

Juan Pablo Alperin and Gustavo Fischman [editors]

**MADE IN
LATIN AMERICA**

**OPEN ACCESS, SCHOLARLY JOURNALS,
AND REGIONAL INNOVATIONS**

Gustavo E. Fischman | Juan Pablo Alperin | Ana María Cetto | José Octavio Alonso-Gamboa | Abel L. Packer | Eduardo Aguado-López | Paola C. Bongiovani | Nancy D. Gómez | Keyla Mafalda de Oliveira Amorim | Filipe Degani-Carneiro | Nathalia da Silva Ávila | Glaucio José Marafon | Anabel Marin | Sergio Petralia | Lilia Stubrin



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MADE IN LATIN AMERICA

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FOREWORD

LATIN AMERICA IS THE MOST ADVANCED REGION in the world when it comes to adopting open access to their scientific and scholarly journals, which, for the most part, are available full text on the Web at no cost to either the reader or the author, significantly increasing the visibility and accessibility to scientific production in the region. This movement of open access to journals in the region was driven primarily by regional initiatives: SciELO; RedALyC; Latindex, the Portal of Portals (PPL); and, recently, journal collections in institutional open access digital repositories. These institutional repositories collaborate in national repository systems for science and technology that cooperate regionally under the Federated Network of Institutional Repositories of Scientific Publications '*La Referencia*' (*Red Federada de Repositorios Institucionales de Publicaciones Científicas*), a movement endorsed by advances at domestic legislation level in favor of open access to scientific information through digital repositories.

Latin America distinguishes itself from other regions of the world by considering the scientific information as a common good. All the above initiatives are publicly funded and managed by the same academic community that publishes scientific journals, unlike in Europe and the United States, where much of the scientific communication — mainly journals — has been outsourced and commercialized.

The book presented here provides the results of exploratory research and different perspectives on achievements, detected problems and challenges the region will be facing in the future, in relation to access, visibility, and scientific and social impact of research published in journals in Latin America, the evaluation of these journals by assessment systems and incentives for academic and scientific careers in the region. The coordinators of this initiative, Juan Pablo Alperin (PKP) and Gustavo Fischman (FLACSO), provide recommendations to address the paradoxes detected by the authors of the studies and essays, which are the result of the project Quality in Open Access Scholarly Communication in Latin America, coordinated by FLACSO-Brazil and a team of researchers from Latindex, Public Knowledge Project (PKP), RedALyC, and SciELO-Brazil, funded by the International Development and Research Center (IDRC)-Canada.

For CLACSO — an academic network of 380 research and teaching centers in 25 countries, with 15 years of experience in open access advancement and initiatives in Latin America and the Caribbean, including the main digital repository of social sciences in the region — it is an honor to present this book, which provides new insights for reflection and discussion on academic and scientific communication in our region and contributes to the dialogue with other regions of the ‘Global South’ .

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Chapter 1

ON LIGHTS AND SHADOWS

**THE SCIENTIFIC JOURNALS MADE
IN LATIN AMERICA**

THE ACCESS, VISIBILITY AND THE SCIENTIFIC AND SOCIAL IMPACTS of the research performed in Latin America are common topics of discussion at universities and research centers in the region. In these discussions, two highly polarized perspectives are often debated. One group highlights the current malaise due to what is missing — appropriate budgets, technical training, senior researchers, and other resources. The opposition emphasizes that, despite adverse conditions, Latin America is continuously producing more and better science because a great number of the researchers are accomplished professionals. Working mainly from public universities, using public-sector resources for research and development programs, these professionals are clearly committed to the defense of knowledge as a public good.

Without trying to resolve which of these two perspectives is more accurate, our starting point is that in order to take stock of the state of scientific publications in the region, one must recognize that the issues of access, visibility, and the scientific and social impacts of the research produced in Latin America are shaped by a series of unequal processes. There are many successful initiatives, areas of excellence and effective, innovative models (among them, the CLACSO digital library, Latindex, La Referencia / Red CLARA, RedALyC and SciELO are very good examples), as well as a good number of failed projects,

structural rigidities, confusing incentive models, and multiplication of editorial efforts that, rather than strengthening, tend to weaken the regional systems of scientific communication.

