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Growth of the number of indexed journals of Latin America and the Caribbean: the effect on the impact of each country

Francisco Collazo-Reyes

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Abstract The number of LA–C indexed journals in WoS has increased from 69 to 248 titles in just a period of four years (2006–2009). This unprecedented growth is related to a change in the editorial policy of WoS rather than to a change in the LA–C scientific community. We find that in the LA–C region, Brazil had the largest increase in its WoS production that also corresponded to a large increase in its production in its indexed local journals. As a consequence, Portuguese has been promoted to the second scientific language, only after English, in the LA–C production in WoS. However, while the Brazilian production in its local journals represents about one quarter of its whole WoS production, it shows a rather little effect on the respective number of citations. The rest of the LA–C countries represented in WoS still show very low levels in production and impact. Scopus has also enlarged considerably the database's coverage of LA–C journals but with a steady growth in the period considered in this study.

Keywords Latin American journals · Mainstream local journals · Production and impact · Local journals in WoS

JEL Classification Z210

Mathematics Subject Classification 00A99

Introduction

In recent times, the international databases have performed an unprecedented large inclusion of Latin American and the Caribbean (LA–C) journals. While in 1982 there were only eight LA–C journals covered in the science citation index (SCI) (Garfield 1984), this number increased to 69 in 2005 and now to 240 in the web of science (WoS) databases

F. Collazo-Reyes (✉)
Departamento de Física, Centro de Investigación y de Estudios Avanzados del IPN, Av. IPN 2508, San Pedro Zacatenco, 07000 Mexico, DF, Mexico
e-mail: fcollazo@fis.cinvestav.mx

(Luna-Morales and Collazo-Reyes 2007; Collazo-Reyes et al. 2008). As a consequence, there has been a noticeable increased contribution of LA–C to the world's scientific production indexed in mainstream journals included in the WoS databases (Hollanders and Soete 2011). LA–C increased its contribution to world science from 1.9 % in 1995, to 3.5 % in 2003 and recently to 4.2 % in 2010 (Consejo Nacional de Ciencia y Tecnología 2010). However, recent studies on the huge growth observed in the number of articles displayed in the WoS database indicates that it should not be interpreted as an increase in the world's scientific activity but rather to a lower threshold of the impact factor of the new indexed journals (Chinchilla-Rodriguez et al. 2012; Michels and Schmoch 2012). The LA–C scientific journals have been traditionally used by local scientists to publish most of their research work. However, these journals do not have enough coverage in the international data bases like WoS or Scopus (Russell 2000; Macias-Chapula 2010; Collazo-Reyes et al. 2008; Cetto and Alonso-Gamboa 2010). As a consequence, the impact of most of these journals is very low and they occupy the lowest positions in the international rankings (Luna-Morales and Collazo-Reyes 2007). The growths in the number of LA–C journals in these databases do not reflect necessarily an increase in the research done in most of the LA–C countries (Larsen and Von Ins 2010; Michels and Schmoch 2012). This seems not to be the case for Brazil and Mexico, where the growth in the scientific production has been associated to a parallel increase in the number of researchers (Gonzalez-Brambila and Veloso 2007; Luna-Morales 2012; Leta 2011; Leite, Mugnaini and Leta 2011). A natural question then arises: what is the real effect of the LA–C production in recently indexed journals on the whole LA–C production in mainstream journals? Furthermore, a concomitant issue is to determine if this local production in indexed journals has induced an appreciable effect on the impact of each LA–C country.

The question concerning the relation of a country's productivity and the increase in the number of its indexed journals has raised a lot of interest recently (Basu 2010; Leta 2011; Liang, Rousseau and Zhong 2011). In the case of the China extraordinary rise in the world scientific productivity, it has been shown that this phenomenon is related to his large journal packing density, that is, the large average number of papers published in its domestic journals (Basu 2010). On the other hand, the recent increase in the Brazilian scientific production has been associated to both a rise in the number of indexed local journals and the good performance of its graduate programs, in particular, in medicine and agroscience (Leta 2011; De Brito-Cruz and Chaimovich 2011). On the other hand, various authors (Menenghini and Packer 2007; Aguado-Lopez et al. 2012) have attributed the increased visibility and impact of LA–C research to the development of the regional information systems SciELO and REDALyC. In some countries, the improvement of the international visibility and impact of their local journals has been a long standing task (Bonilla and Perez-Angon 1999). Other authors considered that social and political variables need to be taken into account in order to explain the sharp increase of the scientific production of some LA–C countries in both local and international indexed journals (Moya-Anegon and Herrero-Solana 1999).

