Linguistic circuits of Latin American scientific production

Maximiliano Salatino*
https://orcid.org/0000-0001-5573-9599

Introduction

Scientific production is mostly published in scientific journals (Phillips and Bhaskar, 2019). This process emerged and consolidated since the creation of the Science Citation Index in the 1960s. As a result, the paper and journals as have become privileged spaces for the circulation of scientific knowledge (Guédon, 2008). Since then, countless quantitative indicators of productivity, impact, citation, and journal rankings were created, configuring new ways of (e)valuing science (Beigel, 2014; Gingras, 2016; Larivière *et al*., 2010; Santin and Caregnato, 2019; Vessuri *et al*., 2014). This development transformed the role of journals from an artifact of circulation to a consecrating device.

Specifically, many studies have analyzed the historically unequal and asymmetrical constitution of science at the global level (Chatelin and Arvanitis, 1989; Gingras, 2002; Guédon, 2008). This structuring has been possible due to the primordial accumulation of symbolic capital in certain institutions in the centers of the world academic system. This process was made possible by the universalization of a series of criteria and parameters that define excellence as quality. Beigel (2013, 2014) argues that, based on institutional resources, disciplinary differences, and the constitution

* Universidad Nacional de Cuyo, Mendoza, Argentina.

of English as the lingua franca of science, different strategies of consecration were formulated that had an unequal impact worldwide.

The role of languages in the production, publication, and circulation of scientific knowledge is therefore essential to understand the current asymmetries and inequalities in the world academic system. The constitution of English as a global language has been widely documented (Badillo, 2021; Bennett, 2014; Berns, 2009; Englander, 2011; Gill, 2000; Hamel, 2007, 2013; Lillis *et al*., 2010; Lillis and Curry, 2015; O'Neil, 2018; Ortiz, 2009; Tardy, 2004). These contributions seek to point to the hyper-centrality of English as a constitutive part of the so-called "mainstream science". That is, the symbolic, material and cultural construction oriented by the scientific practices of the North Atlantic academies and which to this day has had a claim of universality.

In this context, we are interested in investigating the linguistic circuits of Latin American publishing. Firstly, we recognize Latin America and the Caribbean as an intellectual space with a long academic tradition in which Spanish and Portuguese have been the main languages of scientific production. Secondly, we consider that the global scenario is complex because some centers are probably not unique or hegemonic and some peripheries are not so backward or even so peripheral. In the field of scientific communication and the structuring of spaces of circulation, we suggest thinking about these relations within the framework of the idea of linguistic circuits, which allow us to comprehend supranational strategies of circulation while identifying local singularities. Thirdly, many specialists warned as early as the 1970s and 1980s that Latin American science was not visible in the world, let alone cited. In contrast in those decades a structure of scientific communication was consolidated that sought to valorize the science produced in this part of the world, with its disciplinary singularities, research themes/agendas, and language of publication/circulation. This led to the regionalization of the circulation of Latin American science, giving way to a strong and consolidated structure of journals, scientific networks/nodes, indexing bases, institutional repositories, international open-access organizations, and even national universities as main journal publishers (Salatino, 2018, 2021).

In this paper, we seek to contribute to the knowledge of regional science published in indexed journals, which will allow us to measure the volume of such production, and especially to identify its linguistic characteristics. A central factor in this proposal lies in the fact that most of the studies that have sought to analyze regional production have taken mainstream databases such as *Scopus* and *Web of Science* as sources of information. From available studies, we know the limitations, low representativeness, and visibility that regional science has in these databases

(Chavarro *et al*., 2018; Lucio-Arias *et al*., 2015; Rozemblum *et al*., 2021; Salatino, 2018; Salatino and López-Ruiz, 2021).

From the study of scientific journals, we can observe how two strategies developed concerning the language of publication in the region. On the one hand, journals (especially in disciplines such as medicine and biological sciences) gradually began to publish articles in English. The next step in many of these editorial endeavors was to completely transform their language of publication and take English as the official language. On the other hand, several journals spotlight Spanish and Portuguese as languages of regional circulation and boosted their development to increasingly regionalize their productions. Between these two major strategies, we will observe in this paper nuances that need to be made explicit to generate a sociolinguistic mapping of the state of scientific communication in Latin American regional centers.

The paper is structured in three parts. The first part examines the representation of Latin American production in mainstream databases such as *Scopus* and *Web of Science*. Special attention will be paid to the linguistic description of this circuit, the supremacy of English, and the minimal representation of languages such as Spanish and Portuguese. In the second section, the analysis of a complete corpus of Latin American scientific production will be presented. This is a sociolinguistic study of the Oliva database, composed of 1,720 indexed journals and more than 900,000 articles. Finally, the concept of the linguistic circuit will be analyzed in the light of the socio-historical development of the Latin American scientific journal space, to assess its current development and main challenges.

