



RESEARCH ARTICLE

Indicators of research circulation: Localization and internationalization under scrutiny—The Cuyo Manual and its exploratory case study in Argentina

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ABSTRACT

Given the limitations of traditional scientometric indicators to recognize the diversity of circulating knowledge in different languages, formats and regions, the Research Center on the Circulation of Knowledge (CECIC-Argentina) has developed a set of research circulation analytical indicators, nucleated in the “Cuyo Manual.” This article presents the results of the first exploratory case study carried out, that of the Universidad Nacional de San Martín (UNSAM), showing how the institution and its researchers internationalize, regionalize or territorialize their scientific productions. In addition to the articles published in internationally oriented journals, under what other formats and in which directions does research production circulate? What are the capacities installed and actions deployed by the university in terms of research circulation? These and other questions are addressed in this paper, in order to show the diversity and multiscalarity of the scientific knowledge produced, which crosses not only international and national spaces but also the closest areas of influence to the institution itself.

1. INTRODUCTION

The purported internationalization of scientific, technological, and innovation (STI) activities, as well as their relatively conventional parameters of measurement and evaluation, have in recent decades aroused numerous criticisms among academic communities in various parts of the world. Leading specialists (Albornoz & Osorio, 2018; Beigel, 2014; Losego & Arvanitis, 2008, among others) have pointed out the tensions and asymmetries generated in the World Scientific System as a result of the universalization of indexed publications in databases, such as Web of Science (WoS) or Scopus, and the preponderance acquired by the writing of articles in English as a criterion of validation and academic recognition.

In particular, the communities of nonhegemonic countries, also called *peripheral*, whose natural language is generally not English, have been expressing a growing concern about the low impact of their scientific productions in this global publication system.

In line with this, from the Research Center on the Circulation of Knowledge (CECIC), which has its headquarters in Argentina, we have distanced ourselves from the traditional internationalization perspective, identified as a guarantor of the hierarchies imposed by a system of commercialized publications. From recognizing the vitality and diversity of alternative spaces to this dominant system and to legitimize the active role of “peripheral” academic communities

in STI production, with CECIC we have developed a theoretical perspective of multiscale circulation of scientific knowledge, recognizing multiple formats and circulation routes—local, national, and regional—besides the international ones.

The methodological complement to this approach has crystallized in the design of a set of institutional indicators of knowledge circulation, which are developed in what we have called the “Cuyo Manual” (CECIC, 2020). This is a relational indicators model that, in accordance with a “bottom-up” information gathering logic, seeks to be implemented in university institutions or research organizations, and to provide a more dynamic vision of their interaction geographical scales to recognize the multidimensionality of the knowledge circulation generated there.

The purpose of this article is to advance the empirical study of a public university institution in Argentina, the National University of San Martín (UNSAM), located in the suburbs of the province of Buenos Aires and forged in the heat of the 1990s, a context in which Latin American universities were reconfigured according to the neoliberal development model. Focusing the analytical lens on an Argentine university is of great interest and relevance, as according to Beigel, Gallardo, and Bekerman (2018) this country has recently become a “peripheral scientific center” in the region.

In particular, the following questions will be addressed as guiding axes in the presented case analysis: What are the installed capacities and actions deployed by the university in terms of research circulation? What endogenous and exogenous modalities of knowledge accreditation does the institution promote? Besides articles published in internationally oriented journals, under what other formats and in which directions does the research production circulate? That is to say, what other modalities of knowledge circulation are deployed? Which are the participating disciplinary spaces? And what are their geographical scales of implication?

By implementing the indicators contemplated in the Cuyo Manual, we hope to understand how the institution and its researchers internationalize, regionalize, or territorialize their scientific productions. We seek to account for the diversity of scientific knowledge produced in the university under study—a diversity that, as we shall see, is multiscale, because the circulation circuits pass through not only international and national spaces but also the closest areas of influence to the institution itself.

The article is organized as follows: In Section 2 we review the relevant literature highlighting the main conceptual knots of the theme; and in Section 3 we present the methodology and describe the data and methods, paying special attention to the proposal of indicators that constitutes the Cuyo Manual. In Section 4, we detail the results of the presented study case and in Section 5, finally, we conclude the paper, discussing some political implications and pointing out new research developments.

2. THEORETICAL BACKGROUND

2.1. Mainstream Science and Technology Indicators as Unidirectional Vectors of Academic Internationalization

STI production developed in universities and research agencies around the world is closely followed, and increasingly so, by governments and civil institutions, public opinion, and various international actors. The growing interest in the knowledge generated in these spaces, usually sustained on the premise that science is equivalent to development, lies in its potential to diversify resources in a given territory, improve the quality of basic or applied research, or take advantage of opportunities in relation to the socioproductive environment.

Hence, we see the great influence that science and technology indicators have gained around the world, oriented to account for the relationship between resources invested and products obtained at the level of individuals, institutions, and countries. The quantification of the number of researchers per thousand inhabitants and the count of invention patents in relation to the total number of scientists and investment amounts, as well as bibliometric indicators (number of scientific publications per author and per institution, and citation frequency) have been considered sufficient elements to evaluate and validate the characteristics of a country's scientific development.

Thus, obtaining high values in these indices was considered a direct reflection of high rates of investment in STI and became an indicative factor of the social and economic development of a given country, also assuming a certain use by the social and productive sectors of such research capabilities and resources. Leading specialists (Ortiz, 2009; Ràfols, 2019; Vessuri, Guédon, & Cetto, 2014; among others), report that metrics and research evaluation systems were specifically the preferred means of institutionalization and universalization of a style considered legitimate and valid for the production and international circulation of knowledge. In a recent study, Vélez-Cuartas, Uribe-Tirado et al. (2021) indicated that the use of indicators such as the Impact Factor in the *Journal Citations Reports* (JCR) and the indexing of journals in WoS (now Clarivate), created together with the Institute for Scientific Information in the mid-20th century, along with the appearance of the large bibliographic reference and citation database Scopus, promoted by Elsevier at the beginning of the 21st century, constituted a select system of mainstream publications.

In this context, Beigel (2014) has pointed out that journals basically became the guiding axis of the World Scientific System, a phenomenon that was enhanced by the hyper-centralization of the English language and the growing flow of scientific information through new virtual technological supports. In this framework, we can mention, for example, the advent of Google Scholar (in 2004), a web search engine that extended information on scientific and bibliographic content to a wider audience, as well as the *h*-index (in 2005), a technique based specifically on the individual researchers' citation counts.

In this context, global university rankings were also consolidated (such as the Shanghai ranking and the *Times Higher Education* list), which tended to hierarchize/classify higher education institutions worldwide according to the internationalization degree achieved (Aguillo, Ortega, & Fernández, 2008). Consequently, the publication of scientific articles in English became one of the main sources of international prestige and a select group of universities monopolized the top of the world rankings. The allegedly "international" character of STI activities became a well-recognized and rewarded value in terms of academic and economic capital.