Despite these challenges, scientific journals produced in Latin America and the Caribbean has shown impressive quantitative and qualitative growth. According to the Latindex list, there are currently more than 5,000 scientific periodicals in the region, and the vast majority uses the Open Access model (OA)¹. The widespread adoption of OA has meant that a significant part of the scientific production in the region — including research models and results — is available for any user to read, print and distribute at no cost.

Thus far, activities in the OA model have focused primarily on creating research repositories to store journal articles and using online platforms to publish OA journals. Therefore, we begin this book with a chapter that features the characteristics of some of the most innovative and successful initiatives in the region. Ana María Cetto, in collaboration with Octavio Alonso-Gamboa from Latindex, Abel Packler from SciELO, and Eduardo López Aguado from RedALyC highlight the history and characteristics of these initiatives (Chapter 2) that share a regional, non-commercial model and are aligned with the OA movement. The successes as well as limitations of these initiatives reaffirm the value of continuing regional reflection on how to improve scientific journals, the main aim of this book.

The early adoption and widespread use of OA by a considerable segment of the regional scientific community has represented significant progress. However, despite these advances, knowledge or attitudes about OA are very heterogeneous and divergent. The work of Paola C. Bongiovani and Nancy D. Gómez (Chapter 3) presents the results of regional opinion surveys regarding OA, and provides us with a glance at the perspectives of researchers from three countries in the region that are directly involved in scientific communication. This work shows an apparent contradiction between the growth and success of OA initiatives and the researchers' confusion and lack of knowledge about OA, thus highlighting one of the remaining barriers to expanding access and the shaping of scientific research in the countries of the region.

Another obstacle that must be considered is that when we refer to the regional scientific production, we must take into account that, qualitatively, an important part of Latin American scientific produc-

1 A study by Miguel et al. (2011) reports that 73.9% of the publications in Latin America and the Caribbean are OA, a percentage that drops to 6.9% for Europe and to 4.9% for North America.

tion is published outside the region in journals that are not usually Open Access. The irony is that the systems that promote research often give greater ‘incentives’ for researchers to publish their results in international journals with highest ‘Impact Factor’. The trend is that the higher the Impact Factor, the more difficult the access to this publication is in terms of costs (many libraries cannot afford the subscription) and language (mostly English). This incentive model, strongly associated with the use of the Impact Factor, generates the ironic situation where a significant proportion of regional production, which has been paid for with public funds, on topics relevant to the region and with potential benefits to the people who funded them, are not accessible even within the region.

Modifying the incentive systems is an important task that requires multiple debates and that may take a considerable time. The magnitude of this undertaking becomes evident at the diversity of incentive models that exist in the region. The work from Keyla Mafalda de Oliveira Amorim, Filipe Degani-Carneiro, Nathalia da Silva Ávila, and Glaucio José Marafon (Chapter 4) systematically analyzes the incentive programs, presenting a view of how regional agencies in charge of promoting research understand the quality and impact of publications in the region. Considering the criteria used in the incentive systems, it becomes evident why they promote the conflict with which we began this chapter: on one hand, they promote OA, when valuing the work of regional initiatives, while, at the same time, they disparage OA by rewarding publication in journals with a high Impact Factor, which are largely closed access.

Similarly, systems of research incentives give priority only to one type of publication: articles in scientific journals. The results of numerous investigations produced in the region are not distributed exclusively through scientific articles published in research journals; there is also a valuable range of documents, books, informative brochures, journalistic outreach articles, research reports and multiple other ways to ‘translate’ regional scientific output into more accessible styles. Many of these studies investigate issues of national and regional importance.

