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Approaching bibliometrics and prosopography: The comprehensive publishing landscape of CNPq (Brazil) and CONICET (Argentina) and its coverage in global databases

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Approaching bibliometrics and prosopography.

The comprehensive publishing landscape of CNPq (Brazil) and CONICET (Argentina) and its coverage in global databases

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Abstract: Global databases such as Web of Science and Scopus have determined the standard indicators to measure the research output in national comparisons and its quality evaluation for decades. Already classic studies of science proved that this landscape of scientific production was distorted by using overly selective bibliographical indexes that were considered “international databases” while their coverage was severely limited. A relevant part of the bibliometric literature in the last 10 years has revolved around the limitations of these global data sources and the search for alternatives to explore more comprehensive universes of the scholarly output, considering all disciplines and languages. Particularly relevant in this debate are some recently created bibliographic services and search engines that provide new opportunities: Dimensions, Lens, Open Alex, CrossRef and Google Scholar. Our specific contribution to these studies relies on a methodological shift based on a convergence between prosopography and bibliometrics. For that end, we selected two countries that can be considered “peripheral centers” in the Latin American region. Firstly, we determined a universe of national researchers of the National Council for Scientific and Technological Development (CNPq, Brazil) and the National Council for Scientific and Technical Research (CONICET, Argentina). The target populations are composed of 10,619 tenured researchers at CONICET and 14,418 holders of the CNPq’s “research productivity fellowship”. Secondly, we built a database with their comprehensive publishing performance uploaded in the national curricular information systems, the Brazilian Lattes and Argentina’s SIGEVA, that includes metadata for all articles. After computational and manual data cleaning of this database, we retained a total 464,361 articles for Brazil and 81,005 for Argentina published in 2013-2020. The comparative study shows that Argentina and Brazil have similar patterns of coverage in the global databases, although they differ in terms of collaboration practices and national publishing.

Approaching bibliometrics and prosopography.

The comprehensive publishing performance of CNPq (Brazil) and CONICET (Argentina) and its coverage in global databases

Luciano Digiampietri, Osvaldo Gallardo, Denis Baranger & Fernanda Beigel

The publishing platforms and international indexing services are critical components of the current research system, providing the basis for bibliometric reports as well as for research assessment and university rankings. The two main global databases, Web of Science (WoS, property of Clarivate) and Scopus (property of Elsevier), have determined the standard indicators to measure the research output in national comparisons and its quality evaluation. Already classic studies of science proved that the landscape of the scientific production from the so-called periphery was distorted using overly selective bibliographical indexes that were encumbered as "international databases" while their coverage was severely limited (Gareau 1988; Arvanitis & Gaillard, 1992; Van Leeuwen et al. 2001). According with numerous available comparative studies, Scopus and WoS are structurally biased regarding the research produced in non-Western countries, in non-English language, and specially within the arts, humanities, and social sciences (Martín-Martín, Thelwall, Orduna-Malea, & Delgado López-Cózar, 2021; Martín-Martín *et al.*, 2021). An important share of the output of the European countries published in non-English languages is also left aside and it is also extensively proven that great part of the scholarship in the social sciences and humanities is left outside these sources, and this is particularly striking for books, which carry a large part of knowledge in these disciplines (Engels, Istenič Starčič, Kulczycki, Pölönen, & Sivertsen, 2018). Consequently, as Ràfols, Ciarli & Chavarro (2015) have argued, the exclusive use of these two databases in bibliometric studies results in a significantly distorted view of the national research agendas.

A relevant part of the literature in the last ten years has revolved around the explorations on these global data sources and the search for new alternatives to build more comprehensive outlook of scholarly publishing, considering all disciplines and languages. Particularly relevant in this research domain are the bibliographic services that provide opportunities to auscultate production beyond WoS and Scopus: Google Scholar, Dimensions, Lens, and Open Alex. The available studies agree in considering that Google Scholar includes a much broader range of documents and coverage, but also that it is only a search engine, with less quality control (Doğan *et al.*, 2022). Open Alex is currently a progressive alternative and a collaborative infrastructure attempting to overcome these limits, and several research teams are developing studies to calibrate its coverage.

Our specific contribution to these coverage studies proposes a methodological shift based on a convergence between a bourdieusian field approach and situated bibliometrics. This consists of focusing in research communities identified through national categorization systems that regularly classify them and play a recognized role in science and higher education (Beigel & Bekerman, 2019; Beigel, 2024a). These countries have national curricular information systems available with the metadata for all their publications; some of them are public, others provide the metadata upon demand. Compiling and curating these national data sources has an additional heuristic value that allows us to discuss who these researchers are and to what extent their publications are represented in the global databases. These bottom-up studies based on curriculum databases make visible the multi-scalar dynamics of national and regional publishing circuits, showing the resilience of bibliodiversity and multilingualism (Beigel & Gallardo, 2021).

In the frame of a comparative project, we explored two national research communities and their curriculum databases, the National Council for Scientific and Technological Development (CNPq) and the National Council for Scientific and Technical Research (CONICET) through the Brazilian Lattes[1] and Argentina's SIGEVA[2]. Lattes is a complex system with decades of development that includes all academic and educational staff in the country, with personal and institutional identifiers, along with a stamp by the indexers services certifying publication. Used by numerous researchers, Lattes serves as a valuable tool for evaluating the national scientific output and academic development (Digiampietri *et al*., 2012; Nascimento, 2022, Digiampietri *et al.*, 2019). SIGEVA is a system for administrative management and research assessment created by CONICET which encompasses all its agents (researchers, professionals, fellows, administrative staff). While Lattes is public and is the unique database for curriculum in Brazil, SIGEVA is not public (only available for research on formal demand), and it is not the only curriculum database in the country.

To move away from the studies that analyze a disembodied set of publications harvested from global databases, in this research we selected two countries that can be considered "peripheral centers" in the Latin American region. Firstly, we determined a universe of national researchers of the National Council for Scientific and Technological Development (CNPq, Brazil) and the National Council for Scientific and Technical Research (CONICET, Argentina). The target populations are composed of 10,619 tenured researchers at CONICET and 14,418 holders of the CNPq's "research productivity fellowship". Secondly, we built a database with their comprehensive publishing performance uploaded in the national curricular information systems, the Brazilian Lattes and Argentina's SIGEVA, that includes metadata for all articles of these researchers. After computational and manual data cleaning of this database, we retained a total 464,361 articles for Brazil and 81,005 for Argentina, published in 2013-2020. As we will see, as scientific fields, Brazil and Argentina differ in several ways, although both research communities have similar patterns of limited coverage in the global databases.

Global data sources under scrutiny

The critique to the dominant standards for research assessment based on the Impact Factor is extensive to WoS and Scopus, because these selective proprietary databases played a relevant role in establishing global academic hierarchies all of which had a relevant incidence in the current prestige-building system (Beigel, 2014; Marginson, 2020). These global databases conquered such a status that a paper published in these mainstream journals became the materialization of an "international export" of scientific knowledge, while articles published in other indexing platforms, such as SciELO or Redalyc were devalued as local research, reinforcing them as peripheral science (Vessuri, Cetto & Guèdon, 2014). These "export" counts in the sphere of circulation came to express the state of the national scientific development of any given country, converting this portion of papers in the pattern of value of the sphere of knowledge production from a given country (Beigel, 2023). International collaboration was considered a feature of scientific development and national publishing a sign of peripheriality. In a study covering 1980-2021, Aksnes & Sivertsen (2023) show that the traditional relation established between collaboration rates and the economic status of a nation has changed over time and only a moderate correlation was still found between a country's income and its publishing performance. On the other hand, the breakthrough of China to a leading global role, and the rise of India, Iran, South Korea, and Brazil shows that national

[1] Officially "Platform Lattes", managed by CNPq (see https://lattes.cnpq.br/)

[2] Spanish acronym for Integrated Management and Evaluation System, managed by CONICET (see https://sigeva.conicet.gov.ar/)

collaboration has often been more generative than international co-authorship (Shu, Wang, Liu, Qiu, & Larivière, 2023). Kwiek (2020) notes that in five countries in 2018, including the US and China, domestic co-authored papers received higher global citations rates than international papers. On the contrary, in international collaboration papers, when an emerging country author is first, citation shows often lower (Chinchilla-Rodríguez, Sugimoto, & Larivière, 2019).

Overall, the global patterns of internationalization and scientific development described using WoS or Scopus is currently under scrutiny. Van Leeuwen (2022) argues that three large multidisciplinary databases (WoS, Scopus, Dimensions), show limits in terms of coverage and also regarding reliable and transparent citation statistics. With an awareness of the role played by these mainstream databases in creating the existing academic elites, interesting studies have tried to understand the formation of these top cited researchers. Akbaritabar, Castro Torres, & Larivière (2023) analyze a small fraction of influential scientists that benefit disproportionately and concentrate its outcome in the form of impact and citations.