Available studies on the universalization of these tendencies (Babini & Rovelli, 2020; Baranger & Beigel, 2021) show that it was fundamentally the systems of scientific production evaluation in the academic communities that stimulated this orientation towards internationalization by recovering bibliometric indicators and information about indexing as valuation criteria.

In short, the proliferation of these tools and their widespread use in the evaluation of scientific performance ended up configuring a sort of global metric market that increased the unequal accumulation of "international" scientific capital, which came to be measured essentially through citations and coauthorships.

2.2. Overview of the New Routes of Open Access to Knowledge

Criticism of the effects of this internationalization model of knowledge and its measurement and evaluation indices has multiplied in recent decades. Authors such as Ràfols (2019), Spezi,

Wakeling et al. (2017), and Vélez-Cuartas et al. (2021) have been making important contributions to the general debate about the open access approach to scientific information and the overweighting of publications in international journals indexed in WoS or Scopus. Among the main points, it is observed that the major European and North American publishers have built a big business around the charging of tariffs to authors for their publications, resulting in the exclusion of a large number of researchers (and, therefore, of their scientific production) who cannot afford to pay the Article Processing Charge (APC). This has clearly deepened academic inequalities between researchers, institutions, and countries.

Based on this background, some studies (e.g., Beigel, 2019; Vélez-Cuartas, Lucio-Arias, & Leydesdorff, 2016) recognize the existence of diverse modalities and routes of scientific knowledge circulation in various parts of the world, which are invisibilized/delegitimized by the exclusive use of mainstream databases.

To move away from this trend towards the international measurement of knowledge, several European countries, for example, have established relevant national bibliographic databases. These Current Research Information Systems (CRIS), which emerged during the 1990s, have become specialized infrastructures for the collection and communication of scientific information. They are characterized by harvesting and making visible varied and exhaustive information about teams of researchers, intellectual properties, publications, research projects, funding sources, and data sets. Among their main advantages is that they highlight the broad criteria established for the inclusion of STI production, incorporating books formats, for example, and writing in different languages than English.

Among the most outstanding of these we can mention the Flemish Academic Bibliographic Database, implemented in Belgium, and the Current Research Information System in Norway. Similar national bibliographic database formats are also being developed in Finland, Portugal, and Denmark. According to studies by Pölönen, Guns et al. (2021) and Sile, Pölönen et al. (2018), the development of these national repositories has been especially relevant in the Social Sciences and Humanities, where the coverage of their publications by mainstream databases is proportionally lower than in the Exact or Natural Sciences.

As for the pending challenges, the most important is perhaps to converge in a large integral ecosystem, given the limitations they present to establish the information articulations contained in each one, due to the specific details they have acquired in each country.

In this context, the General Conference of UNESCO has had overarching relevance, and, after an extensive process of international discussion, it approved the “Open Science Recommendation” at its 41st session, held in Paris in November 2021. Among the main proposals, the need to promote an exchange of scientific knowledge in different formats and from different geographical origins has been recognized, not only among specialized academic communities but also in dialog with traditionally excluded groups: women, minorities, indigenous researchers, and scientists from less favored countries and with languages with few resources. UNESCO has urged member states to “collaborate in bilateral, regional, multilateral and global initiatives for the advancement of open science” (UNESCO, 2021, p. 3).

2.3. Peripherality or Scientific Diversity in Latin America? The Constitution of Argentina as a Peripheral Academic Center in the Region

The measurement of individual and institutional performance in the university rankings and commercial indexing databases has clearly had an unfavorable effect on the institutions and academics of the “peripheral” regions. Beigel (2019) shows that, in Latin America, for example, these

measurement/evaluation instruments have been leading to the devaluation of the writing and speaking processes of native languages, as well as of other formats and publication channels.

According to Rodríguez Medina (2019), knowledge is also geographically, politically, economically, and culturally situated. “It is not surprising, then, that flow circuits of knowledge are established, that, in general, link people, institutions and countries in the so-called developed world more frequently than they do with colleagues in the developing world. [...] Permanent and institutionalized contacts between those located in the global south, on the other hand, are scarce” (Rodríguez Medina, 2019, p. 22).

Given the complexities concerning the visibility and circulation of knowledge generated in the “periphery,” important efforts are also being made in these latitudes to develop alternative information systems. In Latin America, especially, it is worth mentioning the institutionalization of the Latindex (1994), SciELO (1998), and Redalyc (2003) systems as transcendental milestones in the digitization and indexing of circulating journals in the region (Vessuri et al., 2014). This is a corpus of approximately 10,000 publications, most of which are managed by the academic community itself. In the words of Salatino (2021), the Latin American repositories present a notable linguistic diversity, as even with a preponderance of Spanish, contributions in Portuguese and English are also recognized.

Additionally, in the transition to open science in Latin America, there are important promoting experiences of the circulation and knowledge of open access. Argentina and Mexico, for example, have national open access laws, and although there are interoperability difficulties, they have deployed their own systems of management and evaluation of scientific personnel at the national level: SIGEVA-CONICET in the first case and the National Repository of CONACYT in the second. In Colombia, for example, there is the Scientific Information Colombian Network (RedCol), which manages and sustains the technological infrastructure to visualize and dispose the national scientific production (Babini & Rovelli, 2020). Regarding the progress of CRIS systems in the region, we may highlight Peru-CRIS and Br-CRIS (developed in Brasil), which are national informatic repositories created with the purpose of maximizing research value and development in each country.

In line with these initiatives, it is worth mentioning that, since the end of 2019, the Latin American Council of Social Sciences (CLACSO) created the Latin American Forum on Scientific Evaluation (FOLEC), a space for permanent debate and exchange on research evaluation politics and practice in the region, from a perspective that strengthens the open, public, and interconnected character of scientific knowledge, as the CRIS systems have been proposing (CLACSO-FOLEC, 2021). The main interest of FOLEC lies in promoting regional initiatives of infrastructure for open science, constituting a fundamental political tool of incentives for open access publications, with a focus on bibliodiversity and multilingualism.

From the above, it is clear that in Latin America there is no a unidirectional knowledge validation and circulation model, sustained only by the importation of scientific standards from mainstream circuits. In fact, scientific peripherality itself has diversified in the region, identifying a continuum between marginal scientific communities and others that have become “peripheral centers” (Beigel, 2014). Hence, some researchers are more integrated to “mainstream” production styles, and others participate strongly in the alternative regional circuits we have described (contributing to enhanced collaborative research and South-South academic flows, for example). Many others still remain linked to the more endogenous institutional agendas.