It is imperative the examination of this incentive model, as stressed by the emeritus researcher of the National Autonomous University of Mexico (UNAM) Ruy Pérez Tamayo, who was one of the architects of the National Research System (Sistema Nacional de Investigación, SNI) of Mexico. He states: ‘What the evaluation system does is to assess the number of publications, the number of citations, the Impact Factor of the journal where it is published. They are pure numbers. Who speaks about the quality of the research process? No

one, and that is something we must change, but without overthrowing the SNI; it only should be done well' (Ruiz Jaimes, 2013, p. 17).

Until that happens, it is possible to implement partial actions that, even if they were not sufficient, would allow us to advance in the right direction: one of them is to encourage the use of alternative and article-level metrics (altmetrics)². Metrics at the level of individual articles, instead of at the magazine level, would allow us to expand the focus of attention not only to the knowledge circulating in academic journals, but to all forms of distribution of scientific knowledge in the region. As we focus back on the articles themselves, we need to value types of impacts that transcend academic citations.

With this aim, Anabel Marin, Sergio Petralia and Lilia Stubrin (Chapter 5) provide us with an initial approach to the various types of impact that academic journals can offer: impact on the mass-media, public policy, education and, of course, the academic field. This more holistic approach to impact reminds us of the motivations for Open Access and offers us a way to bridge the gap that currently exists between incentive systems and the extensive and intensive use of OA in Latin America.

Let us remember that the adoption of OA is the result of a set of traditions and innovations, mainly the use of the Internet to access scientific information; the relative advantages offered by the small size of the regional 'scientific market', which does not appear to attract the large corporations that dominate the business of scientific publications (although this is changing); and the mission of a considerable number of researchers who consider it an ethical duty to make their work accessible, as they were financed with public funds, precisely because it can have an impact on other areas of public interest. In addition, it is crucial to consider the long tradition of many universities and research centers of actively participating in the struggle for the development of national democratization.

To continue recovering the best of these traditions, progress in the evaluation of current models of research incentives is an urgent task for the publications 'Made in Latin America', to maintain their strengthening and quality. To continue in this direction, we conclude this book with recommendations for a comprehensive OA model, with clear mandates, stable and interconnected repositories, and the use of metrics at the level of individual production. We are of the opinion

2 Altmetrics are indicators, usually collected on individual articles, which include academic citations but supplement this with information on citations of those articles in newspapers, blogs, Facebook, Twitter, reference management systems and other sectors of the social Web.

that supporting an OA model can make a great contribution to the mobilization of research and scientific development in Latin America and the Caribbean.

To achieve this ideal, the publishing model that has been used in Latin America has to overcome one of the most severe challenges the OA movement has confronted — and still faces — in Latin America and the Caribbean. The problem is that for the national systems of promotion and evaluation of science the terms *quality* and *quantity* are combined, ironically, in two dynamics. In the first, the idea of quantity is opposite to that of quality. In this case, the Open Access models appear associated with an expansion of the quantity that would lead to an inevitable loss of quality. In the second dynamic, the terms are reversed. Faced with the difficulty of measuring the ‘quality and relevance’ of a particular contribution, a process where the indicators are more complex, available metrics are often analyzed based on measurable quantities (number of articles, number of citations, a journal’s percentage of rejections, etc.), even when such quantities are not useful to assess what was initially intended.

Intending no disrespect to the efforts of those who implemented these systems, the use of these metrics remind us of the joke about the drunk who loses his keys at a corner and goes to look for them at the next corner because there is better light there. With this book, we present a series of studies that attempts to help us understand that although Open Access might not be able to do much about the drunkenness, perhaps it can help us find the key.

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Ana María Cetto, José Octavio Alonso-Gamboa,
Abel L. Packer and Eduardo López Aguado

Chapter 2

REGIONAL APPROACH TO SCIENTIFIC COMMUNICATION

OPEN ACCESS JOURNAL SYSTEMS

INTRODUCTION

Regarding the topic at hand, Latin America and the Caribbean have a set of important features in common.¹ One, perhaps the most obvious, is the Spanish language, which is the national language in all cases except Brazil. Another common denominator among the countries of the region, no less relevant and of course related to the first, is historic: particularly, the three centuries of colonial rule under the Iberian Crowns and their development as independent nations in the last two. This shared history is reflected in a multitude of related cultural and idiosyncratic traits, which, when coupled with a common language, greatly facilitates communication and understanding among each other.