Our previous study has drawn that the LA–C journals with the highest impact factors (IF) also have the highest percentage of citations and papers published by authors coming from outside the LA–C region (Collazo-Reyes et al. 2008). We also found that most of these journals show a tendency towards endogamic practices with a marked preference for publishing papers of authors from the same countries journals. The lowest IFs corresponded to the LA–C journals with the highest percentage of self-citations and most of the published papers in local languages (Portuguese or Spanish).

In the present study, we study if these endogamic trends have changed after the recent opening given to LA–C publications in the international databases. We are also interested in determining the effect of the increase of LA–C indexed journals on the national impact of each LA–C country. Another issue to be considered is the degree of correlation of several input indicators associated with science, technology and innovation (ST&I) resources with the number of indexed publications and the respective impact of each country.

Materials and methods

In order to identify the LA–C journals in SCI and SSCI in the period 2005–2011, we used the journal citation reports and the countries name of LA–C. We also organized bibliographic records for each journal in a database (general information). This includes information on journal status in the indices (year of start, cancellation date and current titles), impact factor, production and citations. Additionally, we completed a historic repertoire of information on the annual status of the LA–C journals in the indexes WoS, over a long period of 51 years, 1961–2011. Data for this purpose was gathered from previous studies (Luna-Morales and Collazo-Reyes 2007; Collazo-Reyes et al. 2008), using information from the period 1961–2005. These data show that the coverage of LA–C journals in WoS maintained a modest growth during the period 1961–2005, in contrast to the 2006–2011 period showing unprecedented growth. Scopus is a recent database and does not record these contrasts in its coverage of LA–C journals.

The process of search and retrieval of bibliographic information during 2005–2011, includes three search strategies in two indices (SCI and SSCI) of WoS.

1. Total number of papers. With the full journal name in the "publication name" field, we identify the total production, citations, and years of coverage. This information was added in the database (general information).
2. Papers with only local affiliation. Combines two bibliographic fields: "publication name" AND "address" (country name). This is the production coming from the same country that the journal. Bibliographic records were organized in a local database called LA–C journals.
3. Papers with foreign affiliation. We use the same bibliographic fields of strategy 2, but with the connector NOT, "publication name" NOT "address" (country name). This is the production coming from a different country to the journal. Bibliographic records were organized in the same local database. The papers without address information of the authors are considered coming from the same journal's country.

WoS vs Scopus databases

In Table 1 we include the data corresponding to the current coverage of WoS and Scopus databases for LA–C local journals. It is clear that Scopus has generated a larger growth of LA–C indexed journals in the period (2005–2011) than the one observed so far for WoS. While WoS has displayed only 240 titles of LA–C journals, Scopus covers now 573 titles (SciMago journal and country rank 2012). The respective total number of articles displayed in both databases shows also a big gap: 174,453 in Scopus and 100,986 in WoS. However, it is interesting to notice that only 204 LA–C journals are indexed in both databases. On the other hand, in order to draw sensitive conclusions on the evolution of the LA–C production

and impact generated in the local journals, we have decided to focus on the WoS data for the whole period 1961–2011: 1961–2005 covered in our previous study (Luna-Morales and Collazo-Reyes 2007; Collazo-Reyes et al. 2008) and then 2005–2011 studied in the present study. A similar study for the LA–C coverage in Scopus and WoS for the period 1996–2007 has been published recently (Santa and Herrero-Solana 2010).