The circulation of Latin American science in the mainstream

One of the main features of scientific production refers to the language of publication. Circulation and visibility are therefore subject to the language skills that audiences develop to be able to read, understand, use and cite publications. At the same time, scientific information platforms and databases have taken English as their language, so that the main indexing databases, journal rankings, impact, and citation indexes are developed in English.

Although many studies have analyzed the role of English in global science, their empirical knowledge of the peripheries is still limited. Particularly because many of the studies conducted are based on information from mainstream databases. This phenomenon implies at least two core issues. Firstly, mainstream indexing as a device for scientific selection and competition represents a form of exclusion for a large part of the world's scientific output. The number of Latin American journals included in mainstream indexing databases is tiny concerning the total number

of journals published in the region, which is why indexing in *SciELO*, *Redalyc*, and *Latindex Catalogue* is essential to gain more and better knowledge of Latin American science. Secondly, the historical constitution of the regional scientific communication space has been predominantly in Spanish and Portuguese. Writing practices, local cultures, the development of communication infrastructures, and the main publishing projects were constituted in languages other than English. So, this is not simply a dimension that concerns translation or the learning of English as a language but is embedded in intellectual and socio-cultural roots that go back more than two hundred years.

In *Scopus*, we can identify 27,339 indexed journals, of which 932 are Latin American (barely 3.4% of the total). In the case of Web of Science, the Core Collection (WOS CC) has 24,769 journals, of which 1,287 are Latin American (5.2% of the total). The journals that have an Impact Factor and are included in Clarivate's Journal Citation Report (WOS JIF) are 13,802, of which 270 are regional (0.2% of the total)[1].

Table 1 shows the distribution of journals indexed in *Scopus* and *Web of Science* according to their country of publication. An important detail is the greater number of regional journals and the greater number of countries represented in the Core Collection of *Web of Science* (CC) than in *Scopus* (20 out of 21 Latin American countries). This is due to the creation of the Emerging Source Citation Index and its evaluation mechanism that excludes the citation impact requirement. However, if we look at WOS journals with an impact factor, their representation of the region is very restrictive (with journals from only 9 Latin American and Caribbean countries).

Of the total number of journals in the mainstream, Brazil is the country with the highest representation with 44.4% in *Scopus*; 39.5% in WOS CC, and 48.9% in WOS with JIF. It is followed by Colombia with 13.2% in *Scopus* and 16.2% in WOS CC while its representation drops to 6.7% in WOS with JIF. Argentina (7.7% in *Scopus*; 10.8% in WOS CC and 6.7% in WOS with JIF), Chile (12.8% in *Scopus*; 8.2% in WOS CC and 18.1% in WOS with JIF) and Mexico (12.1% in *Scopus*; 9.4% in WOS CC and 15.6% in WOS with JIF) complete the top five positions.

1. The Web of Science Core Collection is composed of the Science Citation Index (SCI), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI) and Emerging Source Citation Index (Esci). However, only the SCI, SSCI and A&HCI have citation requirements for inclusion and have an Impact Index (included in the Journal Citation Reports). Thus, Esci is less restrictive and therefore more inclusive.

TABLE 1
Latin American journals indexed in Scopus and Web of Science

COUNTRIES	JOURNALS IN *SCOPUS*	JOURNALS IN THE CORE COLLECTION OF WOS	JOURNALS IN WOS WITH JIF
Argentina	72	139	18
Bolivia	1	4	–
Brazil	414	508	132
Chile	119	106	49
Colombia	123	209	18
Costa Rica	7	34	1
Cuba	24	27	–
Rep. Dominicana	–	2	–
Ecuador	5	18	–
El Salvador	–	2	
Guatemala	–	1	
Honduras	–	1	
Jamaica	3	2	1
México	113	121	42
Nicaragua	–	3	–
Paraguay	–	3	–
Perú	15	29	–
Puerto Rico	3	–	–
Trinidad y Tobago	1	2	1
Uruguay	1	20	–
Venezuela	31	56	8
Total	932	1287	270

Source: Elaborated by the author in September 2022 from information available on the official Scopus website and Clarivate.

To deepen the analysis of the languages of publication, it is necessary to advance on the universe of Latin American articles included in both *Scopus* and *Web of Science*. To this end, we propose an approach based on three levels of comparison: total number of articles by the language of publication, number of Latin American articles by country of affiliation of the authors, and number of articles by the language of publication for Brazil, Chile, Mexico, Colombia, and Argentina.