Focusing particularly on the Argentine scientific university field, it should be noted that in recent decades it has recovered its center-periphery character in the Latin American academic circuit. After the great structural crisis of 2001–2002, which, among other things, reduced the

levels of public investment in scientific development to a historic minimum, the country experienced a significant and heterogeneous expansion of its STI capacities, consolidating its university and public scientific matrix. Beigel et al. (2018) highlighted the considerable budget increase experienced from 2003 onward, which resulted in the opening of new institutions, salary increases for lecturers, and strengthening of the scientific scholarships system and post-graduate careers, as well as tripling of the number of full-time researchers.

However, during this expansive stage of STI capabilities, a series of institutional asymmetries and geographic inequalities within the field also deepened. According to Beigel (2017, p. 828), “the polarization between scientists integrated into the dominant production styles in the world academic system and those with a more endogenous agenda, get deeper.” Two major opposing scientific profiles materialized around the two main areas of STI production and circulation of knowledge in the country: public universities and the National Council for Scientific and Technical Research (CONICET).

In this sense, given the weight acquired by mainstream science and technology indicators in CONICET’s evaluation system, most of its researchers have a more internationalized curricular trajectory based on their strong attachment to the publications circuit indexed in WoS and Scopus. In contrast, most of the national (public) universities researchers deploy a fundamentally local habitus, enjoying higher quotas of institutional recognition from the weighting indexed publications in regional databases, among other formats of their scientific productions publication. However, as these are not disjoint but complementary organisms operating in the same field, autonomous and heteronomous research tendencies that cross all disciplines, converge from both of the different principles of legitimization.

3. DATA AND METHODS

3.1. The Cuyo Manual: A Proposal for “Bottom-up” Knowledge Circulation Indicators

At CECIC, we have been developing a theoretical approach on the multiscale circulation of scientific knowledge, which recognizes and weighs the different interactions and formats that integrate the research process. This approach (Beigel, 2019; Beigel & Algañaraz, 2020) is based on the following guiding ideas:

- In the so-called “periphery” there are diverse institutional styles of production and knowledge circulation that are related not only to the local dynamic of the institutions and their researchers but also to the particular absorption of national politics and global opportunities.
- The STI production of these communities develops in diverse transnational, regional, national, and local circuits, thus breaking down the idea of an absolute belief in scientometric and bibliometric indicators.
- Science that is published in local languages other than English is relevant in the region, although it is not duly recognized by the major indexing services. The same happens with other formats of visibility/circulation of scientific productions, such as books, with greater development among the social sciences and humanities, generally managed by the academic community itself and not-for-profit organizations.
- While some institutions promote the achievement of global prestige, others stimulate a local “habitus” of circulation, and between the two extremes there coexist heteronomous production forms and knowledge circulation.
- The processes of academic evaluation of institutions and individuals in these communities usually include intermediate instances that articulate the weighting of global criteria with local needs.

But this transition between the internationalization paradigm and that of circulation itself has taken place not only on a conceptual level but also on a technical one. To accommodate this, CECIC has developed a set of analytical indicators of scientific capital circulation, institutionalized in the Cuyo Manual (CECIC, 2020): a social technology that allows the registration and articulation of diverse and exhaustive information on research processes in universities and scientific organizations in a systematic and organized way. Methodologically, the Cuyo Manual is formed from the interaction of four major analysis dimensions (Figure 1): published scientific production; research capacities and actions; academic spatiality; and university–society interaction.

Each of the analytical dimensions of the Cuyo Manual contributes to the recognition of a specific modality of STI production circulation, for which the treatment of different instances and locus of research circulation/legitimization has been included. In this way, it seeks to transcend the unilateral consideration of published results and therefore the overestimation of publications indexed in commercial databases, as well as English writing.

In addition, the Cuyo Manual recognizes not only the mainstream circuit but also the multiple geographical scales of scientific knowledge interactions: international, regional, national, and fundamentally local. In this sense, it presents a convergent methodological design with

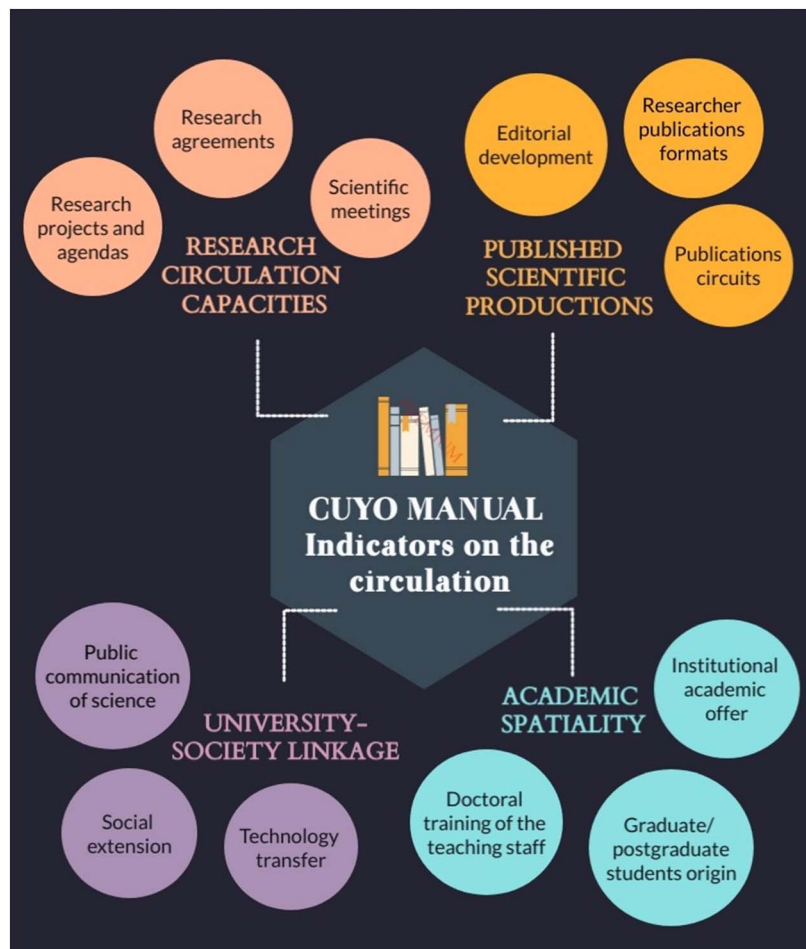


Figure 1. The Cuyo Manual: analytical dimensions of research circulation. Source: Own elaboration, based on Cuyo Manual (2020).

other responsible measurement experiences, especially with the Valencia Manual; specifically, the block corresponding to University–Society linkage: dialogue with the indicators of university linkage with the socioeconomic environment prepared by the Ibero-American Network of Science and Technology Indicators (RICyT, 2017).