Finally, we analyze bibliometric indicators of local journals through correlations with two indicators: (1) national gross product (NGP) and the percentage of NGP assigned to science and technology by country; and (2), population, in millions of inhabitants. We hope that these correlations put also in evidence the convergence among different indicators for a period of growth of the scientific activity (RICyT 2011), as has been emphasized by other authors (Moya-Anegon and Herrero-Solana 1999).

Results and discussion

We have identified 240 LA–C journals that are currently included in both indices SCI and SSCI and have been active, at some time, during the period 1961–2011. There is another group of 65 journals that were also included in these indices but they are not active anymore. The historical number of LA–C journals ever included in SCI and SSCI makes thus a total of 305 titles. Figure 1 depicts the evolution of the number of LA–C journals included in these indices since 1961. We have separated the number of current and excluded journals in order to appreciate three periods associated with atypical growths in the number of LA–C journals included in this indices: in the early 70's, then in the late 90's and finally in recent years starting in 2006. The first period corresponds to the inclusion of the first LA–C journals in social sciences and humanities. These journals were incorporated in SSCI (1972) and A&HCI (1974) due to their excellent editorial performance.

The second period is related to the steady consolidation of the LA–C research activity and the consequent proliferation of local journals. On the other hand, the third and most recent period of growth of indexed journals included in SCI and SSCI is related to a change in the editorial policy of these indices rather than to a sudden change in the number of active researchers in LA–C or in their respective scientific production (Leta 2011; De Brito-Cruz and Chaimovich 2011; Luna-Morales 2012). In fact, 72 % of all LA–C current journals now included in these indices were registered in just a period of four years, 2006–2009 (Fig. 1).

Table 1 WoS and Scopus coverage of the LA–C scientific production (2005–2011)

No.	Country	WoS articles	Journals	Scopus articles	Journals
1	Argentina	5,771	17	9,844	41
2	Brazil	64,749	117	108,238	271
3	Chile	8,995	36	15,018	68
4	Colombia	4,380	21	8,941	50
5	Cuba	314	0	5,756	22
6	Mexico	11,365	33	16,790	71
7	Venezuela	3,195	14	5,727	34
8	Others	2,217	2	4,139	16
	Total	100,986	240	174,453	573

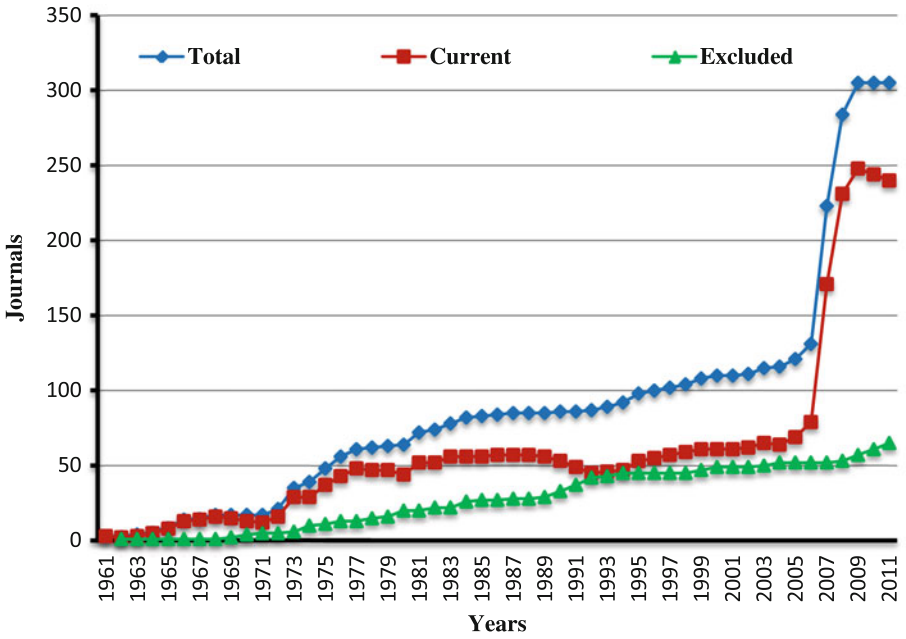

Fig. 1 Evolution of the number of LA–C journals included in WoS (1961–2011). Source: period 1961–2005 (Luna-Morales and Collazo-Reyes 2007)