As of September 2022, *Scopus* has 62,446,772 million articles, of which 56,734,432 are in English (90.8%); 1,436,361 in Chinese (2.3%); 819,625 in Ger-

TABLE 2
Number of articles in Scopus by country of authors and language of publication

LANGUAGE	ARG	%	BR	%	CH	%	COL	%	MÉX	%	TOTAL	%
English	229159	84,7	883.721	81,3	169353	80,5	116679	74,8	356732	85,2	1755644	82,0
Spanish	38921	14,4	12.582	1,2	39641	18,8	37831	24,3	59995	14,3	188970	8,8
Portuguese	1321	0,5	188.416	17,3	697	0,3	1008	0,6	760	0,2	192202	9,0
French	694	0,3	1.998	0,2	418	0,2	323	0,2	706	0,2	4139	0,2
German	276	0,1	449	0,0	195	0,1	61	0,0	140	0,0	1121	0,1
Italian	122	0,0	362	0,0	94	0,0	37	0,0	138	0,0	753	0,0
Total	270493	100	1087528	100	210398	100	155939	100	418471	100	2143229	100

Source: Elaborated by the author in September 2022 from information available on the official Scopus website / References: Arg-Argentina; Br-Brazil; Ch-Chile; Col-Colombia; Mex-Mexico.

TABLE 3
Number of articles in CC-WOS by country of authors and language of publication

LANGUAGE	ARG	%	BR	%	CHI	%	COL	%	MÉX	%	TOTAL	%
English	180819	88,0	805.542	88,2	138935	85,4	85573	81,0	269315	89,6	1.480.184	87,7
Spanish	23501	11,4	6.197	0,7	23151	14,2	19495	18,5	30330	10,1	102.674	6,1
Portuguese	853	0,4	100.761	11,0	394	0,2	483	0,5	518	0,2	103.009	6,1
French	217	0,1	826	0,1	179	0,1	69	0,1	271	0,1	1.562	0,1
German	53	0,0	178	0,0	76	0,0	31	0,0	40	0,0	378	0,0
Total	205443	100	913504	100	162735	100	105651	100	300474	100	1.687.807	100

Source: Elaborated by the author in September 2022 from information available on the official Clarivate website / References: Arg-Argentina; Br-Brazil; Ch-Chile; Col-Colombia; Mex-Mexico.

man (1.3%); 755,030 in French (1.2%); and 819,625 in English (1.3%). 030 in French (1.2%); 542,959 in Spanish (0.9%); 482,899 in Russian (0.8%); 370,947 in Japanese (0.6%); 244,568 in Portuguese (0.4%); 219,443 in Italian (0.4%) and 131,776 in Polish (0.2%).

If we consider the country of institutional affiliation of the authors, we can find representation from 23 Latin American countries with a total of 2,502,340 articles (4% of the total number of articles in *Scopus*). Of this universe of articles, 47.3% correspond to Brazilian authors; 16.3% to Mexicans; 10.6% to Argentines; 8.1% to Chileans; and 5.9% to Colombians. The five Latin American scientific centers account for 88.2% of Latin American articles in *Scopus*.

Table 2 shows the distribution of articles in *Scopus* signed by authors from Argentina, Brazil, Chile, Colombia, and Mexico according to their language of publication. What is most relevant in all cases is that publication in English is the majority: 82% of Latin Americans have published in English in journals indexed in *Scopus*, 9% in Portuguese, and 8.8% in Spanish. Argentina and Mexico are the countries with the highest average number of articles published in English out of their total production. In the case of Spanish, Colombia is the country with the highest proportion of publications (24.3% out of an average of 8.8%). Brazil is the country with the highest proportion of articles published in Portuguese (17.3% out of an average of 9%). A singular situation results from the scarce publication of texts in Portuguese by Latin American authors whose native language is Spanish (at most 0.5% of Argentines) and, paralleling this, the very few articles published in Spanish by Brazilian authors (1.2%).

The Core Collection of *Web of Science* (CC-WOS) has 34,429,810 articles of which 1,875,158 (5.4% of the total) are published by Latin American authors (from 23 countries in the region). The proportion of Latin American articles is slightly higher than in *Scopus*, even though Elsevier's index includes almost twice as many articles. Of this universe of articles, Brazil has 49%, Mexico 16%, Argentina 11%, Chile 9%, and Colombia 5%. These five countries account for 90% of the regional representation in the Clarivate database.

Of the total number of articles in CC-WOS, 96% are in English; 0.75% in Spanish; 0.7% in German; 0.56% in French; 0.35% in Chinese; 0.32% in Portuguese, and 0.28% in Russian. Compared to *Scopus* we can observe very similar representations except for an even higher concentration of English in CC-WOS.

Table 3 shows the distribution of articles signed by authors from Argentina, Brazil, Chile, Colombia, and Mexico according to their language of publication in journals indexed in CC-WOS. Eighty-eight percent of the articles were published in English, while Spanish and Portuguese share 6.1%. Here again, compared to the

articles in *Scopus*, English is more concentrated, and Latin American languages are less represented. Articles from Argentina, Brazil, and Mexico published in English have a higher average. Colombia is the country with the highest proportion of articles in Spanish, while Brazil has the highest proportion of articles in Portuguese (still lower than in *Scopus*).