The fact that Google Scholar covers the social sciences more broadly opened its increasing use as a bibliometric data source for research assessment, but its commercial nature creates constant obstacles for an autonomous development such as the efforts made by the COLAV[3] (Spanish acronym for *Colaboratorio de Vinculación para las Ciencias Sociales Computacionales*, University of Antioquia) in Colombia. The first comprehensive studies of Google Scholar's unique citations reported the existence of a wide range of non-WoS citing sources, especially from non-journal documents including theses, books, conference papers, and unpublished materials (Kousha & Thelwall, 2007). This was considered an advantage of Google Scholar, since it could be useful to surpass the limitations of WoS and Scopus and for citation tracking of social impact beyond academic journals. Martín-Martín *et al.* (2018) followed these first studies pursued from 2007 until 2016 revealing the growth over time in the coverage of citations in Google Scholar, reporting much more comprehensive and consistent values across subject areas. However, they found strong correlations between Google Scholar and Scopus. The high citation count correlations made by Harzing & Alakangas (2016) also suggest that Google Scholar advantage was not substantial, as it provided essentially the same citation rankings as Scopus and WoS at the document level in most subject categories. The distribution of non-English among the unique Google Scholar citations do increase, but most of these citations found only by Google Scholar still came from non-journal sources (Martín-Martín *et al*., 2018).

This explains why they are still used in studies of science where that criticism is mainly developed. The main argument is that WoS has the highest overall quality among the sets considered; and that the differences in quality comparing with new databases such as Google Scholar or others lies primarily in how the data sources are organized (Nguyen, Luczak-Roesch, Dinneen, & Larivière, 2022). Archambault *et al.* (2006) argue that it is like a long-lasting marriage: there has been a healthy dialogue between the partners and both the tools, and the users have grown in sophistication through mutually beneficial exchanges. However, after decades of persistent use, the language bias has increased, and the coverage problems persist. In addition, the debate on these global data sources not only revolves around coverage, but also around transparency, given the predatory journals expelled from these collections and the different means for gaming the metrics observed in recent studies (Biagioli et al 2019; Siler & Larivière, 2022; Beigel, 2024b).

On its part, recent studies of national data sources show that non-hegemonic countries have become increasingly diversified, not only in terms of scientific production but also regarding international circulation. A consequent argument in favor of national data collection is the enlightenment of comprehensive research agendas, multilingual output and bibliodiversity -particularly books and non-

[3] See https://github.com/colav

journal formats. Additionally, according to Siles (2022) national databases are increasingly seen as a potential solution for a responsible research evaluation. Eventually, these sources can also boost a necessary move towards a virtuous interaction between science and society. Ràfols, Muthu *et al.* (2023) for example argue that the dissemination of agricultural research through initiatives like 'extension' (service) programs at the universities has long been recognized as essential for development, but these contributions are invisible in global data sources.

Nonetheless, the national curriculum databases have several data-cleaning problems that range from the basic information on the articles without DOI, including the author order that could be mistaken during the uploading by the researcher. We have been curating these national curriculum databases for quite a long time in the framework of a comparative study, completing a national dataset with all the available DOIdocuments produced by the researchers in Argentina and Brazil. We analyzed publishing performance, collaboration, multilingualism and gender asymmetries putting in relation the national databases with Google Scholar (Beigel, 2017; Beigel & Gallardo, 2021; Baranger & Beigel, 2021; Beigel *et al.* 2023). After several explorations aimed at the creation of a multi-source publishing database for Argentina (Vélez Cuartas, Beigel *et al.* 2022) we found several obstacles to build a comprehensive database merging Google Scholar with the national curriculum databases. This paper shows our feasible results in this journey as also its limitations.

Target populations and methods

In this paper we explore two research communities, the CNPq in Brazil and the CONICET in Argentina, and their publishing performance between 2013 and 2020. A relevant part of these researchers circulates outside the traditional impact journals, but most of them also participate in national and regional publishing circuits. Choosing these research communities implies observing the most productive researchers who are subject to similar academic career evaluations, leaving aside a large group of professors in both countries. To move from the studies that analyze a disembodied set of publications harvested from global databases we examine the complete research output of these researchers using the national curriculum databases that are used for their national classification. The list of active personnel provided by CONICET for this research was composed of 10,619 tenured researchers. The Brazilian list included 14,418 holders of the CNPq's "research productivity fellowship" [4].

The Argentinian CONICET was created in 1958 and is a public research-performing agency, which Scientific and Technological Researcher Career (CIC, *Carrera del Investigador Científico*) is based on annual competitions that ensure a full-time position and relative stability. It is structured in five categories of ascending hierarchy: Assistant, Adjunct, Independent, Principal, and Superior Researcher. Teaching is not mandatory, although the majority of the CONICET researchers hold a teaching position at a public (national) university. While there is a difference in researchers' salary associated with their position in the hierarchy, there is no direct monetary compensation for publishing productivity.

In turn, CNPq was created in 1951 and is a public research-funding institution not offering research careers with full-time positions, but a prestigious so-called "productivity grant" (*bolsa de produtividade* in Portuguese) to a selected group of researchers. It grants a prestigious monetary incentive to tenured researchers on a competitive basis. The awardees hold a university professorship or a research position in a research institute. This *bolsa* does not refer to a stipend assigned to young doctoral or postdoctoral students to finance their studies, but a financial support given to researchers for a research project[5]. As a

[4] Both lists of active researchers were built with official information provided by CNPq and CONICET between February and June 2021.

[5] The economic reward of the "*bolsa de produtividade*" is USD 215-300 per month, according to the researcher category. Source: https://www.in.gov.br/web/dou/-/portaria-cnpq-n-1.237-de-17-de-fevereiro-de-2023-465632489 (accessed 07/04/2023).

result of this evaluation, the awardees are assigned to one of five levels (2, 1D, 1C, 1B and 1A) that serve the purpose of a national classification for the most productive researchers in the country.

In the comparison of the two target populations, several differences arise, particularly in terms of gender. Argentina shows a progressive diminishment of gender asymmetries at CONICET, especially regarding the move of women up to the higher categories of the research career. Currently, parity is achieved in the intermediate category (Independent researchers), and this seems to be a slow but systematic virtuous tendency (Beigel, Gallardo, & Bekerman, 2018).

CONICET has a highly internationalized evaluative culture even if it doesn't have a direct monetary incentive for mainstream publishing. Academic writing in English, journal rankings, and impact indicators have a cross-cutting incidence on the indicators considered for tenure, as well as on career promotions, across all disciplines in the exact, natural, biological, agricultural, and engineering sciences. However, in the social sciences and the humanities (SSH) CONICET committees also value publication in journals included in Latin American indexing services such as SciELO or Latindex-Catalog (Beigel, 2017). As a result, applicants with articles in these journals can achieve similar scores to those in mainstream publications[6]. Even with some ambiguities, many national and regional journals receive a significant flow of articles from CONICET researchers and fellows aspiring for tenure. So, although the evaluative culture of the agency promotes international publication, this norm, together with the lack of a salary incentive for publication in Scopus or WoS, certainly impacted on the bibliodiversity observed in the CONICET's production.

Brazil shows a high masculine dominance overall, not only in the higher categories: only 35% of the bolsistas are women. The CNPq's evaluation committees also use journals' rankings to evaluate the researchers' bibliographic production. Unlike CONICET, though, it uses the so-called Qualis system, which classifies national and international publications. Journals are classified in ordinal strata with A1 being the highest, followed by A2, B1, B2, B3, B4, B5, and C, the least valued (Martínez-Ávila, 2019). The vast majority of the CNPq's evaluation committees use the journal impact factor as an indicator to establish quality of a published article[7]. It should be noted that Brazil has many journals indexed in international services, such as Scopus and WoS, and hundreds of journals indexed in SciELO. Mugnaini *et al.* (2019) analyzes the complete list of publications of 260,663 scholars/postgraduate students included in Lattes Brazil, showing that national journals occupy a significant portion of the articles in all areas. Even more striking is that national publishing is a relevant tendency, although inverse to the tendency of publishing in Portuguese, which is much lower than Argentina's publishing in Spanish (Digiampietri & Beigel, 2022).

In this paper we use the Brazilian Lattes Platform which has become strategic not only for planning and management activities, but also for formulating policies for the Ministry of Science and Technology and other government bodies in the area of science, technology and innovation[8]. The database is constantly updated by the workload of each researcher, who normally updates his/her CV at least once a year. Since it is not a database curated or monitored by a repository system, it was necessary for us to develop a curatorship to identify duplicates, eliminate records that did not correspond to articles published in journals, and determine the sex of the researchers that was not included in the public information[9]. The CNPQ-PUB table was thus constructed from the harvesting of all metadata of articles published between 2013-2020 and interconnected with a trajectory database called CNPq-INV through the ID of the

[6] An institutional decision is responsible for this, as a special regulation for the SSH classifies journals indexed in the mainstream circuit on the same level as those indexed in the regional databases. See Resolution N°2249/2014 https://www.CONICET.gov.ar/bases-para-la-categorizacion-de-publicaciones-periodicas-en-ciencias-sociales-y-humanidades/ (accessed 07/04/2023).