At the same time, however, Latin American countries share some important stumbling blocks in the development process, which have kept them from completely shaking off dependency and solving their internal problems of inequality and poverty. This common challenge is a powerful reason to join forces and work to fulfil shared objectives.

¹ In the context of this chapter, Latin America and the Caribbean correspond to all the countries of Latin America plus the Spanish-speaking Caribbean. For purposes of brevity, we speak of the Latin American region or Latin America, and Ibero-America when including Spain and Portugal.

In the international scientific arena, it is known that Latin America as a whole has traditionally had a low presence. It is also true that in recent decades, scientific activity has increased in some countries of the region. However, overall, the main problems are shared: 1) there are few researchers per capita (the region only contributes 3.8% to the world's total); 2) there is little investment in science and technology (with an investment of 0.78% of the gross regional product, the region contributes 3.2% to the world's total); and, 3) the Latin American presence in the international scientific landscape, as measured by publications in specialized journals, is very low (ranging between 4% and 8% according to the international database consulted; for further details, see RICYT, 2013).

Two decades ago, in the early 1990s, the state of science and scientific production was even more precarious (see RICYT, 1997). The lack of international presence of Latin American publications received special attention, underscoring the need for the region to create its own information systems. By then, there was already a specific precedent in the area of medical science in Latin America, in the form of BIREME, an efficient and comprehensive information system for journals in the field of health, established in 1967. However, in general terms, most of Latin American scientific output was considered almost grey since, due to its low circulation, it was hardly accessible, let alone consulted or cited, not only internationally but also within the countries themselves. From the challenge to identify all the problems and generate visibility for Latin American scientific output, new information systems emerged, each with a different approach but with a number of common characteristics that responded to the shared history of Latin American countries.

In 1995, the Latindex project was created, followed in 1996 by SciELO and, a few years later, by RedALyC. In barely two decades, these three projects have become widespread, successful systems, with different but complementary functions. In this chapter, their respective directors or coordinators give an account of that process, providing us with a valuable overview of the current status, the main services provided and the challenges they face with a view to the future.

It is important to note that these three systems are not the only ones, nor are they the sole type of information services for journals in the region (Cetto & Alonso-Gamboa, 2014). In this recent development, information and communication technologies have had a profound impact, from which these and other users and systems have been direct beneficiaries. Thanks to these technologies, it has been possible to increase access to Latin American scientific production on a scale that would not have even been possible to dream about thirty years ago, considering the costs of printed journals and their difficult distribution. More recently, a variety of computing platforms and bibliographic services, or combina-

tions thereof, have emerged, radically changing the regional landscape of scientific publishing and its access. The three systems presented in this chapter have played a decisive role in this development, not merely as models, but also for their continued advocacy for and support of journals and for their disseminating efforts in regard of good practices and editorial policies.

A characteristic of the region that distinguishes it from other areas of the world is the notion of scientific information as a common good, with the consequent free access to it. This concept has formed the basis for the publication of our scientific journals, the vast majority of which are produced by universities, research institutions, academic associations, or similar non-profit organizations.

With such a tradition, it is not surprising that the Open Access (OA) to information movement, particularly regarding material published in scientific journals, found fertile ground in the region. A tendency to openness has always existed; however, adhering to the movement has meant greater access to our publications, has given us a common language with which to talk about them, and has supported the development of tools and specialized computer platforms, along with increasing recognition and institutional support.

This history and tradition of OA has resulted in information systems, as well as most of these journals, being managed within academic and scientific environments and financed through public, non-commercial funds. This model, characteristic of Latin America, generates coherence between the philosophy of knowledge as a common good and the method of financing it. It is a model that understands that to ensure access to knowledge as a good belonging to all, it is necessary to preserve the management, production and dissemination of that knowledge in public hands.