The analysis of Latin American production circulating in the mainstream shows a historical continuity of low representation and visibility. Even in countries with greater research and internationalization capacities, the proportion of journals and articles continues to be minimal, in line with previous studies (Beigel *et al*., 2022; Beigel and Gallardo, 2020; Céspedes, 2021; Miguel, 2011; Salatino, 2018). The 91% concentration of English-language articles in *Scopus* and 96% in CC-WOS only confirms the hyper-centrality of English in these databases and their impact on North Atlantic academia.

Latin American production circulating in the region

In this section, we concentrated on Latin American production published in journals indexed in *SciELO* and *Redalyc*. In other words, we will focus on a complete corpus of scientific articles included in the two Latin American databases that have full-text access and have become veritable libraries of Latin American science. For this purpose, we will use as a source the Oliva database[2] consisting of 1720 journals and 908,982 documents published between 1909 and May 2019[3]. This database will allow us to identify the predominant languages of publication in the regional space, the linguistic concentrations according to countries, and most importantly, the linguistic circuits constructed from a representative corpus of regional production.

Table 4 shows the distribution of journals, documents, articles, and authors of the scientific output included in the Oliva database. Fifty percent of the articles are published in Brazilian journals, which represents a concentration of authorship of 57%. Mexico concentrates 12.7% of the articles with a proportion of 10.5% of authors. Colombia has 11.4% of the articles and 8.6% of the authors. Chile accounts for 7% of the articles in Chilean journals, with 7% of the authors. Surprisingly, Cuba

2. The Oliva project database is made up of data from *SciELO* and *Redalyc* indexed journals surveyed on a primary basis and by consolidating data from published papers. Each of these indexing systems collaborated by providing their historical database updated to June 2019 and both were subjected to a process of cleaning and detection of common journal overlaps. Oliva is a bibliographic metadatabase for statistical purposes (Beigel, *et al*., 2022).
3. For an overview of the full Oliva *corpus* and its main features see: Beigel, Packer, Gallardo and Salatino, 2022.

is the country with the fifth highest number of articles (5.2% of the total), while Argentina has 4.5%.

TABLE 4
Basic data of the Oliva corpus. Journals, documents, articles, and author records by country

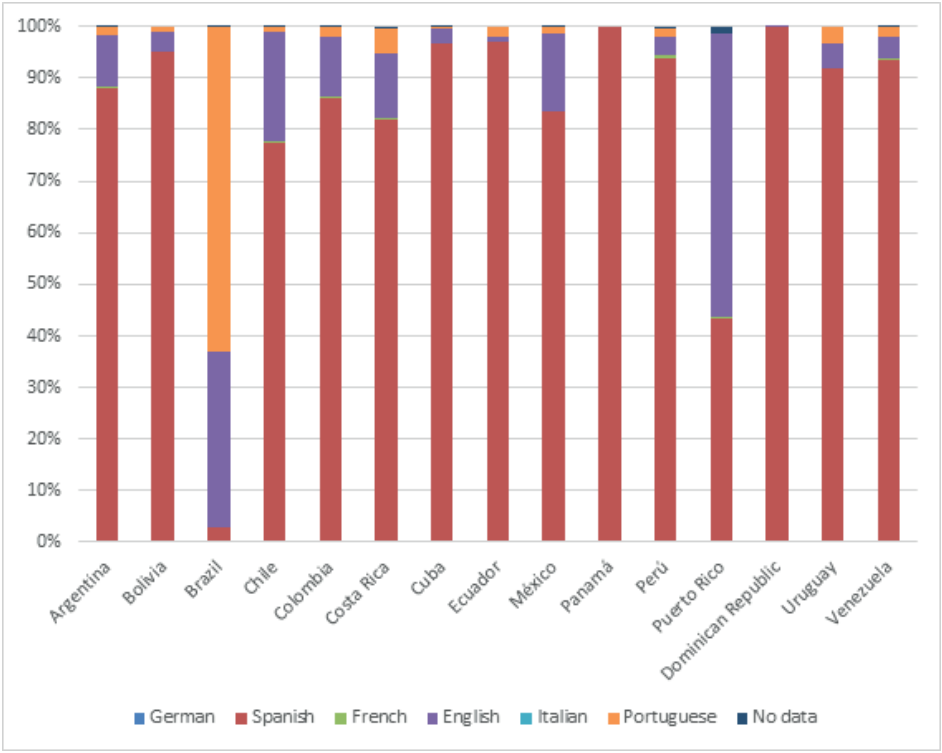
COUNTRY OF PUBLICATION	JOURNALS	DOCUMENTS	DOCUMENT AUTHORS	ARTICLES	ARTICLE AUTHORS
Brazil	506	444,332	1,579,011	396,293	1,476,492
Colombia	291	102,762	241,335	90,530	224,630
Mexico	283	120,475	299,471	100,355	273,002
Argentina	167	46,237	121,052	35,919	104,093
Chile	144	69,095	199,308	57,032	178,521
Venezuela	97	34,939	92,097	30,161	85,814
Cuba	82	46,052	160,371	41,621	149,736
Costa Rica	48	16,313	35,322	14,816	33,199
Peru	37	13,902	40,558	11,773	37,066
Uruguay	25	4,756	14,914	3,680	12,866
Bolivia	22	4,491	10,080	3,629	8,767
Ecuador	11	3,440	5,631	2,877	5,002
Puerto Rico	5	1,253	1,841	816	1,382
Panama	1	408	427	333	341
Dominican Republic	1	527	877	469	793
Total	1,720	908,982	2,802,295	790,304	2,591,704

