceania

Note: In tables 4 & 5, the presence of co-authorship relations that are different from relationships between LAC countries and other regions occur due to the counting of each pair of relations that co-occur in a single document.

Table 5. Collaborations in *SciELO* documents with at least one address in LAC

Rank	Value	N
1	1,300	Europe-LAC
2	1,217	LAC-LAC
3	671	USA & Canada-LAC
4	98	Europe-Europe
5	92	Asia-LAC
6	66	Oceania-LAC
7	64	Africa-LAC
8	56	Europe-Asia
9	52	Europe-USA & Canada
10	24	Asia-USA & Canada
11	18	Africa-Europe
12	16	Asia-Asia
13	9	USA & Canada-USA & Canada
14	7	Oceania-Europe
15	6	Africa-Asia
16	4	Africa-USA & Canada
17	1	Africa-Africa
18	1	Africa-Oceania
19	1	Oceania-USA & Canada
20	1	Oceania-Oceania

*It was not possible to determine the country of origin in the case of 1,161 address records.

collaboration might become more readily apparent when relying on regional indexing exercises like *SciELO* (**Ponds**; **Van-Oort**; **Frenken**, 2007), because in international collaborations at the level of *WoS* the global network prevails.

This picture changes when considering contributions in *SciELO CI* indexed journals. The resulting map of collaborations (figure 2) suggests a more pronounced strategy based on the regional conjugation of research efforts. Collaboration with Europe is mainly oriented towards Spain and Portugal, suggesting that linguistic and cultural similarities are a strong motivation to collaborate.

> The inclusion of *SciELO CI* into *WoS* appears as a win-win strategy: *SciELO*-indexed journals gain in visibility, while *WoS* gains in regional coverage

Collaborations with Europe, and to a lesser extent with the USA and Canada, or Asia, remain strong in *SciELO CI*, but LAC authors seem less dependent on large-scale multinational collaborations. The more central position of LAC countries in the map suggests the importance of collaborations in strengthening and consolidating research capacities in the region. Despite the geographical proximity of the USA and Canada, Europe remains the main partner of authors in the LAC countries. Brazil, Colombia, and Mexico tend to have the highest rates of collaboration with Europe and the USA. The strong collaborative ties between Mexico and the USA may reflect their geographical proximity and economic relations (*Nafta*). Table 5 summarizes the results in a format directly comparable to table 4 (that is, at the level of world regions).

Although they deserve further research, collaborations in *SciELO* seem to show more South-South cooperation than *WoS*-based publications. As noted, these collaborations are important as exchanges of resources and ideas within and among developing countries to solve similar development problems. In table 5, LAC appears more visible in terms of participation in collaborations than in table 4. Moreover, regional (LAC-LAC) collaboration is ranked in the second place after Europe-LAC co-authorships.

In figure 2, collaborations within LAC, and with Africa or Asia, provide a stronger representation of South-South cooperation. We expect less mediation of the North in South-South collaborations in *SciELO CI*-indexed communications. However, we also find similarities with *WoS*-indexed contributions. The comparison between *SciELO* and *WoS* suggests that the regional strategy set by *SciELO* has had some impact in promoting the visibility of LAC-LAC collaboration, as they have a higher frequency in table 5 than in table 4.