Non-commercial OA is made possible, in part, because many initiatives, including the three mentioned here, work at the regional level.² Thus, they help to spur all countries in the region to progress along the same timeline, with some coordination, even when independent processes are followed to a lesser or greater extent. This relative diversity is also seen in the legislation on the subject, adopted by some countries in the region, as well as the criteria adopted by the

2 In this context, it is also worth mentioning the Network of Virtual Libraries of Social Sciences (*Red de Bibliotecas Virtuales de Ciencias Sociales*), a digital repository created in 1998 by the Latin American Council of Social Sciences (*Consejo Latinoamericano de Ciencias Sociales, CLACSO*; see <http://biblioteca.clacso.edu.ar/ingreso-informacion/actualizacion-profesional/accesoabierto/>); and the Federated Network of Institutional Repositories of Scientific Publications (*Red Federada de Repositorios Institucionales de Publicaciones Científicas, La Referencia*).

national registers of evaluated and classified journals that promote and support the higher-quality journals.

Certainly, the current situation of Latin American journals has little to do with the situation of twenty years ago. The systems presented here have not only contributed to these changes in a pivotal manner; they have also developed with them, allowing the formation of new tasks and services, and the facing of new challenges.

LATINDEX, SCIELO AND REDALYC SYSTEMS

LATINDEX

Latindex is a bibliographic and qualitative information system about scientific and scholarly journals, created as result of a recommendation issued by Guadalajara's First Workshop (Cetto & Hillerud, 1995), which gathered scientists, publishers and information professionals. The National Autonomous University of Mexico (UNAM) hosted and supported the idea of its creation in 1995; two years later, in February 1997, Latindex was formally constituted as a cooperation network, releasing the first version of the journal directory (www.latindex.org), available since that time for free consultation.

At the time of Latindex's gestation, there was already awareness that most of our academic publications were not part of the commercial circuit of journals, that they were not well represented in the most prestigious international databases and that there was a scattered and fragmented perception of our publications. In the existing databases, the number of journals covered was limited by selection policies, by the regional or national scope of the service, or by their thematic specializations. At that time, Ulrich's International Directory offered globally about 5,220 titles from Latin America (Cetto & Alonso, 1998), which was the known universe, but one had to pay a subscription fee in US dollars to consult it.

Latindex was created in response to the need for an information resource that covered, in an integrated, comprehensive and inclusive manner, the universe of academic and scientific journals published in the countries of the region. Complying with this objective, Latindex covers a wide range of Latin American academic publications, which distinguishes it from other information services in the region.

Characteristics

Latindex employs a regional approach through a cooperative network present in 22 countries in Ibero-America.³ Partner institutions are pri-

3 The list of partner institutions can be found at: <http://www.latindex.unam.mx/socios/insAso.html>.

marily universities and national science-supporting organizations from which data is updated daily using a common methodology. In addition to journals published in Ibero-American and Caribbean countries, Latindex incorporates into its databases those journals with content related to Latin American, Hispanic and Lusophone Studies. For this purpose, it has information collection centres located at the University of Toulouse (France) for European journals about Latin America; at the University of Foreign Studies of Busan (South Korea) for Asian Latin Americanists; and at the UNAM itself for North America.

In 1997, in order to integrate the data of the existing journals into a single site, the Directory was established. All of the registered journals have academic content and correspond to three groups, differentiated by their objectives and the public to whom they are addressed: a) scientific research journals, b) technical and professional journals, and c) scientific and cultural dissemination magazines. Each journal is described in a record comprising up to 50 fields of information; two new fields, *refereed journal* and *Open Access journal*, will be added with the release of the new website in 2015. Printed journals are recorded separately from those available online. The directory includes current journals and those that have ceased production but also reports when the status of a publication is unknown, a frequent circumstance for regional journals.