Note: "Journals" column includes active and non-active journals; "Papers" column includes articles and other literature; "Authors" columns refer to the number of author occurrences in journals published in each country, not the number of different authors from that country.
Source: Beigel, Packer, Gallardo and Salatino, 2022. Oliva database as of June 2019.

However, if we focus on the languages in which the Latin American production is published, we find that 43.7% is published in Spanish, 32.09% in Portuguese, 23.9% in English, 0.2% in French, and 0.12% with no data. Although English is not the official language of the countries with the greatest research and internationalization capacities, its representation in regional publications is very important.

From the analysis of graph 1, it is possible to determine the majority presence of Spanish in the countries that have it as their native language, as well as the predominant presence of Portuguese in Brazil. At the same time, the orientation of Brazilian production towards English can be noted. Some intra-regional singularities should also be distinguished. The country with the highest proportion of produc-

FIGURE 1
Relative distribution of scientific articles published according to the language of publications by country



tion published in English is Brazil with 33.9% (of total Brazilian publications), well above the regional average; and the lowest proportion is Argentina with 10% (of total Argentinean publications). Chile has 21.3% of its articles published in English, a high percentage compared only with Spanish-speaking countries. On the other hand, beyond its small proportion, it is important to note that Latin American language circuits include publication languages such as French, German and Italian, among others.

The Latin American journals that publish the most articles in English are Brazilian. Among them, Memórias do Instituto Oswaldo Cruz has more than 6,000 articles in English, followed by the Journal of the Brazilian Chemical Society (4,657), Arquivos de Neuro-psiquiatria (4,280) and Brazilian Journal of Medical and Biological Research (4,145). At the same time, it can be observed that many journals have multilingual strategies given the presence of articles in several languages, such as the case of Memorias, Revista da Sociedade Brasileira de Medicina Tropical, Ciência Rural, Nutrición Hospitalaria, Cadernos de Saúde Pública, Revista de Biología Tropical, among others.

FIGURE 2
Distribution of scientific articles by the language of publication (1990-2019)

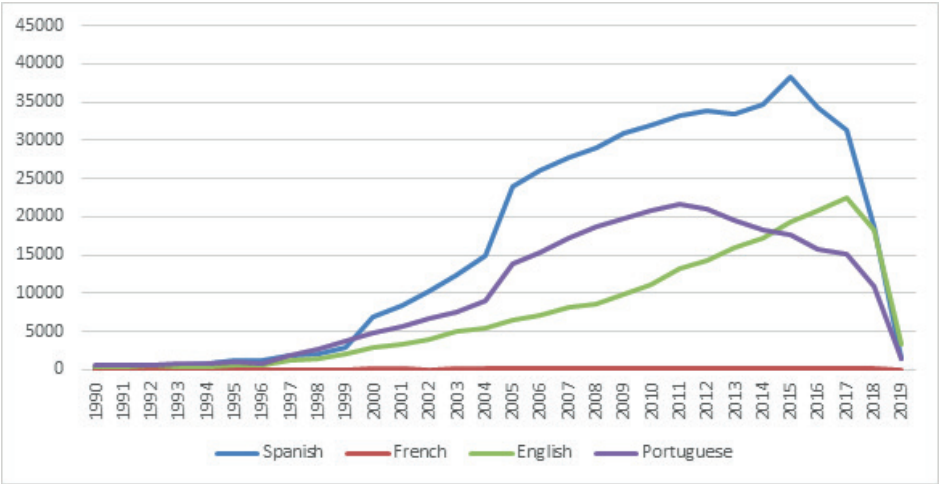


Figure 2 shows a time slice between 1990 and 2019[4] of Latin American publications according to language. There we can point out the coexistence of English, Spanish, and Portuguese as the predominant languages of Latin American circuits at least since the end of the 20th century. Publishing in Spanish has been strengthened in the new millennium, while Portuguese has seen a decline, which has allowed English to become the second language of publication as of 2015. This phenomenon is precisely explained by the progressive immersion of Brazilian journals in English to the detriment of Portuguese.