In contrast to international trends in the measurement of scientific production, carried out in a quantitative manner and through the harvesting of information in commercial indexing databases, the Cuyo Manual promotes an inverse methodological approach (i.e., from the bottom up). The proposed indicators model has been designed from the tracing/observation/analysis of a diversified series of information sources retrieved *in situ* from the institutional environment itself. In this sense, it entails a methodological approach with further empirical disaggregation and prioritizes the horizontal collection and primary treatment of data.

This corpus of circulation indicators has been implemented in several public universities of Argentina, selected *ad hoc* as pilot case studies. In particular, UNSAM has been the first institutional analysis experience. In this paper, we specifically recover the main findings of the first two indicators blocks (Figure 2) in the UNSAM case: the scientific production published by the institution and its “other” research capacities and interactions.



Figure 2. Analytical indicator blocks of the Cuyo Manual, referring to “research circulation capacities” and “published scientific production.” Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020).

3.2. Collection and Information Sources Instrumented

Our field of observation is UNSAM and, in particular, the scientific production of its researchers, as well as their formats and spaces of circulation. Indeed, during 2018–2020 we carried out an exhaustive fieldwork in the institution to collect the required information by the Cuyo Manual. From there, the different circulation indicators examined refer to a specific T-Year, in this case the academic year 2020, indicating the final moment of data capture¹.

A varied set of information sources was used: from data on its website (taking care that they were updated to March 2020), also retrieving documents, reports, and institutional regulations, to the management of different databases. Some of these databases were provided by UNSAM itself, especially the one related to its lecturing staff, and the others were elaborated *ad hoc* by the work team from formal access to the curricular information systems (SIGEVA) of the university and CONICET.

Regarding editorial institution development, its own publication repositories were explored, as well as the websites and books and journals catalogs published there. As for the articles published by their researchers, the following indexing databases were explored: Scopus; WoS-Clarivate; RedALyC; Directory of Open Access Journals (DOAJ); and Scielo. In fact, the tracing included a wide spectrum of searches, ranging from mainstream publication databases to Latin American indexing systems themselves. Additionally, the researchers' book and book chapter production was explored, as declared in SIGEVA-UNSAM and SIGEVA-CONICET.

To address the university's research projects and agendas, the following were obtained: lists of projects approved, funded, and in execution until 2020, hosted on the UNSAM institutional website; payroll of research projects awarded and in force until 2020 by the National Agency for the Promotion of Research, Technological Development and Innovation (R&D&I Agency) and CONICET; and documents provided by UNSAM with complementary information on its research projects in execution during 2020.

Regarding scientific meetings, the following sources of information were inspected: the Noticias UNSAM repository, hosted on the institutional website; and newsletters published until March 2020 by the different Schools and Institutes of the university.

Finally, research agreements were collected by accessing the following sources: UNSAM's Bank of Bilateral Agreements, available on the institution's website; and regulations related to local and national agreements.

The reliability of the information sources used is based mainly on the following factors:

- Exhaustive fieldwork that included long research stays and on-site data collect at the institution.
- The primary processing of the obtained information, most of which was retrieved from the university's own STI offices or specialized agencies in charge of counting, for example, of human resources.

¹ In Argentina, measures of Obligatory Social Isolation/Distancing, due to the pandemic generated by the Sars-Cov-2 virus, were imposed by the national government from March 2020. By then, the "face-to-face" fieldwork at UNSAM, which had started in 2018, was ending. Hence, contact established *a priori* with referents of the university allowed us to complete the tracing of missing information in a "virtual" way.

- The verification of the information from the cross-checking of different implemented accesses, especially to corroborate the completeness of the information, avoid the overweighting of the registers, and guarantee the accuracy of the data reported on the institutional website.

4. RESULTS

4.1. Editorial Development and Published Scientific Production

Starting with the question “What are the editorial capacities developed by the university to promote the knowledge circulation?”, we will examine here its resources, infrastructure, and specialized personnel in editorial tasks.

Table 1 shows that UNSAM has a central institutional repository under the Rector’s Office that includes 720 documents: undergraduate and graduate theses (89%); parts of books (6%); books (4%); and technical reports (1%). A pending issue is interoperability with the systems of their own academic units and with other repositories, such as that of CONICET.

Among the infrastructures available for editing, since 2006 the university has had its own publishing company: UNSAM-Edita. Unlike the large commercial publishers, its catalog includes academic books, translations, literature, teaching notebooks, etc. Thus, bibliodiversity is one of its outstanding characteristics.

UNSAM-Edita was a pioneer in the publication of e-books and, in fact, during 2018–2020 evidenced a significant amount of digital works: 61% of its total edited productions. From Table 2, it is also clear that 50% of the books are published by authors belonging to the same institution, although this proportion decreased compared to 2010 where the entire catalog was represented by authors from UNSAM. As for translated publications, none of them are in English (three are in French and one in Portuguese).

In relation to journals, the publishing company has not been linked in a stable way. Currently, there is no cooperation policy between the publication of books and journals.

According to Table 3, of the 13 journals published by UNSAM during Year T, nine are from the Social Sciences and four from the Humanities. The editorial bodies are mostly made up of researchers who hold effective positions in the university. In all cases, they are periodicals and have their respective ISSN or ISSNc. Regarding their indexing, only three journals are included in the databases inquired: “Contemporary Ethnographies” in Latindex Catalog 2.0; “Working

Table 1. Institutional repositories available and UNSAM’s publishing capabilities, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators	Results
Provision of a unified institutional repository	Yes
Number of academic unit repositories	7
Availability of metrics on visits and/or downloads	No
Number of full-text documents included in the institutional repository	720
Percentage of open access documents with respect to the total number of full text documents included in the institutional repository	98%
Availability of open data platform	No
Number of training workshops given to librarians and editors of its journals	2

Table 2. Books published at UNSAM, period 2018–2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators	Results	
Number of total books in the catalog	206	
Number of books edited by the university during the period 2018–2020	34	
Percentage of books in digital/epub or other formats with respect to total books published	61%	
Percentage of books published by authors	from the university	50%
	from other national institutions	11%
	from Latin American institutions	16%
	from foreign institutions (non-Latin American)	23%
Percentage of books published by authors from the university, coauthored with other institutions	researchers from other Argentine institutions	22%
	Latin American researchers (excluding Argentina)	0
	foreign researchers (excluding Latin American)	0
Number of books translated	4	

Papers” in DOAJ and Latindex Catalog 2.0; and “Task” also in DOAJ. (There is more information about UNSAM publications in the [Supplementary material](#).)