[7] According to the available documents, the only areas that do not use impact indicators are anthropology/archaeology, education, architecture, urbanism, and arts/music (CNPq, 2020).

[8] About Lattes Platform https://www.gov.br/cnpq/pt-br/acesso-a-informacao/acoes-e-programas/plataforma-lattes

[9] Sex and race were publicly available in the past, but were deleted from open Lattes several years ago as part of a public policy to avoid discrimination -a contested decision that is not consensual among experts in academic inequalities.

researchers, containing prosopographic information: disciplinary affiliation, year of birth, sex, the institution of work, year of entry to CNPq, category of the researcher, doctoral training, among others. It contains records for 14,814 "bolsistas" according to the official information we extracted from the CNPq lists as of June 2021.

In Argentina, the SIGEVA database is not publicly open, so we built a database from now on called CONICET-PUB with 2 sources: a) the dataset with the publications provided by the CONICET Repository, including all the articles (2013-2020) uploaded by the researchers and curated by the team of the Repository[10] . The careful data-cleaning work carried out by a national network of curators of this repository gives an important quality to this database, and its main advantage is that it allows linking the articles with the CONICET researchers who have authored them. However, it also has some problems. The main problem is that the speed at which the data is updated depends on the pace of work of the Repository and, over the selected period, as we get closer to the present, the annual number of articles tends to stagnate or even decrease. b) This database was enriched with the dataset prepared in 2021 in collaboration with the COLAV, which amalgamated different global sources about Argentina and CONICET for a previous study (Vélez Cuartas, Beigel *et al.*, 2022). We aggregated all the articles from the period 2013-2020 that were not included in the Repository dataset. The CONICET-PUB database is interconnected with the trajectory database called CONICET-INV through the ID of the researchers with data on their disciplinary affiliation, year of birth, sex, institution of work, year of tenure in CONICET, category in the research career, doctoral training, among others. It contains data on 10,619 full-time researchers who were active as of June 2021. This information from the SIGEVA system was provided, at our formal request, by the CONICET authorities.

Our methodology combines a bibliometric analysis with a prosopographical study of each national research community. Prosopography is a kind of collective biography that has been frequently used by Bourdieu (1998) to understand the trajectory of the agents in a field. It is based on the study of the objective and relational features of the individuals belonging to the same space, collecting information such as: social origin, professional category, training, disciplinary self-ascription, social, and cultural capital. Our database is based on previous studies on the target population and contains information of all researchers collected directly from national sources. This determined the decision we made to determine the field of each article not by the classification made by the global databases but using the disciplinary classification declared by each researcher-author. This perspective may represent a limitation for interdisciplinary researchers but it overcomes the numerous limitations observed for the indexing platforms (Shu et al., 2020; Zhang, Hua, & Yuan, 2018). To undertake the coverage study, we followed the procedure proposed by Martin-Martin *et al.* (2021) to obtain the complete list of all documents covered by each source, match the documents across databases, and report the size of the overlaps. Finally, we compared citation performance using the same process but including Google Scholar.

Results

The research output of the CONICET researchers amounts to 81,005 articles and the CNPq researchers to 464,361. This section presents the aggregated data by disciplinary areas in which researchers are enlisted. We have applied the CONICET classification to analyze also the scientific output of the CNPq researchers after a recategorization for comparison purposes. Table 1 shows the total number of articles corresponding to researchers in each area, and the proportion of them identified by DOI. As we can see, the output without DOI is significant, especially in the SSH for both countries.

[10] We thank the CONICET for the access given to the SIGEVA information for this research and especially to the coordinator of the CONICET Digital Repository, Lorena Carlino, for her help in the construction and review of the dataset.

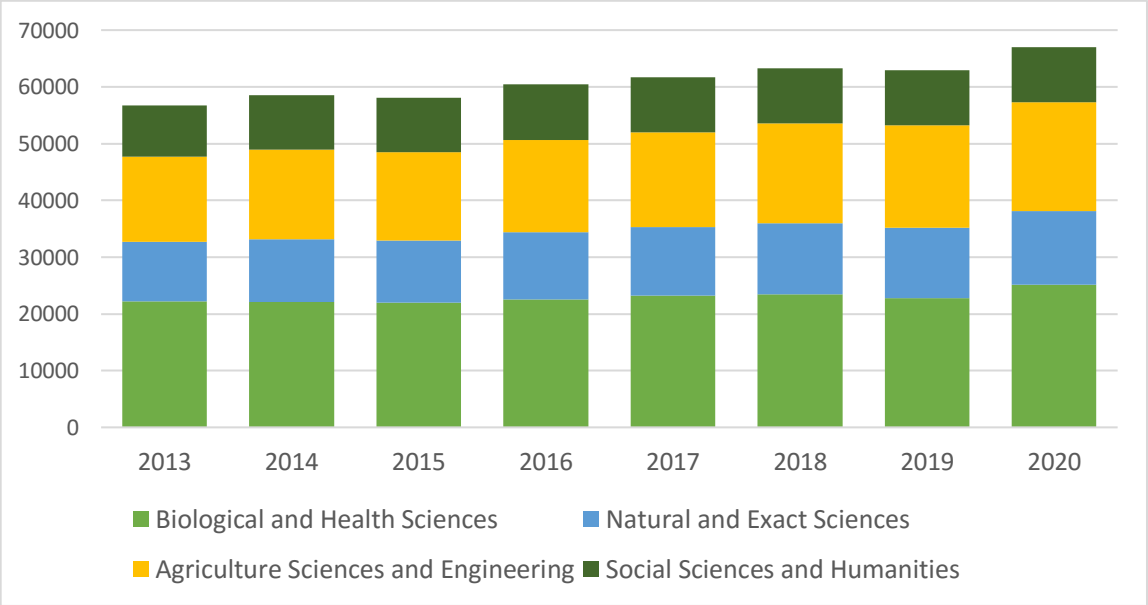
Table 1. Number of articles and percentage with DOI, by broad field and country, 2013-2020. CNPq-Brazil n=464,361; CONICET-Argentina n=81,005.

Broad fields	CNPq Brazil		CONICET Argentina	
	Articles	% DOI	Articles	% DOI
Biological and Health Sciences	183,210	86%	26,529	91%
Natural and Exact Sciences	94,370	90%	22,617	93%
Agriculture Sciences and Engineering	134,346	81%	23,032	87%
Social Sciences and Humanities	76,637	45%	22,228	46%
Total	*464,361*	*78%*	*81,005*	*78%*

Source: CONICET-PUB data collected by June 2021. CNPq-PUB data collected by June 2021. Both curated during 2021-2023.
Notes: The sum of each column of Articles exceeds the total due to co-authorship between researchers from different areas. Each article is counted in each broad field if it has at least one author from the corresponding disciplinary area.

The average number of publications per researcher is significantly higher for CNPq than for CONICET. CNPq researchers have an average of 31.3 articles each, compared to 7.6 articles for CONICET researchers. This contrast is related to the higher collaboration tendency observed in Brazil which we will explore deeply below. For CNPq, Figure 1 illustrates a steady increase in the number of articles published by CNPq researchers where the most substantial growth is observed in Agriculture Sciences and Engineering. The number of publications by the Social Sciences and Humanities remains relatively constant across the period.

Figure 1. Articles by year of publication and broad field, CNPq-Brazil, 2013-2020. N=464,361