The analysis of the information presented so far shows a dynamic regional space driven by publication in Spanish and Portuguese with a growing presence of English. What is most relevant is the volume of Latin American production that is available in important indexing databases such as Scielo and Redalyc published in regional languages. A comparison with the visibility of Spanish and Portuguese in *Web of Science* and *Scopus* shows the limits of these databases for analyzing Latin American science.

The scientific journal space and linguistic circuits

As mentioned above, Latin America and the Caribbean have a long tradition of scientific production, editing, and publication. In the specific case of the Latin American

4. The decline in the number of articles in the Oliva database from 2018 onwards can be interpreted from the lag in the availability of the full text in the *SciELO* and *Redalyc* databases. We can therefore observe a time lag in the visualisation of the latest issues and volumes included there.

space of scientific journals, we can affirm that it was constituted and consolidated mainly guided by five processes: 1) the implementation of documentation, cataloging, and indexing databases at Unam. The creation of Alerta, Clase, Periodica, and, above all, Bibliografía Latinoamericana; 2) the emergence of a critical positioning to the mainstream. The presence of Latin American experts in different academic initiated the construction of a proper regional positioning linked to the rescue of a local scientific tradition and a strong critique of the instruments of mainstream evaluation in the world academic system. Such is the case of the pioneering work of Hebe Vessuri, Lea Velho, and Ana María Cetto; 3). The experiences of regional journal evaluation. From the Rio Piedras Meeting to the efforts of Brazilian experts (mainly linked to Bireme) in the early 1990s, an evaluation system was established in Latin America based on the difficulties of peripheral publishing but also aimed at promoting local publication and assessing its impact on national scientific fields; 4) the construction of scientific communication infrastructure based on the circulation of scientific journals in open access and; 5) the numerical expansion of journals published in the region (10,104 active scientific journals as of 2017). To this expansion in absolute terms must be added an geographical expansion (28 countries have journals) and the development of different local/regional/international circulation strategies (Salatino, 2018, 2021).

All this structuring was supported by Spanish and Portuguese as languages of regional science. This process challenges the interpretations that postulate that internationalization is only possible via English and that it is only possible if publication in the so-called mainstream is achieved. Many of the journals published in a Latin American country can be read regionally because of the language of their publication and their inclusion in databases such as *SciELO*, *Redalyc*, and *Latindex*.

The famous publish or perish motto can be reinterpreted from Latin America. This is because the region has a long-standing journal publishing structure that has allowed it to publish and not perish, albeit in peripheral languages. Even here we can point to the existence of locally oriented circuits in broader terms than those developed in this paper. We refer to the publication of books (both in paper and digital format) which are very important in the social sciences and humanities, and which even have a publishing structure of more than 150 years.

At this point, it is important to highlight a defining linguistic feature in Latin America: the division between Brazilian journals published in Portuguese and the rest of Latin America, which mainly publishes in Spanish. This great language division must be historically contextualized concerning the shaping of intellectual and academic spaces in the region. Bethell (2012) affirms that the relationship between Spanish America and Lusitanian America was marked by strong disagreements until

at least the middle of the 20th century. The Brazilian intelligentsia itself during the post-independence period and even with the formation of the República Velha pointed its compass toward the United States and, to a lesser extent, Europe. Spanish America was always relegated to a secondary position, despite being geographically the most important space for social, political, economic, and cultural interaction in Brazil, which for its part aimed to support Pan-Americanism as a continental movement (Bethell, 2012).

It was only in the post-war period that Brazil began to be thought of and included within Latin America. It was international organizations such as Unesco and the OAS, foundations, academic societies, and other multilateral organizations that included Brazil in their now fully regional policies. Portuguese was not a shared language in the rest of the region, and, on the other hand, Spanish was from the beginning a feature of continental unity, first encouraged by Hispano-Americanism and then by Latin Americanism.

From the observation of the scientific production published in Latin American journals and the socio-historical context of the development of regional scientific communication, we can move towards a conceptualization of a linguistic circuit that allows us to understand the circulation patterns linked to the languages of publication. The idea of the publication circuit was developed by Beigel (2013, 2014) to analyze the circulation patterns of world science based on some central problematizations, including the language of publication. In this paper, we take up this concept and contrast it by identifying the languages that circulate in the region. From the analysis of the Oliva *corpus*, we identify that most regional science is published in Portuguese and Spanish. However, articles are published in English, German, French, Italian, Catalan, and others.

In this sense, the idea of a linguistic circuit allows us to identify the language of circulation of an academic text, while at the same time making the publishing process more complex by recognizing the socio-historical context of its production, the cultural effects of languages, and the scientific practices involved in the research processes. In other words, we note the relevance of going beyond language identification to understand the set of scientific and cultural practices that form part of the context of research results.