Now, if we focus on researchers and their publication practices, we should ask ourselves: What are the formats and directions of knowledge circulation produced and published? Taking

Table 3. Journals edited at UNSAM, year 2020. Source: own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators	Results	
Number of journals published	13	
Percentage of journals by type of access	paper	0
	digital	100%
	mixed	0
	with full text available online	100%
Number of journals by type of indexing	with APC	0
	with paid subscription	0
	Latindex Directory	1
	Latindex 2.0 Catalog	1
	SciELO	0
	DOAJ	2
	RedALyC	0
WoS	0	
Scopus	0	

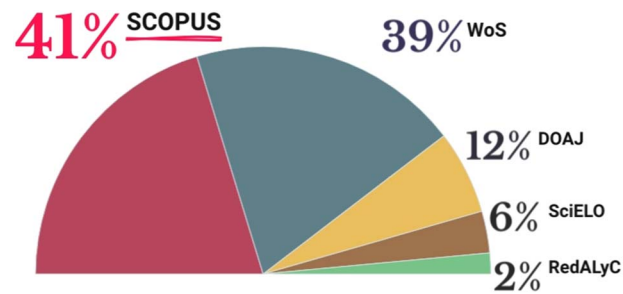


Figure 3. Articles by UNSAM researchers, according to journal indexing bases, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020).

into consideration the 947 researchers and scholarship holders, either employed by the university or dependent on CONICET (but whose workplace is in the institution), 1,434 registrations of articles published in Year T were identified.

Figure 3 shows that most of the articles are concentrated in journals indexed in two specific databases: Scopus (587 articles) and WoS-Clarivate (558). Both form part of the so-called mainstream circuit for scientific publications, mainly including journals with APC and edited in English. These publication practices contrast with the productions edited and published in the same university which, as we have seen, present a purely local circulation flow. Special mention should be made of the publications registered in DOAJ (167 articles), which includes open access scientific journals and gives a relevant place to Latin American productions. Finally, the Scielo and RedALyC databases had respectively 86 and 36 publications registrations by UNSAM authors, showing the scarce interest of researchers in making their contributions visible at the regional level.

It should also be noted that, of the total number of articles registered in mainstream journals, 85% in Scopus and 74% in WoS were published by researchers in the fields of Natural and Exact Sciences and Engineering and Technologies. On the other hand, in the RedALyC and Scielo databases, 88% and 80%, respectively, of the articles were developed by researchers in Social Sciences and Humanities.

Regarding the geographical location of journals, most of them are published in the United States, Germany, United Kingdom, or France, while publications in Latin American and/or Argentine journals are scarce. (There is more information on publication circulation in the [Supplementary material](#).)

Together with scientific periodical publications, we have noticed the presence of an important number of publications in books and/or book chapter format. From researching the registers of the Argentine Chamber of Books, we observed that 329 university researchers published at least one book or book chapter during Year T. Of course, these works were mostly published by national organizations: 52% by universities and 48% by commercial publishers. The publication of books stands out especially among the practices of researchers in the Social Sciences and Humanities.

Assuming that Spanish, as the native language, has been prioritized in the diverse scientific productions, we note a strong tendency to also publish in English. Table 4 shows that this mainstream language assumed a differential weight according to its publication format: Articles written in English amount to 51% of the total, while publications of books or parts of books in English reach only 11%, with a clear advantage for the local language.

4.2. Capacities and Interactions in Research

Besides published scientific production, what other institutional capacities has the university developed and what complementary actions does it deploy in terms of knowledge circulation?

Table 4. Languages of articles and books published by UNSAM researchers, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators		Results
Percentage of UNSAM-CONICET researchers who have published at least one article, by language (different from the official one)	English	51%
	French	1%
	Portuguese	1%
	Other language	0
Percentage of UNSAM-CONICET researcher who have published at least one book or book chapter, by language (other than the official one)	English	11%
	French	0
	Portuguese	1%
	Other language	1%

The resources for STI activities at UNSAM are managed by the Secretariat for Research, Innovation, and Transfer, located in the Vice-Rector’s Office. Regarding the funding sources received during the Year T, 85% came from the STI function of the national budget and was allocated to two specific items: 79% to personnel expenses and 21% to construction or repair works and equipment. Other income came from external resources (mainly from CONICET and the R&D&I Agency and, to a lesser extent, from government ministries and international organizations) and were mainly used to support scholarship holders and campus infrastructure.

Investment in research grants during Year T amounted to \$4,401,037, including resources for projects, scientific meetings, and researchers’ mobility². We will focus on these three dimensions of knowledge circulation.

From Table 5, we stabilized a database with 158 accredited and executed projects at UNSAM during 2020. Most of them (72%) are Scientific and Technological Research Projects (PICT) awarded by the R&D&I Agency and have a duration of 3 years. Another 24% refer to Institutional Recognition Projects (PRI) accredited by the university itself (but without funding) to give an institutional framework to its own scientific production processes. Finally, 4% are Pluriannual Research Projects (PIP) and Executing Unit Projects (PUE) that are accredited by CONICET. In sum, most of the projects deployed at UNSAM (76%) are accredited by national scientific organizations and only 24% concern internal projects of the institution. If we look at funding, all projects are supported by external resources, mostly from the R&D&I Agency (94.2%) and to a lesser extent (5.8%) from CONICET³. (See the Supplementary material for more information on the types of projects deployed at UNSAM.)

Figure 4 shows that the bulk of accredited and executed projects at UNSAM are concentrated in the Natural and Exact Sciences (49%). There is a direct proportionality between the high percentage of projects in this knowledge area and the high proportion of publications by

² It should be noted that the funds allocated to scientific meetings and researcher mobility were suspended in March 2020 because of the covid-19 pandemic. However, as noted above, the circulation indicators consider information captured prior to the pandemic.

³ Resources from international organizations and other public agencies of the country (excluding CONICET and the R&D&I Agency) were not used for research projects or scholarship fellows but were mainly invested in technology transfer actions or infrastructure works (UNSAM, 2020).

Table 5. Research projects carried out at UNSAM, ongoing to 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators	Results			
Total projects	158	Availability of funding	Yes	120
			No	38
Percentage of accredited and funded projects, by subsidiary organization	the university itself			0
		R&D&I Agency		94%
		CONICET		6%
		other organizations		0

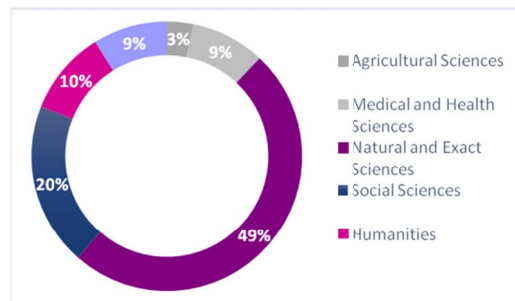
researchers from these same disciplines in mainstream journals (85% of the total published in Scopus and 74% in WoS during Year T).

From the analysis of the projects, their topics, and abstracts, the research “agendas” of the university were examined, which allow recognition of the directionality and objectives assumed by the research resources (Table 6).