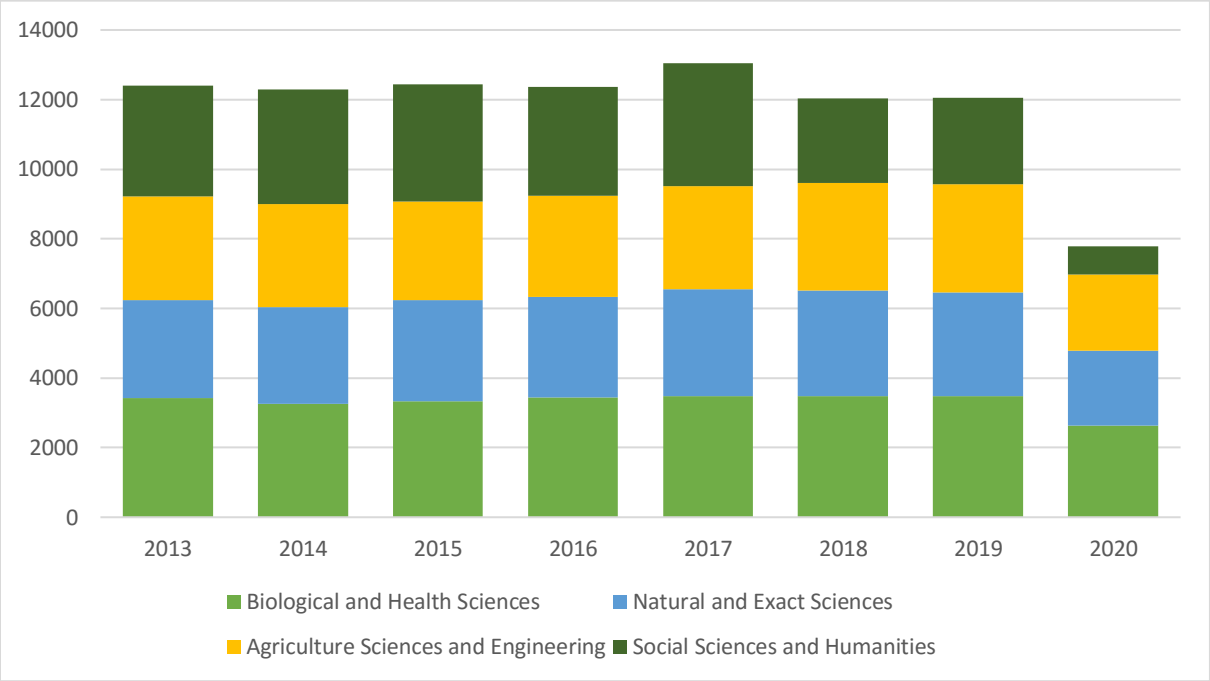


Source: CNPq-PUB 2021. Note: each article is counted in each broad field if it has at least one author from the corresponding disciplinary area. The sum of each column of Articles exceeds the total due co-authorship between researchers from different areas.

By contrast, publications authored by CONICET researchers show relatively consistent numbers from year to year (as indicated in Figure 2). The decrease in 2020 can be attributed to delays in curating and

uploading the new articles in the institutional repository. The decline is more pronounced for researchers in Social Sciences and Humanities, possibly due to the lower availability of DOIs (as seen in Table 1). We will revisit this point in the following section.

Figure 2. Articles by year of publication and broad field, CONICET-Argentina, 2013-2020. N=80,001.



Source: CONICET-PUB 2021. Note: each article is counted in each major area if it has at least one author from the corresponding disciplinary area. The sum of each column of Articles exceeds the total due co-authorship between researchers from different fields.

In general terms, the production of CNPq researchers shows a greater number of co-authors than CONICET (See Table 2). For all disciplines, the proportion of articles with individual authorship is higher for CONICET than for CNPq. This is particularly notable for the Social Sciences and Humanities, where more than half of the articles by CONICET researchers have single authorship, while is reaches only 23.6% in the case of CNPq. In the first three fields there is a predominance of coauthored publications with up to 5 coauthors, except in Biological Sciences in Brazil, where the range with the most cases is 6-10 authors. In this area there are also numerous articles with between 11 and 20 co-authors (more for CNPq than for CONICET). For Exact and Natural Sciences, the proportions with more than 20 co-authors are particularly high in both countries, which mainly corresponds to publications in the area of high energy physics.

Table 2. Articles 2013-2020 by number of authors and broad field, per country. CNPq-Brazil N=464,361; CONICET-Argentina N=81,005.

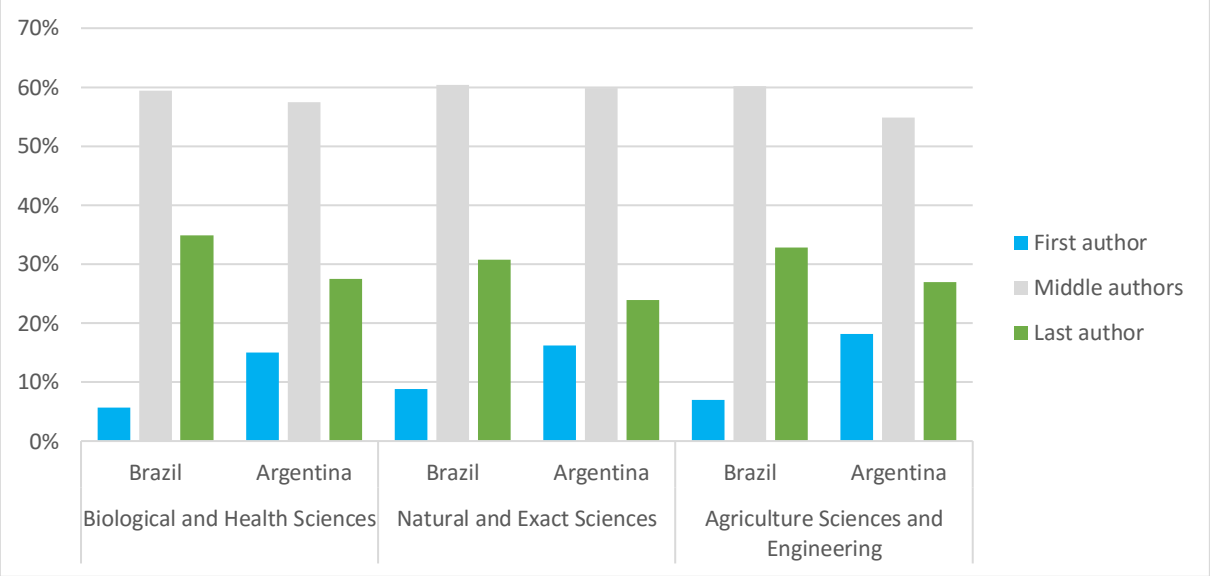
Major area	Country	1	2-5	6-10	11-15	16-20	21+	Total
Biological and Health Sciences	Brazil	1,3%	39,4%	46,3%	9,6%	1,7%	1,7%	100%
	Argentina	1,8%	50,8%	35,8%	6,3%	1,5%	3,8%	100%
Natural and Exact Sciences	Brazil	2,1%	55,7%	32,1%	4,9%	0,8%	4,4%	100%
	Argentina	3,5%	61,8%	25,7%	3,4%	0,8%	4,9%	100%
Agriculture Sciences and Engineering	Brazil	0,6%	53,6%	41,3%	3,4%	0,3%	0,9%	100%
	Argentina	2,9%	63,6%	26,9%	2,8%	0,8%	3,2%	100%
	Brazil	23,6%	71,4%	4,3%	0,4%	0,1%	0,2%	100%

Social Sciences and Humanities	Argentina	51,2%	40,4%	5,7%	0,9%	0,4%	1,4%	100%
Total	Brazil	5,0%	52,9%	34,3%	5,1%	0,9%	1,7%	100%
	Argentina	16,4%	55,6%	22,0%	3,2%	0,8%	2,0%	100%

Source: CNPq-PUB 2021 and CONICET-PUB 2021. Note: the cell with the highest value in each row is colored.

If we now explore the author position in collaborative articles, Brazil shows fewer first positions compared with CONICET (considering only articles with 3-20 authors). Indirectly, this observation can be related to the difference in the total volume of publications already mentioned. The contrary is true regarding the last position, while the intermediate position remains approximately the same for both countries (See Figure 3).

Figure 3. Author position by broad field and country.
CNPq-Brazil N=378,144; CONICET-Argentina N=55,486



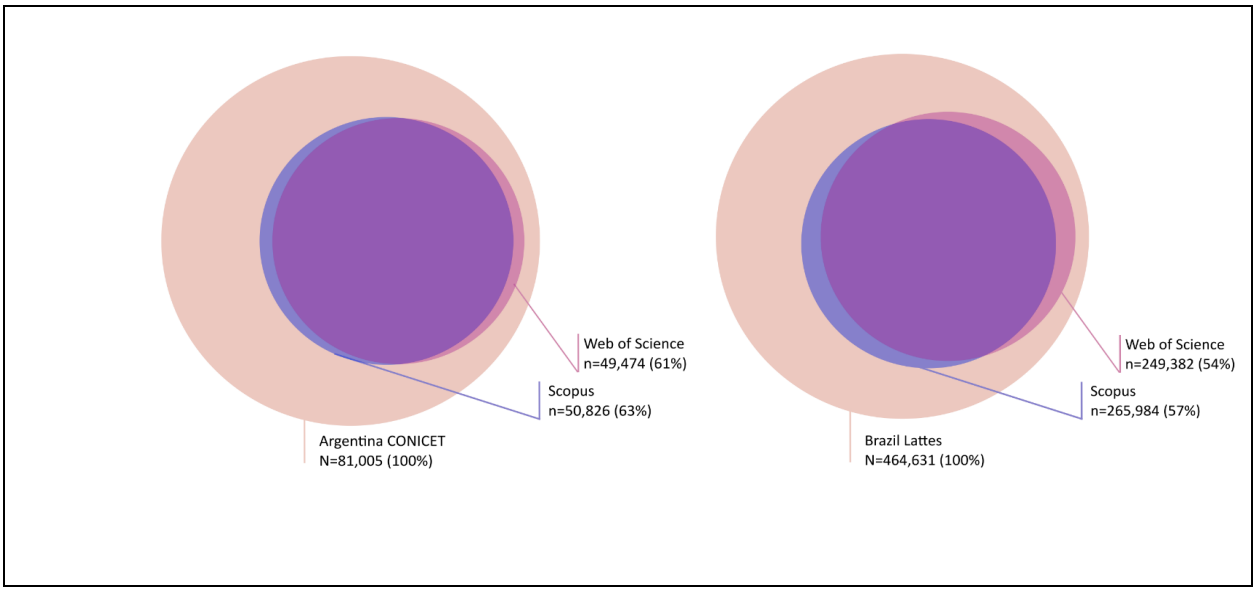
Source: CNPq-PUB 2021 and CONICET-PUB 2021. Note: Only articles from 3 to 20 authors were included. Each group of 3 columns adds up to 100%.