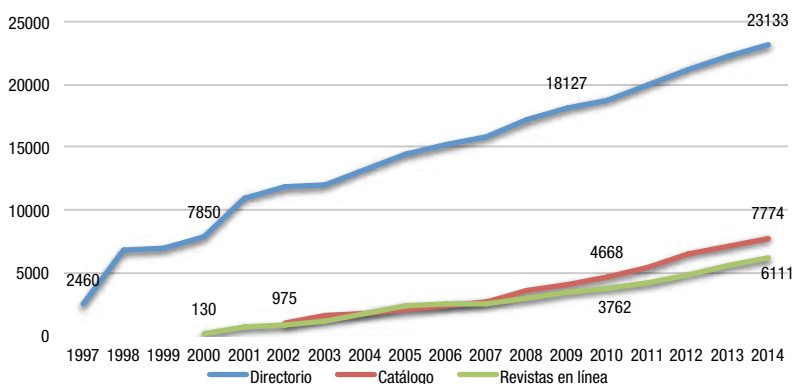
The objective of providing information on the editorial quality of Ibero-American journals has been achieved through the Catalogue, a qualitative information service that investigates the compliance and best practices of print journals through 33 attributes and of electronic journals through 36 attributes. A journal acquires the Catalogue Category when it meets a minimum of 8 basic features and 17 additional ones. As part of the cooperative and regional Latindex model, the associated institutions in each country corroborate the verification of compliance of their own journals.

The growing adoption of electronic publishing of scientific journals in the world is a phenomenon that Latindex has pursued in Ibero-America, specifically by registering online journals. This allows users to learn important information about the websites where the journals are available: a retrospective coverage, the formats in which articles can be displayed, as well as the access policy for users; that is, whether the sites have free or restricted access.

The increasing trend of portal construction for full-text journals, together with the positive reception of OA in the region and the availability of interoperability protocols that facilitate metadata harvesting, propelled the building of Latindex Portal of Portals (<http://www.latindex.ppl.unam.mx>) in 2011 as an action with which Latindex

reaffirms its recognition, support and interest in Open Access. This macro-portal integrates 18 recognized portals⁴, built in the region, allowing access to 1,400,000 articles through a single search interface. Thus, users have access to full-text documents from an extensive number of Ibero-American Open Access journals, making good use of the interoperability that offer the protocols based on metadata harvesting.

Graph 1
Evolution of the Latindex Registration in Directory, Catalogue and Online Magazines



Source: Latindex, October 2014.

Main results

Sustained cooperative work carried out during the first 17 years has resulted in the most comprehensive index of Ibero-American journals currently available (Cerdeira & Lara, 2011). Latindex's quantitative expectations have been far exceeded, which can be verified by comparing its numbers with the aforementioned Ulrich's Directory. By August 2014, Latindex had 20,507 academic journals, while a search in the use of the 'scholarly journals' classification by Ulrich yielded a total of 9,345 Ibero-American titles.⁵

4 The portals are: Dialnet, e-Revistas, LAMJOL, Pepsic, Journals of the University of Chile, UNAM's Portal of Scientific and Refereed Journals (*Portal de Revistas Científicas y Arbitradas de la UNAM*), Racó, RedALyC, Saber ULA, SciELO (eight national portals) and Electronic System of Journals of the UFPR (*Sistema Eletrônico de Revistas da UFPR*).

5 Besides journals of an academic nature, Ulrich's Directory includes newspapers, catalogues, directories, conference proceedings and databases, among other periodical publications, so the delimited classification was needed for comparison purposes. In both cases, titles were considered only once, eliminating duplication of records

Meanwhile, in 2002, the Catalogue established a project that had been proposed earlier by editors, scientists, and information professionals in the region.⁶ There had been constant references to the need for an instrument to show which journals were refereed; if they employed international referees; in which type of services they were indexed; and if they met the criteria of periodicity, among other features. It suffices to recall that when Latindex was created, practically the only reference in which to find out about the quality of journals was ISI-JCR, now, the Web of Science (Cetto, Alonso Gamboa, Córdoba González, Giménez Toledo & Chávez Sánchez, 2012). The Latindex Catalogue provides a comprehensive battery of quality parameters, with quite extensive coverage, both geographical and thematic.