“Application fields” categories provided in the SIGEVA-UNSAM system, specifically in the projects tab, were used as a basis for classification. According to the data collected, the highest proportion of topics in the university’s research agenda corresponds to the field of Human Health (32.3%), followed by topics related to Science, Education, and Culture (12.7%) and in third place studies on Agricultural Production/Technology (10.1%).

How can we explain the high proportion of the field “Human Health” in the university thematic agenda, when only 9% of the projects are grouped in the area of Medical Sciences? This is due to the growing interest in this thematic field, which transcends disciplinary specificity and contributions are made from different areas of knowledge. Among the projects devoted to its study, we can mention: “Closed loop control system by motion sensors for deep brain stimulation in Parkinson’s disease,” anchored in the area of Engineering and Technology.

On the other hand, we have established four geographical scales that help to understand the delimitation of the study objects in the projects: Within the “national” sphere we differentiate the “local” and within the “international” the “Latin American” regional space. In this case study, a small proportion of the projects (4%) present topics based in the San Martín locality and 35% of the projects focus on topics located in other areas of the national territory. On the other hand, research projects that investigate topics from other latitudes (in many cases



2020. Source: own elaboration, based on the Cuyo Manual (CECIC, 2020).

Figure 4. Projects carried out at UNSAM, according to major disciplinary areas, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020).

Table 6. Agendas of research projects carried out at UNSAM, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators		Results	
Percentage of accredited and financed projects, by:	thematic area of application	Multiple fields	3%
		Science, Education, and Culture	13%
		Defense and Security	1%
		Socioeconomic Development and Services	8%
		Energy and Fuels	3%
		Informatic	3%
		Matter and Space	3%
		Agricultural Production/Technology	10%
		Industrial Production/Technology	3%
		General Promotion of Knowledge/Exact Sciences	4%
		General Promotion of Knowledge/Social Sciences	4%
		Natural Resources and Environment	9%
		Human Health	32%
		Urbanism and Territory	3%
geographic scope of research topics		Include local studies	4%
		Include studies of other national spaces	35%
		Include studies on other Latin American countries (including comparative studies with Argentina)	13%
		Include studies on other Latin American countries (including comparative studies with Argentina)	5%
		Projects not limited to studies with specific geographic anchors.	43%

comparatively with Argentina) prioritize a rather regional scope (13%) over studies focused on other areas abroad (5%).

However, during the analysis of the research projects agendas, we have detected a significant number of studies without a specific geographical location (43%). These are study objects that focus on experimental and/or technological developments whose designs and results would have diverse applicability in the field of geolocation.

A noteworthy fact is that “international” and “Latin American” approaches have predominated in the research agendas of what are called *hard sciences* (if we lump together the disciplines corresponding to Engineering, Medicine, and Exact and Natural Sciences), reaching 63% representation in the first case and 67% in the second. As for the smaller scales of aggregation, the research agendas of disciplines linked to the Social and Human Sciences predominated, which together accounted for 58% of the “national” and 54% of the “local” studies. The studies without a specific geographic focus, as expected, were overwhelmingly concentrated (98%) in the “hard sciences.”

Another valuable instance of science circulation is the scientific meeting, which involves the dissemination of certain flows of knowledge among experts through a specialized language and within the framework of a specific locus.

Regarding Table 7, during Year T UNSAM held 111 scientific meetings, mostly in the form of symposiums, open seminars, and study circles. Unlike other more standardized scientific event formats, this institution has especially promoted study circles, planned as spaces for horizontal and participatory formation. The Social Sciences made visible the largest number of scientific events at UNSAM (51.4%), followed by Engineering and Technology (26.1%). Next to the Humanities, with 18.9% and with a lower visibility of events, we find the Medical and Health Sciences and the Natural and Exact Sciences with 1.8% each.

Regarding the geographical scale of knowledge circulation (Figure 5), 36% of the scientific meetings were local (held within the university's area of influence), 30% national (co-organized with other universities or CONICET), 12% Latin American (co-organized or subsidized by other institutions in the region), and 22% international (co-organized or subsidized by foreign academic centers).

It should be noted that the most common geographical scales of scientific meetings for what are traditionally called *hard sciences* have been predominantly national (45%) and international (27%) in character. In contrast, for the Social and Human Sciences as a whole, the most common types of meeting have been local (44%) and national (23%).

Finally, another of the most relevant actions in terms of research circulation refers to cooperation agreements and obtaining international funding. Although, following the onset of the

Table 7. Scientific meetings held at UNSAM, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators		Results	
Total number of scientific meetings held at the university		111	
Percentage of scientific meetings, according to:	type of event	Study circles	22%
		Scientific congresses	6%
		Workshop	9%
		Symposiums	35%
		Open seminars	28%
	areas of knowledge	Medical and Health Sciences	2%
		Natural and Exact Sciences	2%
		Social Sciences	51%
		Humanities	19%
		Agricultural, Engineering, and Technology Sciences	26%
geographic scope of the call for proposals	Local	36%	
	National	30%	
	Latin American	12%	
	International (non-Latin American)	22%	

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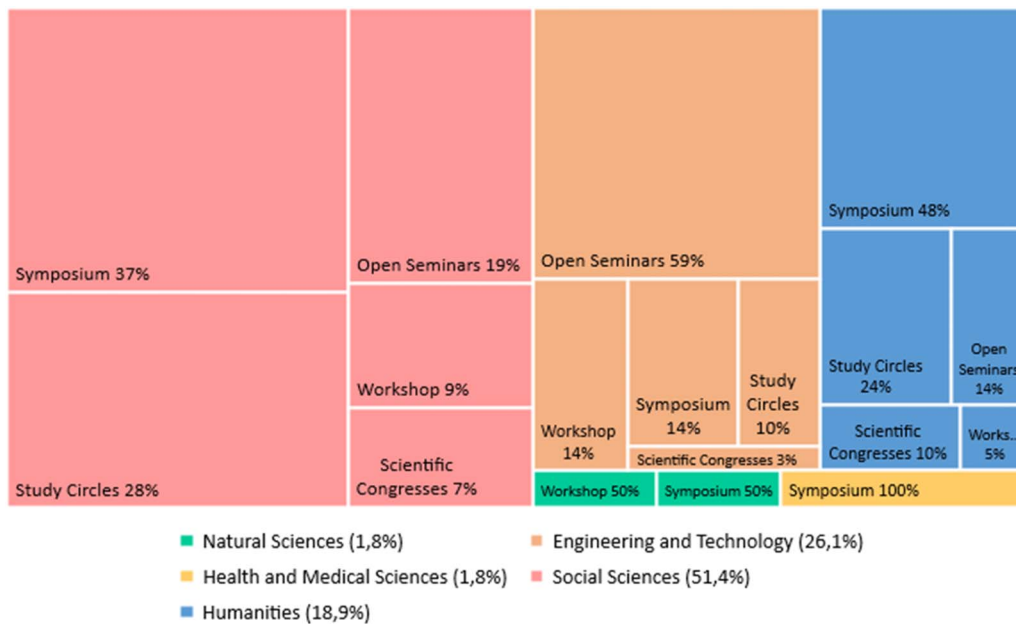


Figure 5. Scientific meetings held at UNSAM, according to type of event and disciplinary area, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020).

pandemic, its usual interactions with other countries were completely affected, fundamentally the processes in-person mobility led the university to incorporate “Virtual Mobility as an emergency mechanism” (UNSAM, 2020).