Results by country

The recent increase in the number of LA–C indexed journals has changed the geographical distribution represented in SCI and SSCI (Collazo-Reyes et al. 2008; Leta 2011): in 2005 there were 12 LA–C countries represented in these indices and now this number has been reduced to just eight, with a high Brazilian concentration of 48.7 % of all indexed journals. This country increased its indexed journals from 28 to 117 titles. Colombia also had a large growth of indexed journals, from one to 21 titles. The respective growth for the rest of the countries is given by: Chile, from 9 to 36; Venezuela, from 5 to 14; Argentina, from 7 to 17; Mexico, from 16 to 33; finally, Costa Rica, Jamaica and Uruguay, are represented with one journal each.

Local journal patterns

The Brazilian journals have a large packing density, just like the Chinese journals (Basu 2010), with an average of about 100 articles per volume, while the respective average for the other LA–C countries is just 33 articles per volume and well below the general average of 62 articles for the whole LA–C region, including Brazil. There are only 88 indexed LA–C journals that have an average higher than 62 articles per volume, and 68 of them are Brazilian, 8 from Mexico, 4 from Chile, 2 from Argentina, and one from Venezuela and from Jamaica.

We present in Table 2 the production and citation data for the LA–C countries in journals included in WoS for the period 2005–2011. The respective percentages were obtained using these data. We have included an indicator, the degree of influence, for each

Table 2 LA–C bibliometric data in WoS: production, citations and degree of influence by country (2005–2011)

	Production				Citations				Influence	
Country	WoS	WoS %	Local	Local %	WoS	WoS %	Local	Local %	Production	Citations
Argentina	54,425	12.76	3,534	4.41	336,083	14.47	3,243	3.16	6.49	0.96
Brazil	221,964	52.03	57,208	71.44	1090,762	46.96	82,243	80.11	25.77	7.54
Chile	34,644	8.12	5,632	7.03	236,049	10.16	5,788	5.64	16.26	2.45
Colombia	16,087	3.77	3,150	3.93	83,568	3.60	962	0.94	19.58	1.15
Mexico	70,902	16.62	7,516	9.39	401,092	17.27	8,670	8.45	10.60	2.16
Venezuela	10,152	2.38	1,869	2.33	124,717	5.37	941	0.92	18.41	0.75
Others	18,405	4.31	1,173	1.46	50,720	2.18	811	0.79	6.37	1.60
Total	42,6579	100	80,082	100	2322,991	100	102,658	100	18.77	4.42