The information provided by the Latindex Catalogue has served as the starting point for the formal assessment applied by other journal information systems in the region, but it has also been instrumental in the creation of Ibero-American collections in libraries. It allowed identifying quality Ibero-American journals for subscription agencies and informing about institutions involved in the evaluation and subsidization of the best national publications. In addition, it has been a very useful tool for the publishers themselves, to inform them about their own fulfilment of Latindex's quality parameters.⁷

In many countries in the region, the Catalogue's criteria have served as a guide to establish national or institutional policies to assess publications, as has been the case in Argentina, Costa Rica, Spain (social and human sciences journals), Nicaragua, Panama, and Dominican Republic, among others (Alperin, Fischman & Willinsky, 2011).

It is worth mentioning that the Latindex Catalogue is the only available tool to identify editorial practices in technical-professional journals and popular science magazines in the region, which together represent more than half (53%) of all registered journals in the Directory. This has made a tangible contribution, as it introduces the characteristics of academic periodicals that do not have the dissemination of original scientific research as their primary objective but which play an important role in scientific communication in the region.

when the same journal is distributed in print and online.

6 The first documented statement on the matter dates back to the proceedings of the meeting of editors, scientists, and librarians who gathered in Río Piedras, Puerto Rico, in 1962.

7 The various attributes rated in the Latindex Catalogue can be found at: http://www.latindex.unam.mx/documentos/revistas_imp.html (printed journals) and at: http://www.latindex.unam.mx/documentos/revistas_elec.html (online journals).

Along with recording services, most Latindex partner institutions have maintained a close relationship with the editors of the magazines in their respective countries, through consultation and courses, as well as by organizing academic events. Findings resulting from the application of the methodology are often shared during the numerous training workshops for publishers. Introducing those criteria that are the most difficult to comply with or introducing the purpose behind a particular criterion makes it easier for publishers to understand and to see the usefulness of adopting standards and best practices, with the purpose of supporting the production of better journals.

The dissemination and application of the Latindex criteria has been accompanied by the emergence of information systems with regional coverage that have created various mechanisms to reach, report and evaluate the quality of academic journals. Therefore, it is possible to say that Ibero-America has made quite a valuable and prolific contribution in this respect, as no other region in the world has.

Another achievement to highlight is the availability of information about online journals. The recording and monitoring of publications available in this medium have made it possible to learn how these magazines are published in our countries, an issue of particular importance given the relevance that OA has achieved in the region and whose underpinning is linked to the availability of online journals. The number of magazines distributed through this medium has grown from 130 to over 6,000 in just 15 years; the proportion of online journals to the total existing titles in the region has increased from 2% in 2000 to 24% in 2014. These data would not be known if not for the systematic documentation that Latindex has been performing.

Comprehensive coverage distinguishes Latindex from other information services about Ibero-American academic journals. Most services offer a selection that provides access to the contents of journals with the greatest prestige and recognition and thus represent the most visible core. In contrast, the data provided by Latindex afford a more complete view of the editorial practices that occur around the scientific and academic journals in the countries covered. This vision is important, since there are marked differences on how to communicate science and culture not only among countries but also among regions or areas of a country.

Given that it contains comprehensive and historical information, Latindex is a valuable tool for analyzing trends, both of journals and portals, particularly when faced with the emergence of electronic publishing. The data collected will contribute to a better understanding of journal publishing activities in the region. Furthermore, it has become established as a tool for the promotion of standards (technical

and document-related), enhancement of product quality and adoption of common technology platforms to ensure interoperability and best practices, including, of course, Open Access.

SciELO

With over 16 years of operation, the SciELO Program and Network continues to develop as both, a national and regional solution. The program covers indexing, publication and dissemination of core scientific journals of better quality that are published independently by institutions of national research systems, technological development, innovation and education.

This integrated solution or model is operated through national collections of OA journals. The collections are developed under the management of national organizations, representative of the research and scientific communication in their respective countries, which share among themselves objectives, a set of principles and a common platform for operating on the Web. Through the platform and methodology offered by SciELO, these national bodies work in alignment for a solution that could only be achieved under international cooperation.