However, as we pointed out above, the fieldwork in UNSAM ended in March 2020. Thus, in this article, data collection reflects the prepandemic situation. As of that date, the university reported 62 new international agreements entered into with institutions from 25 different countries under the formats of framework, specific, and specific mobility agreements⁴.

Of the agreements established by UNSAM (Table 8) the vast majority (165) are concentrated in European countries, 84 in Latin American countries and 11 in English-speaking America (including the United States and Canada). The rest constitute very specific agreements with other countries in other continents, although eight international cooperation agreements with intergovernmental organizations stand out in particular.

In this sense, three main routes of research agreements can be identified: a Euro-American international circuit, marked by a strong presence of countries considered central, such as Germany, France, Italy, and the United States; a Latin American international circuit, where agreements with countries such as Brazil, Chile, and Colombia stand out; and a transnational circuit (with mainly European funds), with an active role of intergovernmental or nongovernmental organizations such as the United Nations (UN) and the International Labor Organization (ILO).

⁴ For the purposes of this paper, we have prioritized references to the interinstitutional agreements made by UNSAM, and in particular those corresponding to academic mobility, in accordance with the meso character of the research carried out. Therefore, information about the participants and their trips is not included here. However, based on the assumption that agreements between academic institutions are usually bureaucratic documents, which do not necessarily correspond to practices, those active and current agreements that registered at least one effective trip during the period under study were included in the information tracing and analysis.

Table 8. International research agreements deployed by UNSAM, active to March 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Indicators			Results
Total number of active research agreements entered into between the university and other institutions			277
Active research agreements	Total number, by location of counterpart	Non-Latin American foreign countries	185
		Latin American countries	84
		Intergovernmental Organizations	8
	Number of specific mobility agreements, according to location of counterpart	Total number of mobility agreements	32
		Percentage of mobility agreements with non-Latin American countries	88%
		Percentage of mobility agreements with Latin American countries	12%
		Percentage of mobility agreements with Intergovernmental Organizations	0

As for the counterpart institutions (Table 9), they mostly refer to academic institutions or those linked to higher education (such as schools, institutes, faculties, foundations) and to a lesser extent to NGOs, publishing companies, academic exchange companies, and public management institutions (such as embassies or international relations departments).

Focusing specifically on institutions with an academic profile, we notice that UNSAM encourages strong links with other universities, prioritizing those of state management located outside the regional scope. In fact, 63% of the active agreements with academic counterparts

Table 9. UNSAM interinstitutional agreements according to type of counterpart institution and geographical scope, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Counterpart institutions	Number of agreements established	%
Latin American academic nonprofit organizations (excludes national)	5	2
Foreign nonprofit academic organizations (excludes Latin American)	7	3
Latin American companies (excludes nationals)	0	0
Foreign companies (excludes Latin American)	3	1
Latin American public agencies (excludes nationals)	0	0
Foreign public agencies (excludes Latin American)	3	1
Latin American public university institutions (excludes nationals)	54	19
Latin American private university institutions (excludes national)	27	10
Foreign public university institutions (excludes Latin American)	159	57
Foreign private university institutions (excludes Latin American)	11	4
Intergovernmental organizations	8	3
Total	277	100

Table 10. Types of UNSAM agreements, according to geographical location of the counterpart institutions, year 2020. Source: Own elaboration, based on the Cuyo Manual (CECIC, 2020)

Geographical location of counterpart	Types of agreements			Total
	Framework	Specific (without reference to mobility)	Specific (with reference to mobility)	
Latin American countries	73	7	4	84
Foreign countries (non-Latin American)	107	50	28	185
Transnational organizations	6	2	0	8
Total	186	59	32	277

correspond to foreign universities (non-Latin American) of public management and 4% to private universities. As for the agreements with Latin American academic counterparts, 22% refer to public universities in the region and 11% to private universities. (See data on agreements broken down by country in the [Supplementary material](#).)

Regarding the type of collected agreements, they are classified into “Framework Agreements” and “Specific Agreements.” UNSAM’s Rector’s Resolution 137/08 identifies the first group as a “mere intentions declaration” and the second as “agreements with specific obligations for the parts” (UNSAM, 2008, p. 6). Among the latter we can find the Specific Mobility Agreements, which we will deal with here because they refer to the circulation of researchers.

Of the bilateral agreements examined, Table 10 shows that 32 correspond to Specific Mobility Agreements (international), which is equivalent to 12% of the total. In terms of geographical scope, 87% refer to mobility experiences with non-Latin American institutions and only 13% to regional circulation. (See the [Supplementary material](#) for the countries to which mobilities are designated.)

5. DISCUSSION AND CONCLUSIONS

Faced with the wide and diverse productions and research activities universe, developed in different latitudes of the world scientific system, a set of macroindicators has been universalized to measure and evaluate their quality/academic prestige. Focused almost exclusively on publications in journals indexed in commercial databases and writing in English, these metrics standardized an international quality regime of “scientific excellence” that is usually valued, legitimized, and stimulated under these parameters in different universities and scientific organizations around the world.

The impact of these indicator systems, coming from countries considered central, was such that the criteria for resource distribution in the field also began to depend on the particular position that people, institutions, and countries occupied in these classifications.

Nevertheless, in recent times, several countries have advanced in the areas of editorial professionalization of autonomous experiences, development of collaborative infrastructures, information digitization processes, assemblies of national databases, and open access regulations for publications, among other ways of weighting the diversity of knowledge produced and which escape the international metric market. Indeed, open access to publications within the more general framework of the Open Science movement is a current agenda item, shared by an increasing number of universities, scientific organizations, and governmental and non-governmental institutions.

In Latin America, especially, experience with regional multibase information systems is being developed that seeks to visualize the published scientific productions in the region in order to promote its valorization in the evaluation systems. Examples of this are the Latin American Observatory of Evaluation Indicators, OLIVA (Beigel, Packer et al., 2022) and the Open Knowledge platform for Latin America and the Global South, AmeliCA (Becerril-García, Aguado-López et al., 2018).