Others: Costa Rica, Cuba, Ecuador, Jamaica, Uruguay

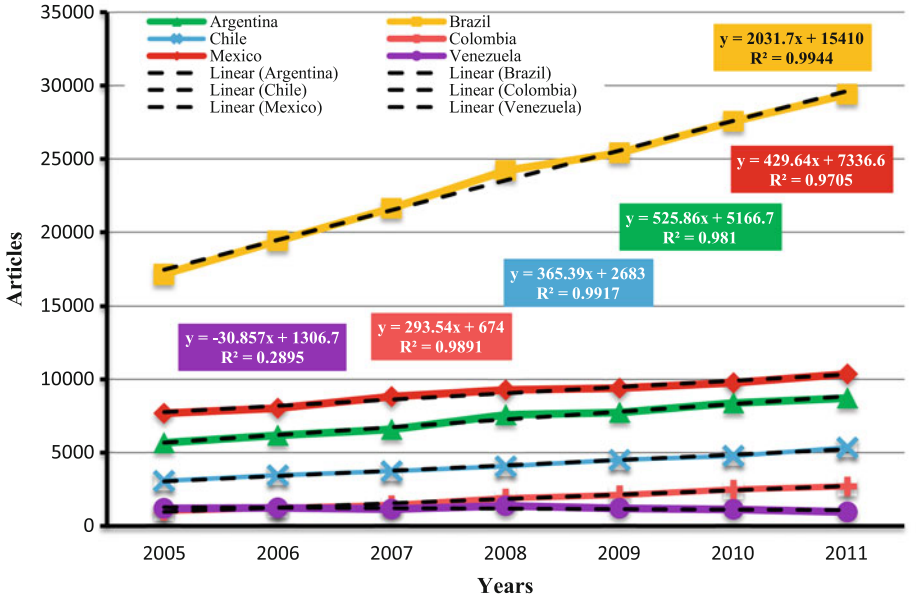

Fig. 2 Growth tendencies of the LA–C production in WoS journals (2005–2011)

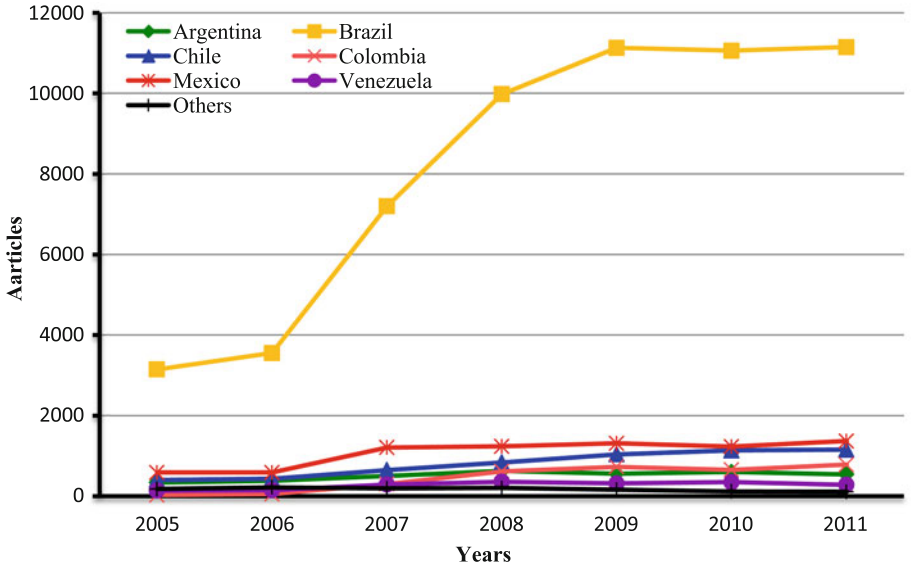

Fig. 3 LA–C production in local indexed journals (2005–2011)

country. It is defined as the percentage obtained from the rate of the number of articles published in the WoS local journals divided by the total number of articles published in all WoS journals. This indicator gives an idea of the specific contribution of the scientific production published in the local journals of each country. Figure 2 shows the lineal fits to the dynamical growth for the scientific production in each one of these countries in the

period 2005–2011. Again, the Brazilian data shows the highest slope, while the data for Venezuela corresponds to a clear decrease in its scientific production in this period. The remarkable growth in the Brazilian scientific production in this period has also increased its share to world science. In particular, Brazil has contributed with 52 % of the whole LA–C production and with 47 % of the respective citations in journals included in WoS.

As far as the Brazilian local journals is concerned, their contribution to the overall LA–C production and impact is even higher: 71.4 % in production and 80.1 % in impact (Table 2). Even more, the Brazilian local journals participate in this period with 25.8 % to its national production in WoS journals, and with 7.5 % to the respective national impact. As a natural consequence, the contributions of the rest of the LA–C countries decrease in percentage as it is shown in Table 2. The only exception to this trend is the Colombian contribution, which in 2005 had a 2.5 % share and in 2011 became 4.6 % to the overall LA–C scientific production in WoS journals. In Fig. 3 we present the evolution of the number of articles published in LA–C indexed journals in the period 2005–2011. We can appreciate the extraordinary growth of the Brazilian production in just a period of three years in these indexed LA–C journals. A similar conclusion has been reached in the 2010 UNESCO Science Report (De Brito-Cruz and Chaimovich 2011).