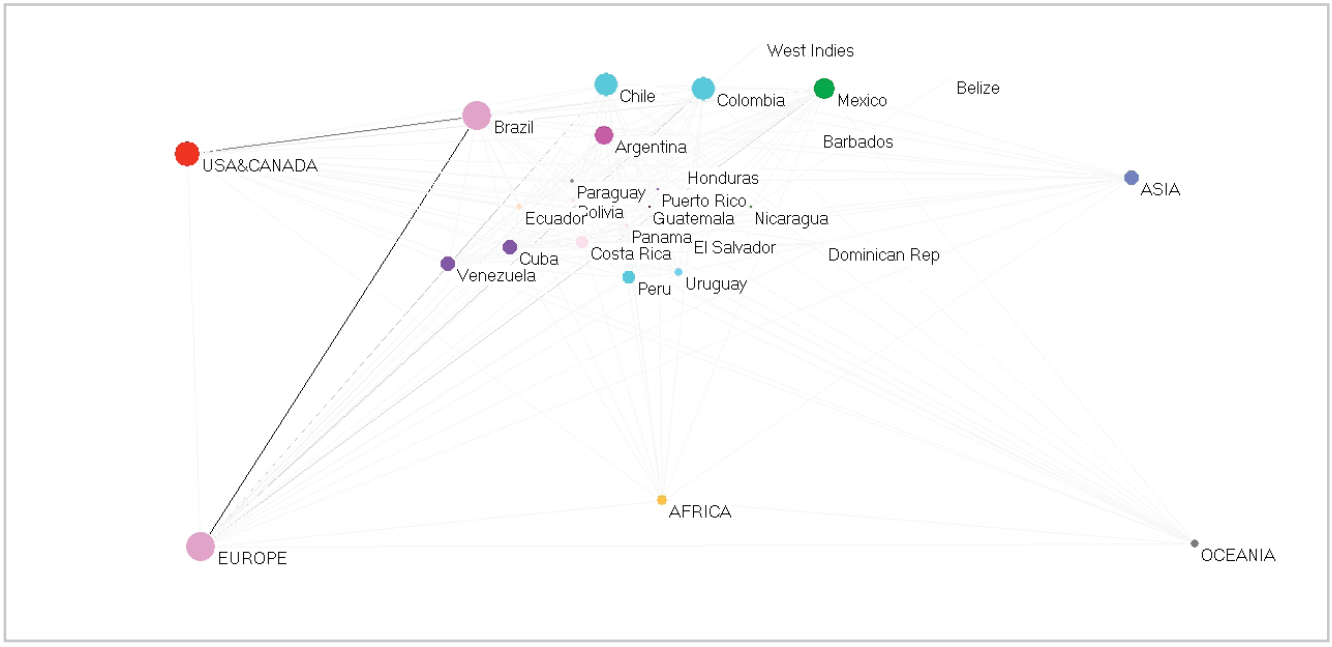

Figure 2. International collaboration including LAC authors in *SciELO CI.*

In summary, the differences between figures 1 and 2 suggest that communication practices differ when (a) aiming at results with international visibility than when (b) the primary goal is regional or local diffusion of scientific results through regional journals. While for *WoS* (figure 1) strong ties are shown with North America and Europe, regional collaboration is more dominant in figure 2. The major participation of the USA and Europe in figure 1 and of Brazil in figure 2 should be interpreted considering that these countries have the highest numbers of indexed journals in each of the respective databases.

> One advantage of the integration of the *SciELO CI* database into *WoS* is that *Thomson Reuters* attributes the same *WoS* Subject Categories (WCs) to journals in both databases

Overlay maps

One advantage of the integration of the *SciELO CI* database into *WoS* is that *Thomson Reuters* attributes the same *WoS* Subject Categories (WCs) to journals in both databases. The subject categories indicate disciplinary groupings and topical sets of journals (albeit sometimes with some error; **Leydesdorff** and **Bornmann**, 2015). Maps are built on the basis of a matrix of similar measures computed from aggregated journal-journal citation relations. **Rafols**, **Porter**, and **Leydesdorff** (2010) provided a comprehensive map of *WoS* based on WCs as aggregates of journals, on which one can project any subset from *WoS* by using overlays to the base map.

We projected our two subsets with LAC authors on this basemap in order to visualize the differences in terms of cognitive categories. The map using *WoS* data (figure 3) shows some dominance of the "hard" sciences, which are more likely to be published in English and in collaborations. For *SciELO CI* (figure 4) the disciplinary participation seems to favor the social, health, and agricultural sciences.

Figures 3 and 4 make visible the differences in the thematic orientation of the communications in both indexes. Figure 3 shows major contributions in all categories from Clinical Medicine to Physics and Math methods which are better represented in the top of the circular shape of *WoS Core Collection*. In figure 4, we can observe that *SciELO CI* contains more journals in less categories: Social Studies in yellow; Health and Social Issues and Clinical Medicine in pink and red respectively; Agricultural Science and Chemistry in aqua blue and blue respectively; Ecological Science in green; and Geosciences, Materials Sciences, and Mechanical Engineering (brown, black, pale blue). In addition, WCs appear more disaggregated in figure 4 than in figure 3. The large number of journals contained in *WoS* explains the difference with *SciELO CI* in the visibility of SC.