Based on the identification of journal publishing institutions, languages of publication, countries of publication, disciplinary area, and indexing, we identified at least four linguistic circuits in the region:

- A circuit that has shifted its editorial strategy almost entirely towards English to become part of the mainstream (39 journals). Anchored in disciplines such

as medicine, biological sciences, and agricultural sciences. Linked to journals published mainly in Brazil, Mexico, and Chile. All these journals are indexed in *Scopus* and the WOS Core Collection (among them: *Brazilian Journal of Medical and Biological Research*; *Brazilian Journal of Infectious Diseases*; *Journal of the Chilean Chemical Society*; *Brazilian Oral Research*; *Neotropical Ichthyology*; *Latin American Journal of Solids and Structures*; *Chilean Journal of Agricultural Research*; *Journal of Soil Science and Plant Nutrition*).

- A circuit that is strongly biased towards Spanish with journals that almost exclusively publish in Spanish (211). The journals that only publish in Spanish correspond to medical disciplines, social sciences, and, to a lesser extent, humanities. They are published in Cuba, Argentina, Chile, Colombia, and Mexico. In this circuit, the possibility of visits, downloads, and citations is amplified since the language allows their circulation throughout most of Latin America without any kind of linguistic restriction. The socio-historical space of Spanish continues to be a relevant feature of internationalization in the 21st century (among them, *Revista Chilena de Cirugía*; *Revista de Ciencias Médicas de Pinar del Río*; *Revista Información Científica*; *Revista Médica Herediana*; A*cta Médica Colombiana*; *Revista de Especialidades Médico-Quirúrgicas*; *Sociológica*; *Revista de Ciencias Sociales*).
- A third circuit predominantly published in Portuguese (12 journals). Smaller than the previous ones, so its restricted circulation does not have a decisive impact on Brazil's linguistic positioning. It is made up of journals from various disciplines, mainly published in scientific societies. Among them, *Revista Brasileira de Cardiologia Invasiva*; *Relações Internacionais*; *Revista Dental Press de Ortodontia e Ortopedia Facial*; *Epidemiologia e Serviços de Saúde*; *Revista Brasileira de Coloproctologia*; *Revista Família*, *Ciclos de Vida e Saúde no Contexto Social*; *Comunicação e Sociedade*; *Caderno de Estudos*; *Sur. Revista Internacional de Direitos Humanos*).
- Finally, a multilingual circuit composed of more than 1000 journals that publish articles in at least three languages (Spanish, Portuguese and English) and, in some cases, in French, German and Italian. It is not only the circuit with the largest number of journals but also with the largest number of articles per journal. Most of them belong to higher education institutions (among them, *Memórias do Instituto Oswaldo Cruz*; *Arquivos de Neuropsiquiatria*; *Cadernos de Saúde Pública*; *Revista Médica de Chile*; *Revista Chilena de Pediatría*; *Revista Mexicana de Astronomía y Astrofísica*; *Salud Pública de México*).

The Latin American case is a unique example in the international concert of scientific communication. Most of the journals are published by national universities, and the articles are available in non-commercial open access and are in languages other

than English. At the same time, if we look at the languages of the articles published in Latin American journals, we see that the journals with the highest number of documents are multilingual. That is, they publish at least articles in English, Spanish and Portuguese. This degree of development of publication/circulation practices impregnates the regional space with an internationalization that differentiates it mainly from the monolingualism of the mainstream.

Conclusions

A central element in the hierarchization of English in the field of scientific production and publication is linked to the development of the so-called mainstream. The world's major publishers, indexing bases, scientometric indicators, and rankings are declined in English, and it is here that English is of vital importance for understanding the asymmetries and inequalities in the global academic system.

English as a medium for the unequal structuring of scientific exchanges implies a complete invisibilisation of peripheral languages in the mainstream. As we have seen in this paper, more than 90% of the articles in *Scopus* and 96% in the Core Collection of *Web of Science* are published in English. The over-representation of English in these databases has historically led to an overly homogenous picture of world science.

For this reason, our main objective in this study was to make visible a corpus of scientific production published in Latin American-indexed journals of more than 900,000 articles. Both the volume of articles and the number of journals analyzed reveal a dynamic regional circulation space with strong socio-historical roots, characterized by non-commercial open access and predominantly public publishing.

However, if we look at its linguistic features, we can identify at least four linguistic circuits: three oriented almost entirely towards Spanish, Portuguese, and English, and a fourth that is completely multilingual. The latter is composed of more than 1000 journals that publish at least in English, Portuguese and Spanish, and, in many cases, in French, German and Italian. At the same time, the multilingual circuit contains the journals with the highest number of published articles.

The reception of articles in different languages by Latin American journals is another step towards better standards of visibility and circulation. This process can be strengthened if, at the same time, the publication of the same article in at least Spanish, Portuguese, and English is encouraged. This will make it possible to move beyond the linguistic boundaries that still exist in the region and, at the same time, boost its circulation outside the region. This publication strategy may be especially beneficial if we consider the structural difficulties that arise when it comes

to analyzing and implementing stable translation policies in the field of scientific communication.