Influence of the local production

According to the data included in Table 2, there is no positive correlation between the whole LA–C production in local journals (18.8 %) and the corresponding contribution to the overall impact (4.4 %) registered in the WoS. However, the Brazilian contribution to the total number of citations induced by LA–C journals in WoS is overwhelming (80.1 %), with a similar share to the overall LA–C production in local journals (71.4 %). Brazil then qualifies as the most endogamic country in the LA–C geographical region: 88.8 % of the articles published in Brazilian local journals correspond to Brazilian scientists. On the other hand, the local journals of Argentina, Chile, and Mexico publish on average 33 % of

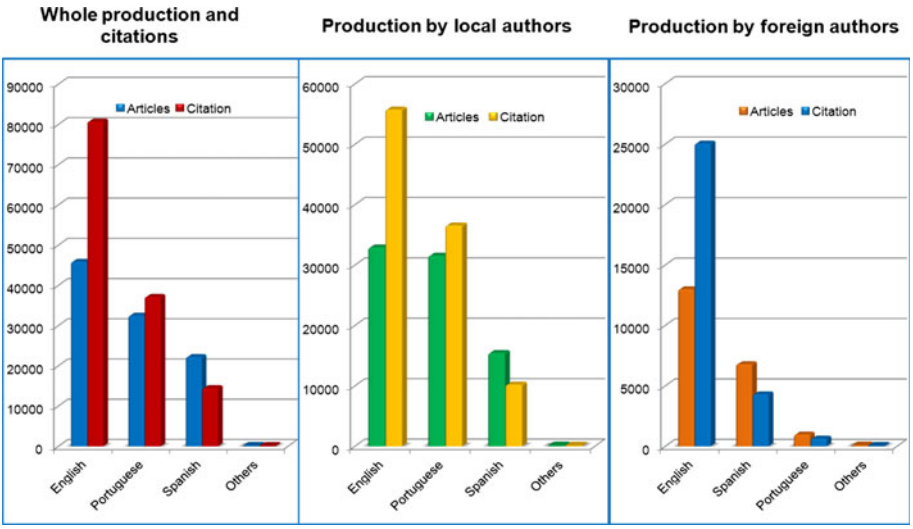

Fig. 4 Distribution of publication languages in the LA–C scientific production and citations in WoS local journals (2005–2011)

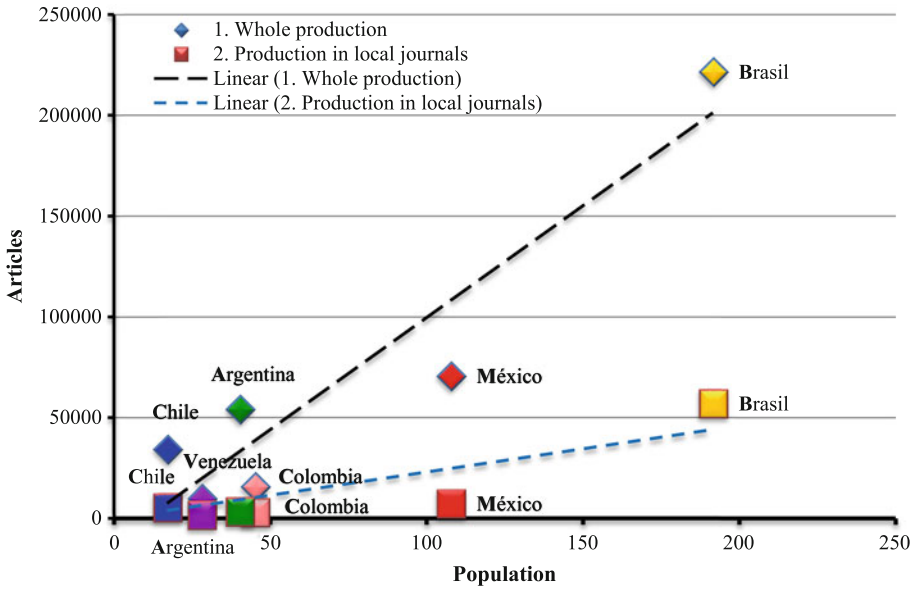

Fig. 5 Correlations between LA–C production in WoS and the number of inhabitants: whole production and production in local journals (RICyT 2009)