The weight of the last author's position in Brazil can be explained partly by the morphological composition of the CNPQ, composed of a higher proportion of "senior" researchers compared with CONICET. Moreover, in Argentina there is a very relevant portion of young researchers, who are in the "Assistant" category, and are compelled by the evaluation requirements to concentrate very early in publications as first authors. In addition, there is the fact that in Argentina collaboration tends to have fewer authors than in Brazil, which reduces the overall volume of publications.

The comparative coverage analysis

The coverage comparison by data source gives evidence that the leading indexing services, Scopus and WoS, cover a very similar subset of publications, while the uncovered portion is 34% for CONICET and 39% for CNPq. As expected, Figure 4 shows that the articles not covered by Web of Science or Scopus is significantly higher in Brazil.

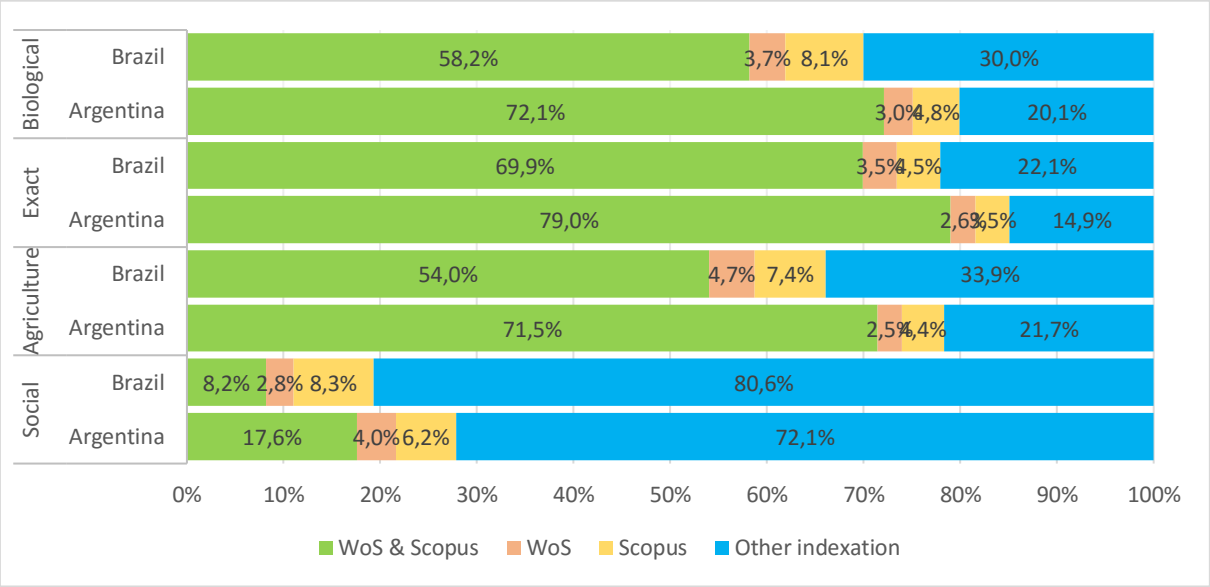
Figure 4. CONICET-Argentina and CNPQ-Brazil articles 2013-2020 by datasource
CNPq-Brazil N=464,361; CONICET-Argentina N=81,005.



Source: CNPq-PUB 2021 and CONICET-PUB 2021.

Figure 5 displays the coverage disaggregated by the broad field of the researchers. As we can see, the proportion of articles not indexed in the mainstream circuit is higher in Brazil than in Argentina for the four broad fields. This is related, among other indications that will be explored below, to the greater tendency of CNPq researchers to publish more articles in the Brazilian journals. On the other hand, Argentines tend to publish less articles with fewer authors, but they have a greater preference for journals from other countries. The share that is not indexed in Scopus or WoS may be indexed in other services, such as Scielo, Redalyc, Latindex or others, given that the evaluative culture of both countries reward other indexations. But also a part of these articles may not be indexed or connected to the lack of DOI. The exploration of this portion of the output shall be part of a future work.

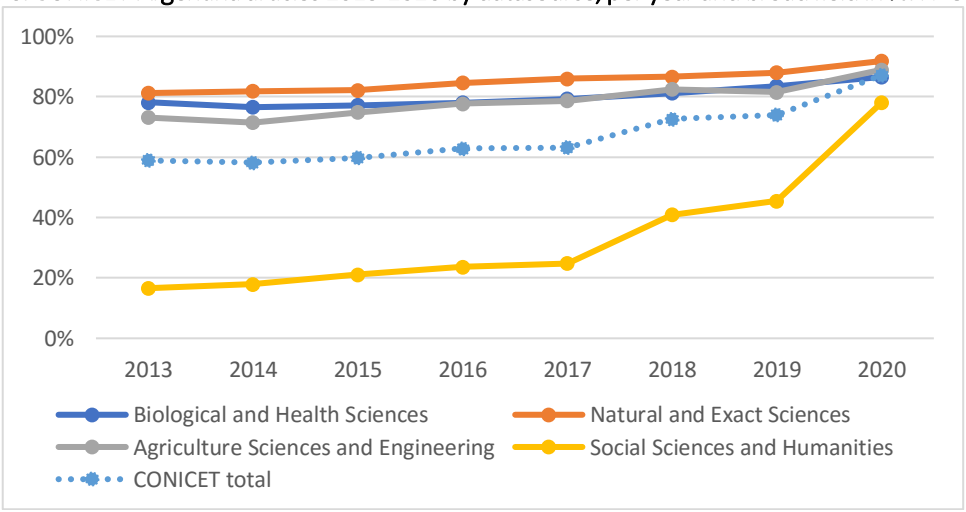
Figure 5. CONICET-Argentina and CNPQ-Brazil articles by data source, per indexation, broad field and country. CNPq-Brazil N=464,361; CONICET-Argentina N=81,005.



Source: CNPq-PUB 2021 and CONICET-PUB 2021.

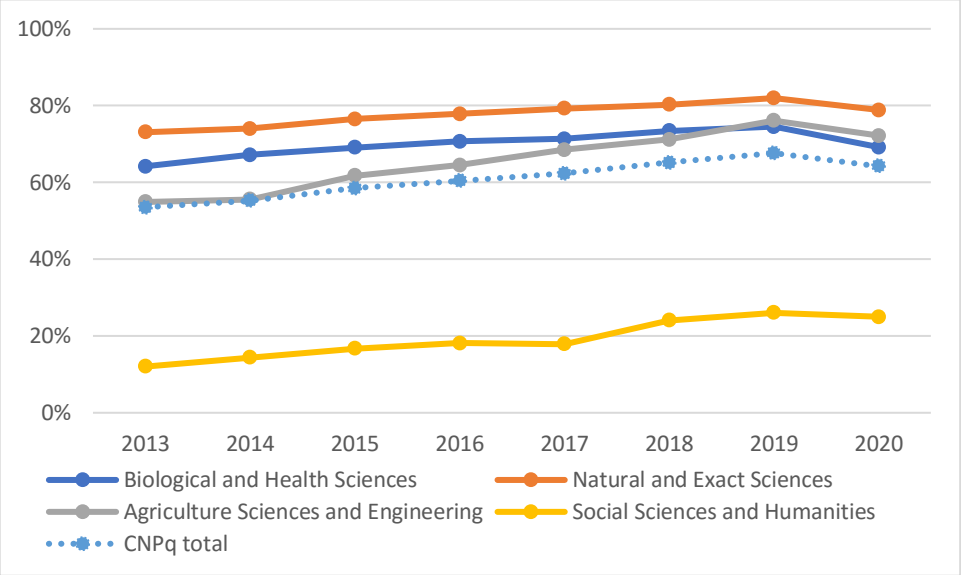
The articles not indexed in WoS or Scopus for the SSH, as we can see, reaches 72% for CONICET and 81% for CNPq. But the coverage of WoS and Scopus evolves in an ascendant pattern in these disciplines. Figure 6 shows the progression from 2017-2020, strikingly reaching 80% by the end of the period. This particular figure for Argentina's SSH might be explained by the creation of the WoS Emerging Sources and its recent inclusion in the core collection. In contrast to the behavior of CONICET, CNPq shows a sustained tendency with a small increase in 2017 for the SSH but less pronounced (see Figure 7).