In this paper, we are not unaware of the role of English in global scientific exchanges. It has enabled North-South/South-North and, perhaps more importantly, South-South dialogue. The predominance and hegemony of English can be seen from the countless asymmetries it has produced in scientific practice. But, at the same time, it has allowed the development of relations between scientific institutions and agents with different traditions, cultures, and languages. This situation does not imply ignoring the structurally monolingual character of what is considered mainstream science.

Based on empirical work representative of regional production, we hope to initiate a discussion that is necessary and decisive for the development of our Latin American scientific systems. While the focus of evaluation systems has for decades been oriented towards the North and declined in English, the region has developed an infrastructure for the circulation of evaluated and quality scientific knowledge published in multiple languages. The connection between evaluation, scientific journals, and languages of publication must be at the heart of reforms of national science systems. Especially if such reforms are expected to lead to greater levels of inclusion, sovereignty, and development for our countries.

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Abstract

Linguistic circuits of Latin American scientific production

Given the current role of scientific production published in journals, it is essential to understand their linguistic circulation patterns. To this end, we examined the journals and articles included in *Scopus* and *Web of Science* to demonstrate their lack of representation and diversity, especially for Latin American scientific production. One of the main objectives of this work is to make visible a corpus of scientific production published in Latin America. To this end, we analyzed more than 900,000 articles and 1.720 scientific journals. Both the volume of articles and the number of journals analyzed reveal a dynamic regional circulation space with strong socio-historical roots, characterized by non-commercial open access and predominantly multilingual. From the concept of linguistic circuit, we conclude how important is this increasing multilingualism for the development and internationalization of Latin American science.

Keywords: Scientific production; Latin America; Linguistic circuits.

Resumo

Circuitos linguísticos da produção científica latino-americana

Dado o papel atual da produção científica publicada em periódicos, é essencial compreender seus padrões de circulação linguística. Para tanto, examinamos as revistas e artigos incluídos no *Scopus* e na *Web of Science* para demonstrar sua falta de representação e diversidade, especialmente, para a produção científica latino-americana. Um dos principais objetivos deste trabalho é tornar visível um *corpus* de produção científica publicado em periódicos latino-americanos. Para isso, analisamos mais de 900 mil artigos e 1.720 periódicos científicos. Tanto o volume de artigos quanto o número de periódicos analisados revelam um espaço de circulação regional dinâmico com fortes raízes sócio-históricas, caracterizado por um acesso aberto não comercial e predominantemente multilíngue. A partir do conceito de circuito linguístico, concluímos ilustrando a importância desse crescente multilinguismo para o desenvolvimento e a internacionalização da ciência latino-americana.

Palavras-chave: Produção científica; América Latina; Circuitos linguísticos.

Resumen

Los circuitos lingüísticos de la publicación científica latinoamericana

Dado el papel actual de la producción científica publicada en revistas, es fundamental comprender sus patrones de circulación lingüística. Para ello, examinamos las revistas y artículos incluidos en *Scopus* y *Web of Science* para demostrar su falta de representatividad y diversidad, especialmente

para la producción científica latinoamericana. Uno de los principales objetivos de este trabajo es visibilizar un corpus de producción científica publicado en revistas latinoamericanas. Para ello, analizamos más de 900 mil artículos y 1.720 revistas científicas. Tanto el volumen de artículos como el número de revistas analizadas revelan un espacio dinámico de circulación regional con fuertes raíces sociohistóricas, caracterizado por un acceso abierto no comercial y predominantemente multilingüe. Partiendo del concepto de circuito lingüístico, concluimos ilustrando la importancia de este multilingüismo creciente para el desarrollo y la internacionalización de la ciencia latinoamericana.
Palabras llave: Producción científica; América Latina; Circuitos lingüísticos.

Texto recebido em 06/09/2022 e aprovado em 30/09/2022.
DOI: 10.11606/0103-2070.ts.2022.201928

Maximiliano Salatino é pesquisador do Consejo Nacional de Ciencia y Tecnología (Conicet) e professor da Universidad Nacional de Cuyo (UNCuyo). Salatino é cientista político, mestre em estudos latino-americanos e doutor em ciências sociais, todos pela UNCuyo. Faz parte do Centro de Estudios de la Circulación del Conocimiento (Cecic) e integra projetos de investigação nacionais e internacionais. Em 2017 ganhou o Premio Internacional Pedro Krotsch en Estudios Universitarios. Sua trajetória de publicação e pesquisa está relacionada com o espaço latino-americano de revistas científicas, circuitos de publicação e políticas regionais de indexação.
E-mail: maxisalatino@gmail.com, msalatino@mendoza-conicet.gob.ar.