> Collaborations in *SciELO* seem to show more South-South cooperation than *WoS*-based publications

The different disciplinary contexts from which *SciELO* and *WoS* originated might explain some of the differences between the regional and global scientific communications encountered in these two databases. Much has been written about the "natural" or hard-sciences origin of *WoS*; *WoS* originated from the *Science Citation Index* (**Garfield**, 1971), but has been expanded to include a broader range of journals and then enlarged by the *Social Science Citation Index* and later on by the *Arts & Humanities Citation Index* (the *Science Citation Index* was officially launched in 1964, the *Social Science Citation Index* followed in 1973, and the *Arts*

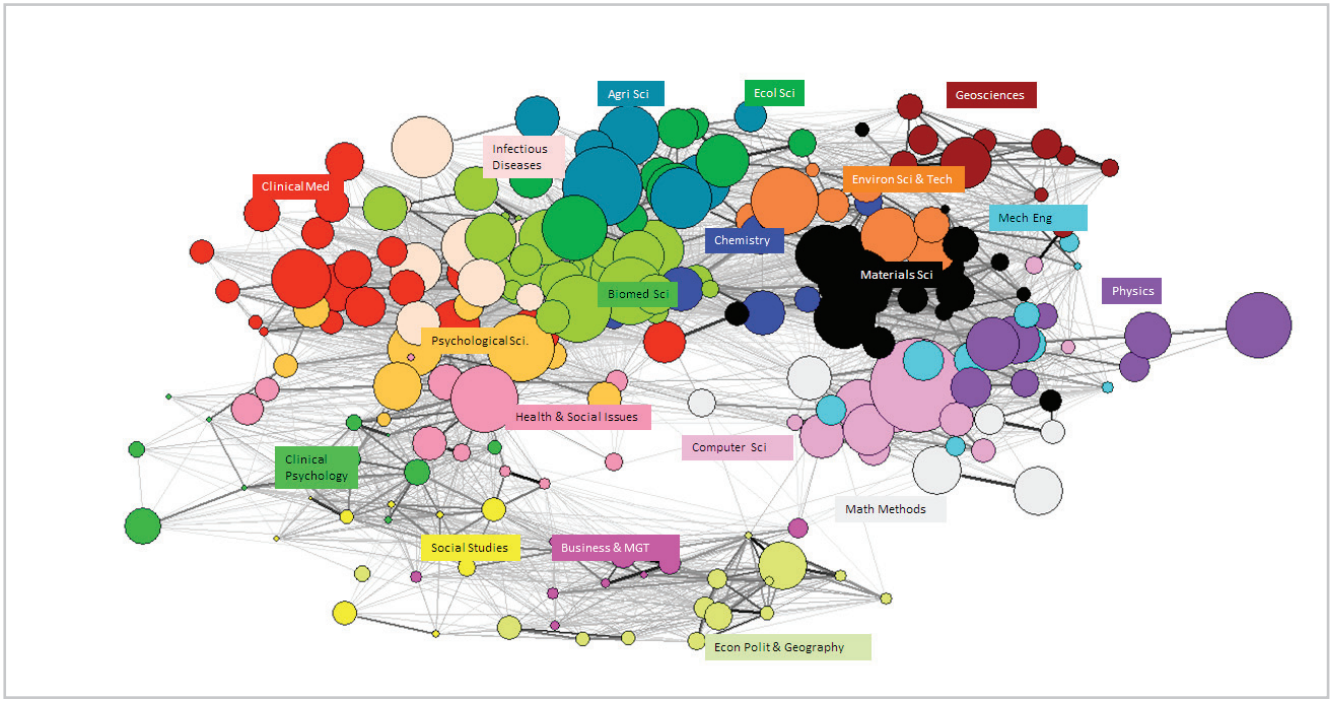

Figure 3. LAC map of Science, *WoS Core Collection*; 224 *Web of Science* categories. Method based on **Rafols**, **Porter** and **Leydesdorff** (2010).

and Humanities Citation Index in 1978). Meanwhile *SciELO* resulted from a cooperation which was formalized in 1997 between the *Fundação de Amparo a Pesquisa do Estado do São Paulo* (*Faspep*) and the *Latin American and Caribbean Center for Health Sciences Information* (*Bireme*) of the *Panamerican* and *World Health Organizations* (*PHO*/*WHO*).

Table 6 shows important differences between both databases which support the argument of differentiating thematic orientations. The documents in the data set were assigned to 99 subject categories in *SciELO* and to 204 (of the 250) WCs in *WoS*. There is also an important difference in the association of subject categories per journal: *WoS* journals have, on average, more subject categories assigned to them than *SciELO CI* indexed journals. The respective distributions show significant intellectual differences in the diffusion of regional versus global scientific knowledge produced in LAC, especially in the fields of Agriculture Sciences, Public