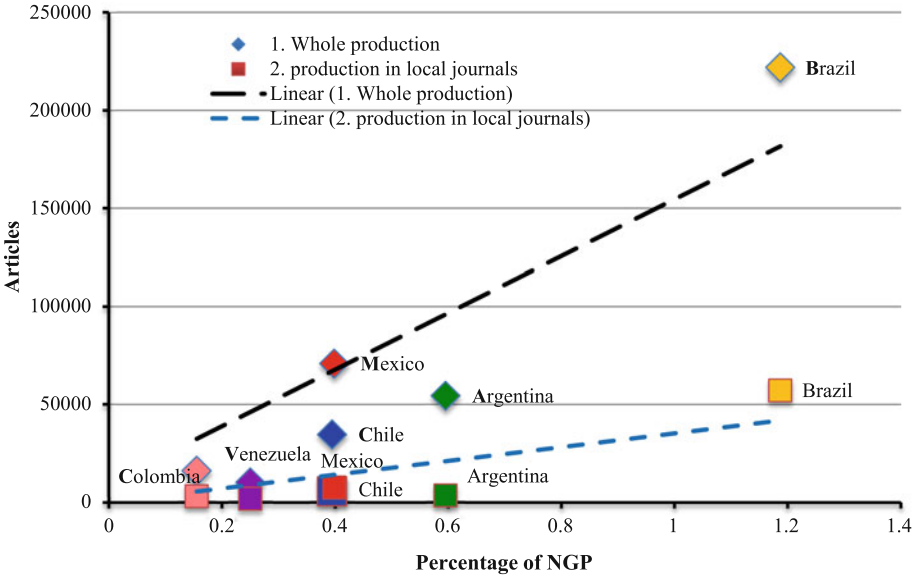

Fig. 6 Correlations between LA–C production in WoS (whole and local journals) and the percentage of the NGP assigned to S&T (RICyT 2009)

their articles by foreign authors. Colombia also has a rather small percentage of foreign authors in its local journals. There is a group of LA–C countries (Costa Rica, Cuba, Ecuador, Jamaica and Uruguay) with a small number of indexed journals and limited production, but its percentage of foreign authors is about 50 %.

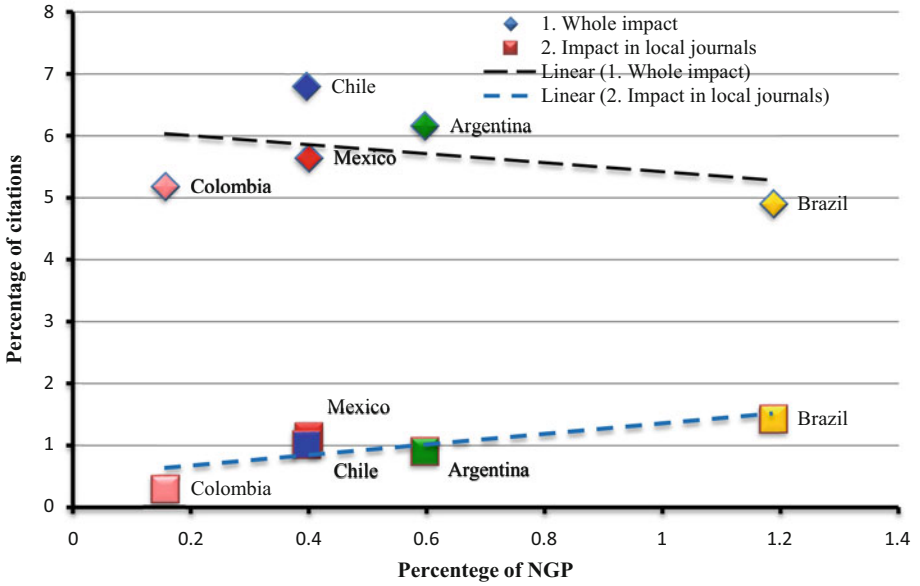

Fig. 7 Correlations between LA–C scientific impact (whole and local journals) and the percentage of the NGP assigned to S&T (RICyT 2009)