Figure 6. CONICET-Argentina articles 2013-2020 by datasource, per year and broad field in %. N=81,005.



Source: CONICET-PUB 2021.

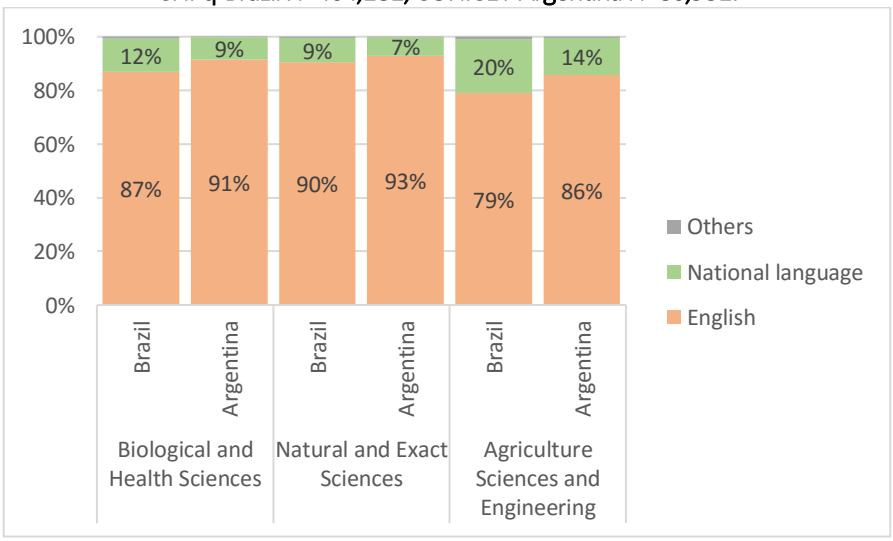
Figure 7. CNPq-Brazil articles 2013-2020 by datasource, per year and broad field in %. n=464,361



Source: CNPq-PUB 2021.

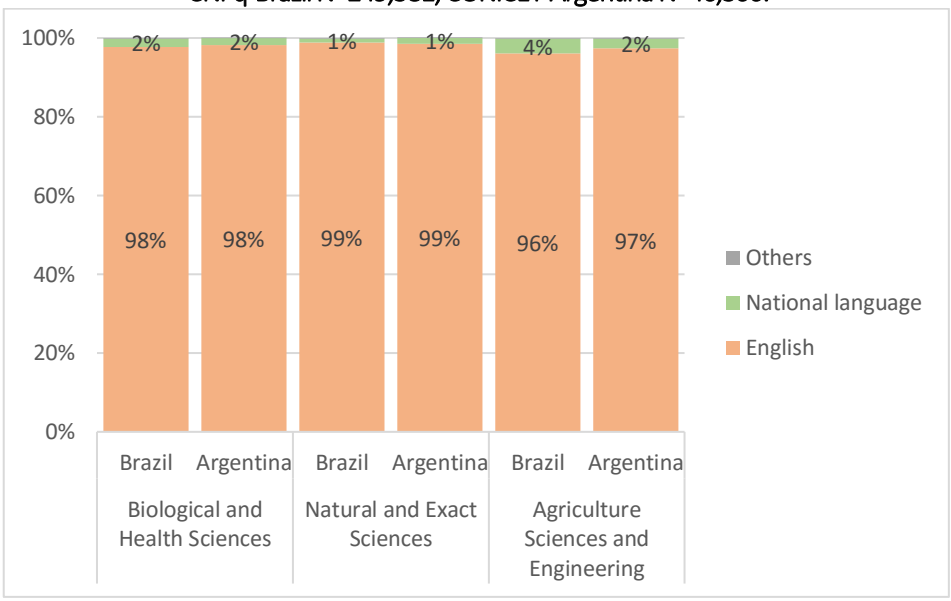
In terms of language coverage, the national database in Figure 8 shows a small portion of publications in the national languages for the "hard sciences", although the incidence of Portuguese for Brazil is higher than that of Spanish for Argentina. But compared with WoS, presented in Figure 9, interesting differences arise: English is practically the unique language. In contrast, the production harvested from the curricular sources shows a higher incidence of the articles written in national languages, with a noticeable participation in agricultural sciences and engineering.

Figure 8. Articles 2013-2020 by country, language and broad field.
CNPq-Brazil N=464,181; CONICET-Argentina N=80,931.



Source: CNPq-PUB 2021 and CONICET-PUB 2021. Articles without information on language were excluded.
Note: "national language" means Portuguese for Brazil and Spanish for Argentina. Spanish for Brazil and Spanish for Argentina are in the "Others" category.

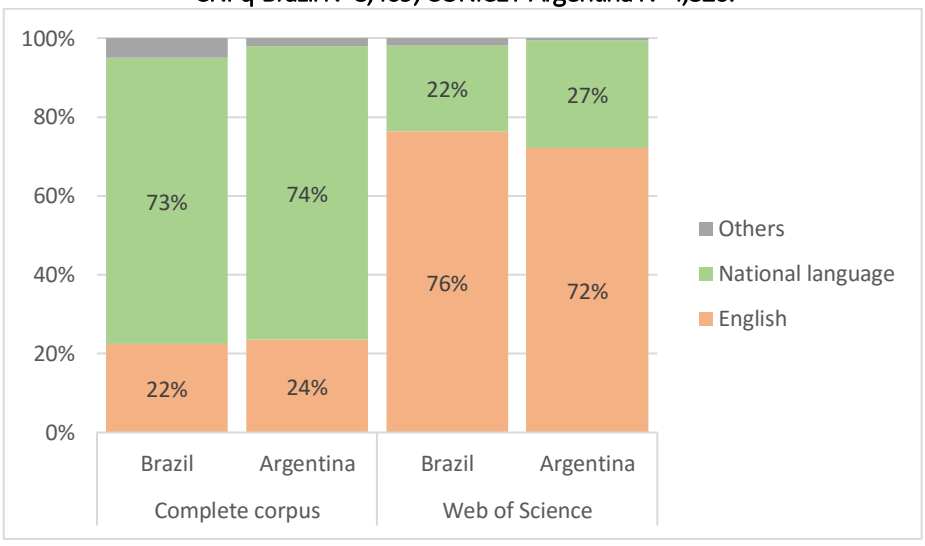
Figure 9. Articles 2013-2020 indexed by Web of Science by country, language and broad field. CNPq-Brazil N=249,381; CONICET-Argentina N=46,306.



Source: CNPq-PUB 2021 and CONICET-PUB 2021.

The situation, of course different for the Social Sciences and Humanities, is shown comparatively in Figure 10. For the complete production in the curricular bases, it can be observed that national languages occupy 74-75% of the total. Conversely, the production indexed in WoS is dominated by English in both countries, although with a greater weight in Brazil. It is possible that the latter is linked to the growing tendency to publish in English in Brazilian journals, as mentioned above, and the marginality of this phenomenon in Argentine journals.

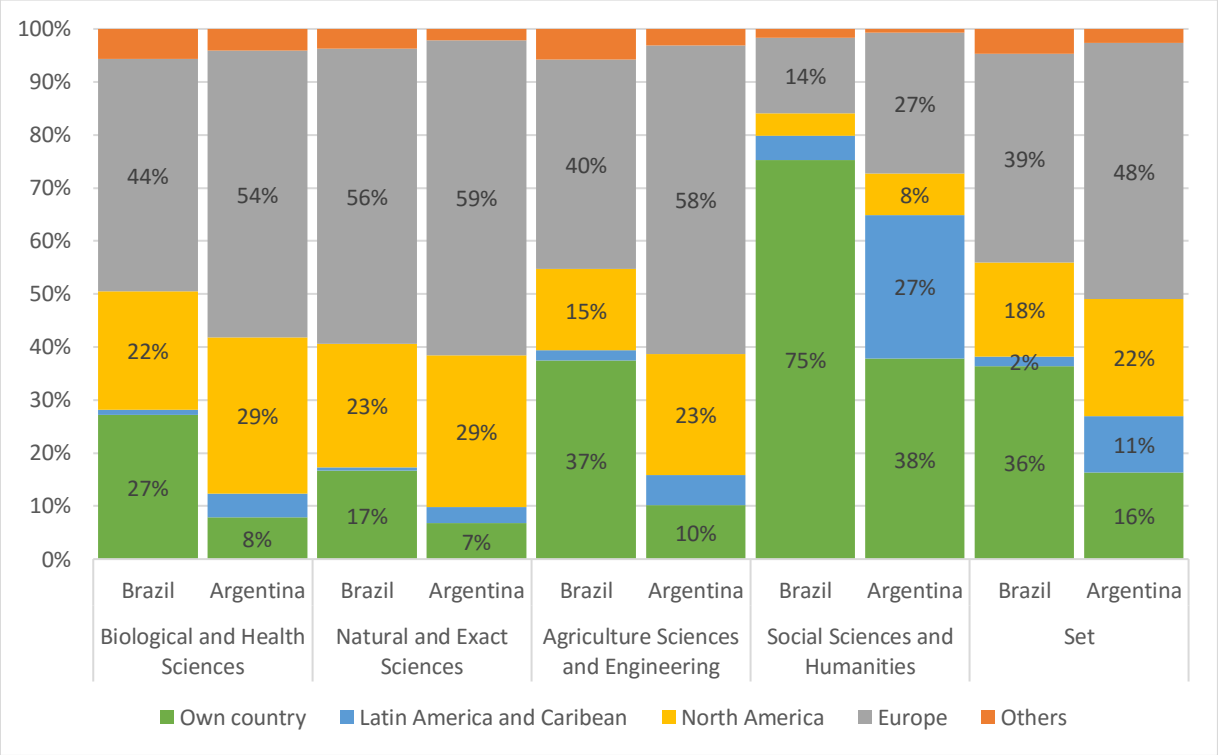
Figure 10. Articles indexed by Web of Science by country and language. Social Sciences and Humanities researchers. CNPq-Brazil N=8,469; CONICET-Argentina N=4,820.