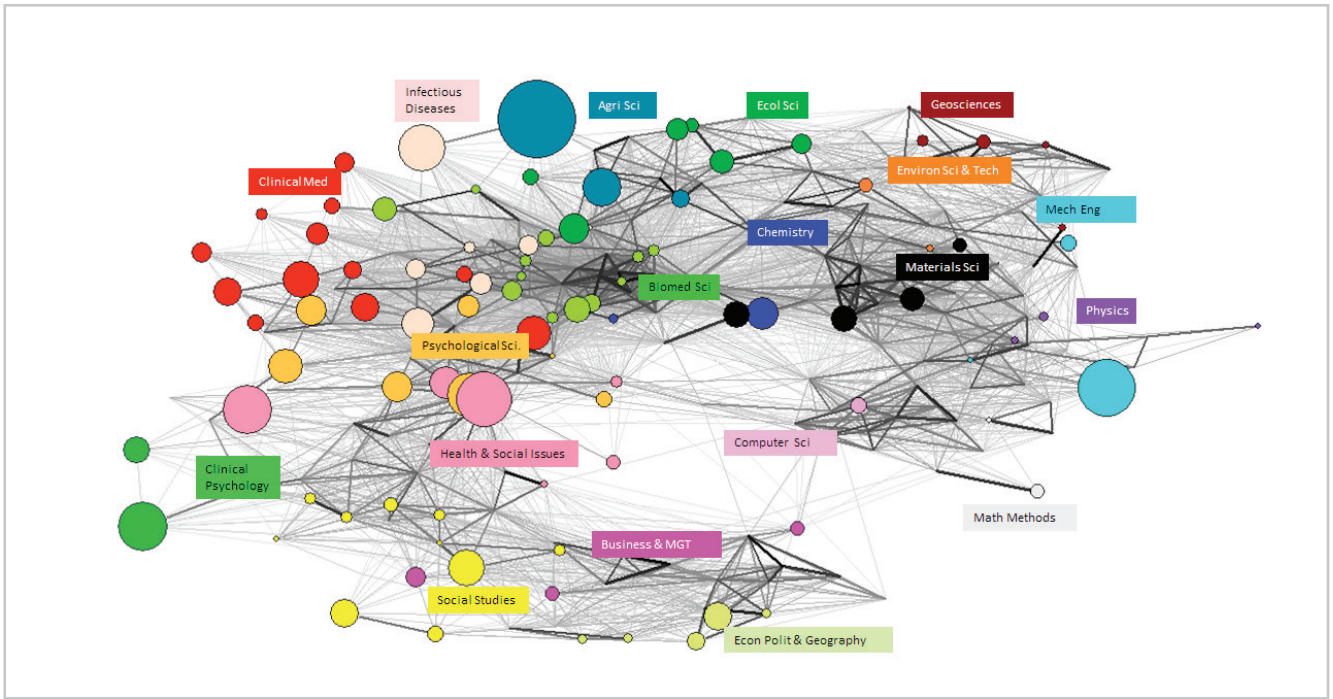

Figure 4. LAC map of Science, *SciELO CI*; 224 *Web of Science* categories. Method based on **Rafols**, **Porter**, and **Leydesdorff** (2010).
Note: According to **Rafols**, **Porter** & **Leydesdorff** (2010) method, the labels and colours in figures 3 and 4 display 19 macro-disciplines (groupings of WCs) obtained using factor analysis of this same matrix. The size of nodes is proportional to number of publications.

Table 6. Volume of articles by *WoS* categories in *WoS* and *SciELO* (top 20 in *SciELO*)

SciELO			*WoS*			Id
Rank	***N***	**%**	**Rank *WoS***	***N***	**%**	
1	3017	10,8	52	1009	0,69	Agriculture, Dairy & Animal Science
2	1608	5,8	192	79	0,05	Engineering, Aerospace
3	1494	5,4	4	2,284	1,56	Public, Environmental & Occupational Health
4	1186	4,3	85	633	0,43	Education & Educational Research
5	1141	4,1	100	521	0,36	Nursing
6	1036	3,7	14	1,890	1,29	Veterinary Sciences
7	1026	3,7	145	246	0,17	Psychology
8	706	2,5	3	3,063	2,10	Plant Sciences
9	698	2,5	165	171	0,12	Sociology
10	656	2,4	18	1,731	1,19	Surgery
11	610	2,2	35	1,291	0,88	Dentistry, Oral Surgery & Medicine
12	595	2,1	135	300	0,21	Rehabilitation
13	532	1,9	49	1,031	0,71	Chemistry, Analytical
14	531	1,9	54	987	0,68	Tropical Medicine
15	502	1,8	74	695	0,48	Health Care Sciences & Services
16	488	1,8	10	2,108	1,44	Zoology
17	478	1,7	78	684	0,47	Sport Sciences
18	470	1,7	43	1,206	0,83	Psychiatry
19	422	1,5	139	296	0,20	Anthropology
20	408	1,5	117	416	0,28	History

Health, Social Sciences, and the Humanities. It is relevant to highlight that Aerospace Engineering has more presence in *SciELO* than in *WOS*, showing regional strengths in this field which are particularly clustered in Chile.