In effect, the wide discussion on the quality of scientific production in the “periphery,” as well as its formats and ways of circulation, has stimulated a critical rereading of the particularities in these academic circuits, assuming a deconstructive view of the “center–periphery” binary and strengthening in turn the movement towards responsible metrics. Suffice it to point out the San Francisco Declaration on Research Assessment (DORA, 2012), the Leiden Manifesto (Hicks, Wouters et al., 2015), and the aforementioned FOLEC-CLACSO experience are fundamental milestones on the road towards the revision of the current global evaluation system.

Indeed, more and more institutions and specialists (Babini & Rovelli, 2020; Beigel, 2019; Rodríguez Medina, 2019; Vélez Cuartas et al., 2021, among others) are promoting the transition process from the model of internationalization of science, a tributary of hierarchies that were consolidating on the basis of the mainstream publication system, towards inter- and intra-national knowledge circulation. But for this to happen, it is also necessary to have new tools for measuring the scientific production in the periphery.

In this context, as we have seen, CECIC has designed and implemented the Cuyo Manual and its research circulation indicators. This is an alternative system of STI indicators that promotes the recognition, and not mere measurement, of scientific production, but from the periphery itself. Distancing itself from the internationalization paradigm and its respective universalist parameters of science, this new social tool seeks to make visible both the international scope and the local anchors of peripheral scientific capital. In effect, each of its analytical indicator blocks recovers all the interactions of scientific knowledge: local, national, regional, transnational, and international. In particular, one of the innovations of this multiscale circulation approach is that it revalorizes the “other” routes along which scientific knowledge travels. In this sense, it contributes to dismantling the unidirectional mainstream–periphery perspective, which is currently under global level revision, while at the same time emphasizing the local/territorial component of scientific production, assuming that these are promoted through the interaction between the university and its area of influence.

Furthermore, considering that the knowledge generated in the periphery is of different types and circulates in different formats and languages, the proposed circulation indicators help to recognize the diversity and complexity of the knowledge that is produced and circulating, which remains outside the realm of the published research harvested by the mainstream databases.

In this article we have presented, specifically, the main findings obtained in the first study case conducted: that of UNSAM. Hence, we move forward by examining two major relevant scenarios of knowledge circulation in the institution: its developed editorial capacities and the scientific publications of its researchers, on the one hand, and its “other” research capacities and interactions crystallized in the projects and their thematic-disciplinary agendas, scientific event organization, and establishment of bilateral research agreements.

Regarding the main findings, even though UNSAM positions itself, and makes visible in its reports, as an institution that is considered in terms of international standards of academic

quality, in practice it permanently combines local and global resources based on its organizational itineraries and management politics.

In terms of editorial development, the institution has its own centralized repository but is still disconnected intra- and interinstitutionally. It also has an important editorial function, and publishes a series of digitized journals in Spanish, but without indexing. Thus, its editorial capacity stimulates a local–national type of circulation in which there is a clear predominance of researchers in the Social Sciences.

However, when examining the scientific production published by its agents, we have detected a strong tendency to circulate in mainstream journals, mainly indexed in WoS. In this case, almost 80% of the publications shown in these databases correspond to researchers in the Natural and Exact Sciences and Engineering and Technology.

It is worth introducing here some recommendations to the institution based on the indicator analysis: expand the coverage of its repository by linking it to the curricular database in line with the advances of the National System of Digital Repositories and taking into account the CRIS system models and orient its journals towards regional circulation through their inclusion in databases such as Latindex, SciELO or RedALyC and the incorporation of content in Portuguese, for example, or else, to integrate with the mainstream if indexed in WoS or Scopus and promote publications in English.

Regarding the other actions and institutional capacities that the university has developed in terms of knowledge circulation, we note that there is a diversity of research projects, but most of them are accredited and funded by external agencies, such as R&D&I Agency and CONICET, and, to a lesser extent, some have internal accreditation and institutional recognition (the PRIs). The former are reconverted into economic and cultural capital and the latter into a type of intrainstitutional symbolic capital. Regarding research agendas, the university has a strong orientation towards the hard sciences (which monopolize the majority of research projects) and its geographical scales of approach do not refer to local or international studies, but rather to national objects of inquiry or do not present a defined scale.

As for scientific meetings, in contrast to the productions published, most scientific events were carried out by researchers from the Social Sciences, and those of purely local or national scope predominated. This is consistent with their publication circulation through alternative circuits to the mainstream system, as well as numerous production of books and/or book chapters. This leads us to think that for the Natural Sciences and other hard sciences, attendance and participation at congresses or scientific meetings held in other latitudes is consistent with the outstanding circulation rates of their work through publications in journals indexed in databases such as WoS or Scopus, and preferably in English.

Regarding the establishment of bilateral research agreements, UNSAM has a clear orientation to interact with academic institutions (mainly universities) over political or commercial entities, in most cases located in European countries. In this sense, the directionality of the circulation points strongly towards the internationalization of knowledge.

Based on the observations provided by the examined indicators, other proposals for knowledge circulation politics also emerge: Promote a line of research projects financed by the university that contemplate the articulation of scientific activities and projects integrated by researchers from different careers and academic units; redefine research agreements to broaden them to include social and/or technological linkages, promoting the participation of researchers in local, Latin American, and other networks; and stimulate the realization of transdisciplinary scientific meetings and from an “internationalization at home” approach, as a

process opposed to the mercantilist and hegemonic tendency of internationalization, which helps to recognize the potentialities of the realization of internationalization activities.

Finally, it should be noted that, although the article deals with a meso study, of an institutional type, and therefore cannot be generalized as its conclusions are specific to one institution, we consider that they support the existence of certain trends in the circulation and recognition of scientific capital developed in the periphery. We believe that the Cuyo Manual and its circulation indicators show technical potential and acquire a critical conceptual importance for peripheral academic communities, their institutions, and researchers, as they allow reversing, converting, and discussing the filters and hierarchies established in the funding and evaluation systems that have historically privileged some publication patterns and languages, as well as circulation routes and formats, over others.

AUTHOR CONTRIBUTIONS

Víctor Algañaraz: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Supervision; Writing—original draft. Flavia Prado: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Software; Writing—original draft; Writing—review & editing. María Pía Rossomando: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Software; Writing—original draft.

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DATA AVAILABILITY

All the supporting data for this article (i.e., entries, annotations and results) are visible in a more detailed report by the Research Center on the Circulation of Knowledge (<https://cecic.fcp.uncuyo.edu.ar/wp-content/uploads/2021/09/Estudio-de-circulacion-del-conocimiento-producido-por-UNSAM-CECIC-EIDAES-2021.pdf>; CECIC, 2021). The study is part of a larger research project that includes the approach of 3 national universities. Therefore, in accordance with the deadlines stipulated by Argentinan Law 26.899 of “Open Access Institutional Digital Repositories”, the data will be available in the CONICET repository when the 3 studies have been completed.

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