Source: CNPq-PUB 2021 and CONICET-PUB 2021, WoS extracted in May 2023.

In Figure 11 we focus on the country of the journal and only within the curricular database[11]. As we see, national publishing is significantly higher for Brazil globally (36% versus 16% for Argentina) and also higher in all disciplines. This notorious inclination for national journals is not complemented by publications in the rest of Latin America and the Caribbean (2%). Among Argentine researchers, instead, publication in their own country's journals is quite low, but publications in the regional journals have a relevant share in the SSH and is higher also for other disciplines than for Brazil.

Figure 11. Country/Region of the journal by region, broad field and country.
CNPq-Brazil N=460,304; CONICET-Argentina N=78,381.



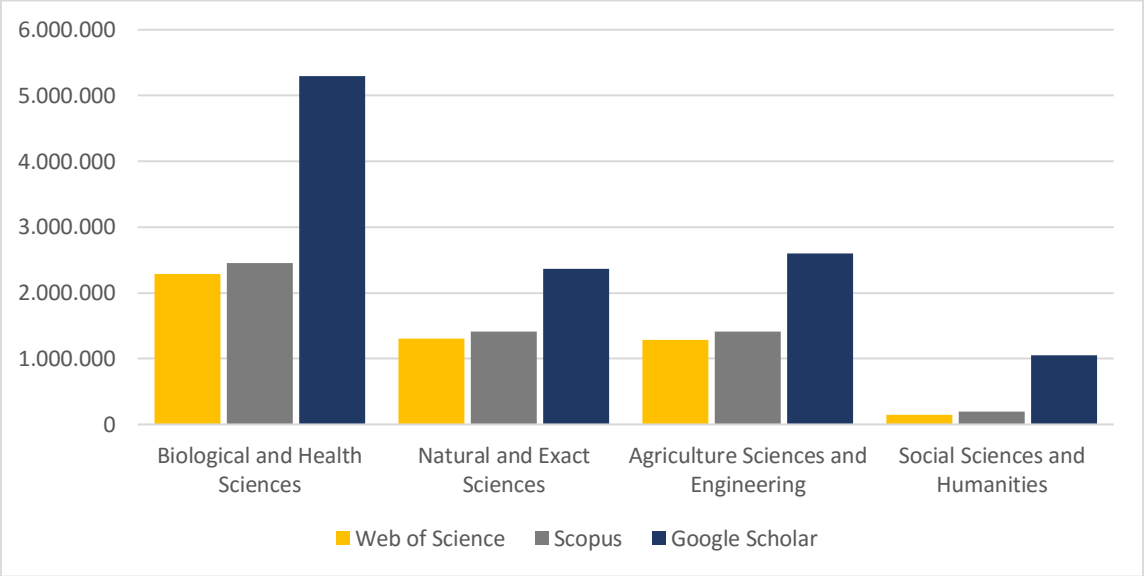
Source: CNPq-PUB 2021 and CONICET-PUB 2021. Note: each article is counted in each column if it has at least one author from the corresponding broad field. "Latin America and the Caribbean" excludes the country itself. Cases without data were excluded from the representation. To facilitate the representation, smaller value labels were omitted. Articles without information on the country of publication were excluded.

The weight of Brazilian national publishing in the Social Sciences and Humanities is very high: only 25% of the articles were published outside the country. Also, in Agricultural Sciences and Engineering, the weight of journals published in Brazil is remarkable, with 37% of the articles published there. On top of a tradition of national publishing, SciELO plays a decisive role with a collection of quality journals that have been betting on open access and international impact for over two decades. The fact that national publication in Brazil is so high, while publication in Portuguese (see Figure 8) does not follow to the same extent, is related to the fact that Brazilian journals have produced a systematic shift towards English (Beigel & Digiampietri, 2022). On the other hand, publication in European journals seems to exceed those of North America (mostly composed of journals based in the US) as we see in Figure 11. But this may be due to the fact that the country of many journals is established with the country of the Publisher but the actual location of the journal is dynamic given the increasing transnationalization of journals and the acquisition by publishing groups.

[11] The country of the journal is curated by the Repository in Argentina. In the case of Brazil we manually revised the Brazilian and Latin American journals and opted for a regional organization of the data for the rest of the journals.

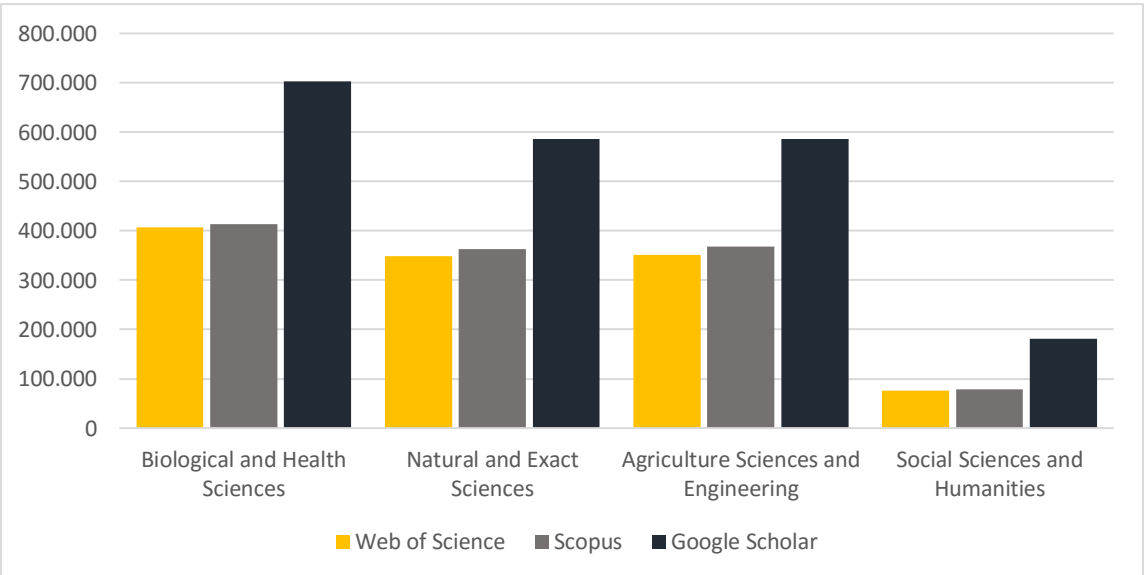
Finally, we explored the citations of the CONICET and CNPq datasets comparing Google Scholar[12], WoS and Scopus. Here we take all the citations of the articles and we see that the total number of citations collected through Google Scholar is significantly higher than that reported by Scopus or Web of Science for both countries (see Figure 12 and Figure 13). Being a search engine and not an indexing service, Google Scholar counts all types of citations, and therefore, the count should be significantly higher. However, we do not count the total number of citations registered in GS but only those referring to each unique article record identified in each country's dataset.

Figure 12. Citations by source and broad field, CNPq-Brazil. N=464,361



Source: CNPq-PUB 2021. Note: each article is counted in each column if it has at least one CNPq author from the corresponding broad field.

Figure 13. Citations by source and broad field, CONICET-Argentina. N=81,005.