4. Discussion and conclusions

We used descriptive statistics about LAC contributions in journals indexed in *WoS*; our results suggest that *SciELO CI* integrates a scientific production which otherwise remains invisible in the mainstream journals contained in *WoS*. The perseverance in LAC scientific communications of Spanish and Portuguese as the main languages for communication, together with differences in the nature of the publishing venues, the geographical distribution of collaborations, and the disciplinary orientations of the contributions all seem to provide evidence suggesting that the integration of *SciELO CI* into *WoS* databases will allow a better representation of research capacities and strengths in LAC.

> The integration of *SciELO CI* into *WoS* databases will allow a better representation of research capacities and strengths in LAC

The collaboration networks analyzed suggested that *SciELO* has in fact provided a platform for interactions among LAC researchers. As mentioned in the introduction, *SciELO*'s open access policy relied on facilitating access to promote visibility. Open access, as a means to make visible research results that do not rise to the level of global interests but that might be relevant to countries with similar problems, has been part of the policy agenda for a while (e.g., **Wagner**; **Wong**, 2011). Contributions in *SciELO-CI* indexed journals have reached beyond the LAC region to include authorships from Africa and Asia, suggesting an interesting data set to study South-South collaboration.

Collaborations in LAC contributions included in *WoS*-indexed journals are more frequently mediated by the more developed countries' capacities, particularly from Europe and the USA. Nevertheless, researchers from LAC countries have a primary role as first authors in 2/3 of the multi-authored papers. This means that LAC researchers are well embedded in the global scientific dynamics.

The distribution of contributions in terms of *WoS* Subject Categories show that *SciELO CI* differs in its coverage of disciplines and specialties from *WoS*. This was illustrated (in figures 3 and 4) using overlays of the two datasets with LAC authors on the same basemap. *SciELO CI* seems then to be better at representing scientific contributions where the particularities of the region and the social context are important. An exercise exploring aggregated journal-journal citation relations in the *Chinese Science Citation Index* of the *Library of the Chinese Academy of Sciences* found that the high frequency of university-based journals in the index provided a practical ends-based structure more aligned to Mode 2 knowledge production (**Leydesdorff**; **Bihui**, 2005). Although such a study using *SciELO CI* would be difficult due to the lack of journal-journal citation information at this point, the frequency of academic publishing sources in *SciELO CI* indexed journals might provide a similar intellectual organization to the regional journal structure.

The inclusion of *SciELO CI* into *WoS* responds to the need for a more inclusive representation of scientific results despite regional constraints and conditions. It may also reflect increased competition for the services offered by *Thomson Reuters* and *Elsevier*. However, the strategies aimed at improving regional visibility seem to differ between *Scopus* and *WoS*. While *Scopus* has aimed at increasing their base of regional journals, the globalization of the *Web of Science* (**Testa**, 2011) has also meant the incorporation of regional

databases as a whole and not on the basis of evaluating individual journals. The *Chinese Journal Database* has been hosted in the *WoS* since 2008, while the inclusion of *SciELO CI* and the *Korean Journal Database* has been operative since 2014.

> The inclusion of *SciELO CI* into *WoS* should, in the short to mid-term, improve compliance with international editing norms and governance structures

From a technical point of view, this inclusion opens the door to a new research agenda. Before the integration of *SciELO CI* into *WoS*, the alternatives to using *SciELO CI*-data for bibliometric studies were limited. Although *SciELO*'s program relied on the importance of Open Access to increase the visibility of scientific results, the platform did not provide appropriate tools to download data, nor did it allow for the simple analysis of results as provided by *WoS*. These new opportunities for bibliometricians will also improve some challenges for the editors of *SciELO CI*-indexed journals. The inclusion of *SciELO CI* into *WoS* should, in the short to mid-term, improve compliance with international editing norms and governance structures. Editors of international journals position their journals by generating the quality, both editorial and cognitive, of the contents of their journals. Competition for relevant content as well as a better evaluation of the referencing procedures will probably be increasingly important for the agendas of LAC journals. We would like to explore this issue further in order to understand how the inclusion of *SciELO CI* might restore the *WoS* to the competition for visibility of regional results, as well as improving the quality of the LAC journals included in *SciELO CI*.

Note

Fecyt (Spain´s foundation for science and technology) has had an important role in certifying quality of journals in order to support their inclusion in the *WoS* after an alliance with *Thomson Reuters* around 2007 (*Fecyt*, 2011).

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