Publication languages

The distribution of publication languages in LA–C indexed journals is shown in Fig. 4. We have split the data corresponding to the articles published by local authors from those published by foreign authors. Just as in our previous study on LA–C indexed journals (Collazo-Reyes et al. 2008), in this period English is the preferred language to publish in these journals, with the highest impact associated to articles published by foreign authors. However, in this period Portuguese is the second language used in LA–C indexed journals while in the previous period studied (1961–2005) Spanish was the second language preferred to publish in these journals (Luna-Morales and Collazo-Reyes 2007; Collazo-Reyes et al. 2008).

Correlations by country

In Figs. 5–7 we present a set of correlations of the scientific production and impact of LA–C countries with respect to some national indicators such as number of inhabitants (Fig. 5), national gross product (NGP, Figs. 6, 7) and the percentage of the NGP assigned to science and technology (S&T) activities. In all cases we have separated the global contribution of each country to production and citations from the respective share coming from the publications involved in LA–C indexed journals.

We have used in all cases lineal fits to the data for these correlations. In the first case, we found that three countries (Brazil, Argentina and Chile) have a better correlation in their WoS production per capita than Mexico, Colombia and Venezuela. This is also the case when we separate the WoS production for local journals, with the production per capita of

the first three countries also above the lineal fit. On the other hand, Brazil and Mexico have better indicators in the correlation between WoS production and the percentage of the NGP assigned to science and technology activities (Fig. 6) for each country (RICyT 2009). On the other hand, Chile and Argentina are better situated as far as the correlations between the WoS whole impact (number of citations) and the NGP percentage dedicated to S&T are concerned, but Mexico and Chile turn out to be better correlated when we use the number of citations for their respective local journals.

Conclusions

Our results show that the unprecedented growth in the number of LA–C journals indexed in SCI and SSCI in the period 2005–2011 is mainly related to a change in the editorial policy of these international indices rather than to a change in the LA–C scientific community and its production. Recently, WoS reports an increment in the period 2005–2011, of about 1600 journals covering mostly research of regional interest, including the LA–C production (Testa 2009, 2011). This WoS editorial policy deliberately aimed to an increase in the number of local/regional journals in order to compete with the increased coverage of the other international indices (Basu 2010; Larsen and Von Ins 2010; Michels and Schmoch 2012). In particular, Brazil had the largest increase in its production as well in the number of new local journals indexed in WoS.

An increase in the number of articles in the WoS international journals also corresponded to a large increase in the Brazilian production in its own local journals due to a large journal packing density with an average of about 100 articles per volume. The Brazilian production in its local indexed journals represents about 26 % of its whole WoS production but with little effect on the respective number of citations (7.5 %). The Brazilian indexed local journals show also a wide endogamic trend with about 89 % of the articles published by local authors. The good performance of the Brazilian local journals in WoS promoted the Portuguese as the second preferred language in the articles published in LA–C indexed journals in the period 2005–2011, only after English. In the previous period studied (1961–2005), Spanish was the second language used in the publications of the LA–C local journals (Collazo-Reyes et al. 2008).

The rest of the LA–C countries represented in the WoS showed rather low levels in production and impact, with limited influence of their respective indexed local journals on their whole WoS production. However, Colombia had also a noticeable increase in its number of indexed journals during the period studied in this paper, from one to 21 titles in 2011. However, Colombia also has a strong endogamic trend in the production published in these journals.

On the other hand, a recent bibliometric study of the LA–C region (Santa and Herrero-Solana 2010) points out that there is an important difference in the number of indexed journals in Scopus and WoS, but coverage indicators of the production and citations are very similar in both systems.

Finally, we conclude that the LA–C indexed journal has increased its contribution to the world science production in an appreciable trend. Even though, this trend has not already a similar effect on the impact of each LA–C country to WoS journals, we expect that this situation will improve in the near future.

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