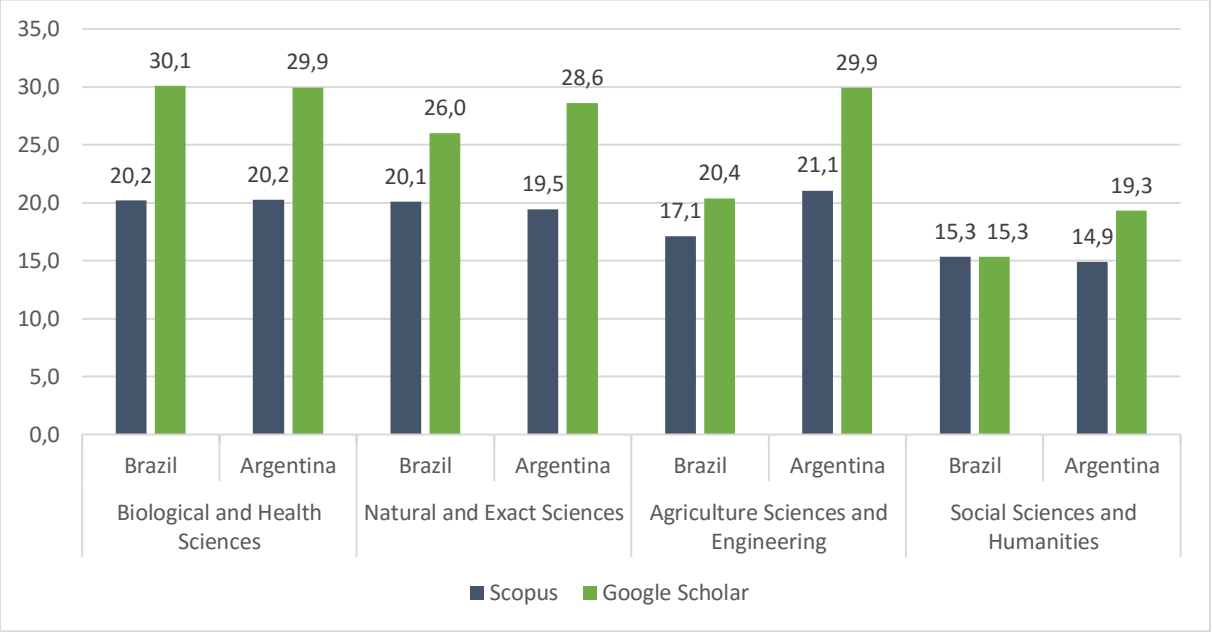
Source: CONICET-PUB 2021. Note: each article is counted in each column if it has at least one author from the corresponding disciplinary area.

The greater breadth of Google Scholar is also evident when considering the number of articles harvested by each source. For Brazil, there are a total of 439,199 articles in Google Scholar (almost all the articles in

[12] We thank COLAV for the preparation of this citation database in Google Scholar. Citations were extracted from Google Scholar in August 2023, Web of Science in May 2023, and Scopus in August 2023.

CNPQ-PUB), 265,982 in Scopus and 249,381 in WoS (Figure 3). For Argentina, there are a total of 63,173 articles in Google Scholar (almost all the CONICET-PUB articles), 50,826 in Scopus and 49,747 in WoS (Figure 4). However, it is important to note that in addition to a significantly higher number of articles, the average number of citations per article is also higher for Brazil. In Figure 14 we exclude Web of Science to facilitate comparison because its behavior is almost identical to Scopus. We can see that in practically all areas the average number of citations per article is higher for Google Scholar.

Figure 14. Average citations, by database and broad field, per country.
CNPq-Brazil N=464,361; CONICET-Argentina N=81,005.



Source: CNPq-PUB 2021 and CONICET-PUB 2021. Note: each article is counted in each column if it has at least one author from the corresponding broad field.

Conclusions and policy remarks

The comparison of the publishing performance in the national datasets of CONICET and CNPq indicates differences in terms of publishing practices and similarities related to the limitations that affect the visibility of part of the output. Among the differences, Brazil has a higher rate of authors per article in all disciplines and more frequent last authorships than CONICET, a tendency that seems related to the "seniorship" of the demographic profile of CNPq. We found an inverse relation between language and country of the journal: while CNPq researchers from all disciplines publish in national journals, their peers in CONICET show a general tendency to international publishing -with a noticeable participation of the Latin American journals in this tendency. Therefore, Argentina exhibits a major incidence of the publications in his national language. Meanwhile in the CNPq dataset we verify that Portuguese has been systematically replaced by English. In previous studies (Beigel & Digiampietri, 2022) we delved into the causal factors of this tendency, most likely related to the isolation of Portuguese in the region and the policies implemented by SciELO.

Among the similar trends, the structural limitations due to infrastructure and material resources are reflected in the proportion of the output that is not identified by a DOI which is complemented by the

lack of ORCID available for the authors in the case of Argentina. The bibliodiversity and multilingualism observed in the national datasets is a result of the bottom-up harvesting made on curriculum management systems where the researchers tend to complete all their productions. This broader landscape fueled with national databases should be interoperable with open infrastructures, although a this depends of the digital capacity of these agencies to assign a persistent identifier to each digital object. As we saw this is still weak and proves the prevalence of the digital asymmetries and its consequences in terms of visibility and recognition.

The coverage analysis of a complete set of articles for two localized research communities allows us to seize the diverse circuits of circulation at stake. We could see that as much as 34.1% of the articles of CONICET researchers and 38.9% of CNPq researchers are not indexed by WoS or Scopus. Moreover, as we have shown, both organizations represent perhaps the portion of science and technology personnel most strongly influenced by the global evaluative, which means that a significant portion of the national output by the professors that are not part of these research agencies is completely left out when analyzing only Scopus and Wos. It is in the Social Sciences and Humanities where the lowest coverage of traditional databases is observed, as might be expected. However, this is not a phenomenon restricted to this disciplinary area. Particularly for Brazil and for the Biological and Health Sciences and the Agricultural and Engineering Sciences, the portion of publications that circulate outside the mainstream circuit is also relevant. On the other hand, the linguistic bibliodiversity of the two bodies of publications represents a very salient feature of the type of approach proposed.

The similar coverage found for CNPq and CONICET through the “trajectory correction” provided by the curricular databases shows that the national classification systems and the criteria established for career-building largely define the publication strategies. In Brazil national publishing is fostered by the Qualis system, a national journal classification used to evaluate graduate programs. The Qualis classification is built by local committees including national and international journals in a ranking of excellence. Although the impact factor is highly used for these qualifications, the Brazilian journals are highly esteemed. In Argentina, the evaluation system is also relevant for publishing strategies and the SSH tendency to the Latin American circuit is explained by the CONICET regulations on this matter. However, a much lesser tendency to national publishing was observed.

Faced with the biases of global databases, the use of national sources appears with increasing interest not only in bibliometrics but also as an instrument for a reform or research assessment towards a responsible evaluation. The most promising experience of building an infrastructure based in national datasources is the Current Research Information Systems (CRIS) and particularly the Norwegian Model. In Latin America, two relevant cases of CRIS projects at national level are in progress today: the PerúCRIS Platform[13] and the Brazilian BrCris[14], this latter developed by the Instituto Brasileiro de Informação em Ciência e Tecnologia (IBICT), in consortium with the major national public agencies: CONFAP, CNPq, CAPES, RNP, Fundaciones Estaduales de Apoyo a la Pesquisa and SciELO. The BrCris Module (https://piloto-brcris-fapeal.ibict.br/) aims to both national CRIS have built their technological infrastructure through the use of open software DSpace7. Both work in a collaboration with the Federated Network of Institutional Repositories of Scientific Publications (LA Referencia[15]) which harvests repositories from 12 Ibero-American countries. Other Latin American countries are more oriented to a federated governance of the institutional repositories, such as the case of Argentina. But in most countries of the region the curricular databases are well-extended and community managed.

[13] See https://perucris.concytec.gob.pe/
[14] See https://brcris.ibict.br/
[15] See https://www.lareferencia.info/en

After many years of explorations and studies on the coverage by Google Scholar and despite its acknowledged limitations, its coverage in terms of citations gives additional evidence of the need to broaden the data sources to explore the circulation and impact, beyond the traditional indicators produced by Scopus and WoS. Hopefully, OpenAlex will represent an alternative in this direction. The technical work needed to integrate national databases is complex, but the major challenge will still be anchored to the publications without permanent identifiers. A structural constraint that affects the visibility of all peripheral and non-peripheral research communities.

Note on the research data

The datasets built for this comparative research will be made available in the repository of CONICET (Argentina) and the repository of Universidade de Sao Paulo after taking all precautions related to the care of personal data.

Conflict of Interest

The authors declare that there is no conflict of interest.

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CRediT -Author's contribution Statement

1. Digiampietri, Luciano: Data curation (Lead); Investigation (Equal); Methodology and Validation (Equal); Visualization (Equal); Writing – review & editing (Equal); Resources (Equal).

2. Gallardo, Osvaldo: Conceptualization (Equal); Investigation (Equal); Methodology and Validation (Equal); Data curation (equal); Visualization (Equal); Writing –original draft (Equal); Writing –review & editing (Equal).

3. Baranger, Denis: Conceptualization (Equal); Investigation (Equal); Methodology and Validation (Equal); Data curation (equal); Writing – review & editing (Equal); Writing –original draft (Equal).

4. Beigel, Fernanda: Conceptualization (Equal); Investigation (Equal); Methodology and Validation (Equal); Visualization (Equal); Writing –original draft (Equal); Writing – review & editing (Equal); Funding acquisition (Lead); Project administration (Lead); Resources (Equal).

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