Characteristics

This cooperation has brought the SciELO Network to 16 countries on three continents — 13 in Latin America, in addition to Spain, Portugal and South Africa — and includes the indexing and online publication of nearly one thousand magazines and annual publication of more than 40,000 new articles in 2014. Due to its characteristics, size and performance, SciELO is the most important cooperative program of scientific communication from a developing region and one of the most important in OA in the world.

Thus, the SciELO Program is projected as a global public good, providing and generating scientific knowledge and information in a decentralized way, but with accessibility to all. This being so, it is not surprising that the SciELO Program emerged from a public institution.

The SciELO Network is the application of the SciELO Program, originally launched by the Foundation for the Support of Research of the State of São Paulo (FAPESP), and whose objectives, methodologies and common technologies are defined in the different countries according to their respective policies, priorities and conditions, to advance research and scientific communication. It is essentially a network, as participants seek common goals through cooperation and rationalization of resources, taking into account the different institutional capacities. This interaction between the national and

the international is one of the main features and strengths of the SciELO Network, whose formulation and operation structure is based on the model of the Virtual Health Library, developed by BIREME (BIREME, 2011).

The development of each of these national collections is led by agencies and institutions supporting research that contributes to the financing of the basic functions of indexing, publishing and interoperability. The editorial management of the periodicals is on charge of the institutions that supervise the journals and their editorial bodies. The national collection constitutes a common space of convergence and cooperation among the periodicals that are published under the auspices of different institutions of national systems of research, development, innovation and education. For each country, there is only one collection that is coordinated by an institution recognized by the national research community. The collections follow the same methodology and technology so that the interoperability of products, services and contents takes place without difficulty.

Under this model, the SciELO Program has achieved considerable growth and recognition within and outside the region, which we could list here. However, the specific objectives of SciELO are ideals we know we can never reach, and therefore, we prefer to emphasize here the way in which, it can be said without a doubt, SciELO has brought us closer together.⁸

Main results

In its constitution and operation, SciELO aims at improving journals through a set of specific objectives and an operation strategy. That is, SciELO contributes by providing ways to overcome the structural barriers to the dissemination of science from developing countries.

The aim of the SciELO Program is to contribute to the development of research through better communication of research results in journals published from within the region. This improvement is realized through online indexing, publishing and interoperability of quality OA journals selected by national scientific committees representing different knowledge areas.

The function and characteristics of journals published in Latin America are well known. Meanwhile, they face barriers and challenges in their positioning in the national stratifications and rank-

⁸ The evolution of the SciELO Program and its implementation through the SciELO Network have been documented throughout its 16 years of operation (SciELO, 2014), and recently, by a number of articles and book chapters (Meneghini, 2012; Packer, 2014; Packer, Cop, Luccisano, Ramalho & Spinak, 2014).

ings of journals that are used in research evaluation systems. In fact, with a few exceptions, these evaluations are based on international rankings in which journals from Latin America, particularly those of national interest or orientation, lack the conditions to compete.

The systematic lower valuation of nationally published periodicals against periodicals already established as international references, in a context where researchers are required to maximize their scores, represents a structural barrier to the development of the group of journals from Latin America, especially those that are set to attain the status of international reference in their subject areas.

SciELO has advanced this objective in two ways: the first is to support the untying of the evaluation of research from the journals where they are published, and more specifically, from citation-based indicators such as Impact Factor. The existence of SciELO itself is a first step in this direction. The entry and permanence of the journals in the collections are determined by a national scientific committee and are not based on citations.

The second path is to support in various ways the development of journals in order to make them internationally competitive in terms of the professionalism with which they are produced; the quality and speed of manuscript evaluation; the more affordable publishing costs; and especially, their international presence and visibility. SciELO has supported the publications, thus significantly advancing on this second path.

For example, SciELO is largely responsible for the online publication of journals using formats that allow easy interoperability with indexing and other computer systems, in such a way as to allow, in the near future, automated publishing for different screen sizes, such as those of mobile devices. Interoperability is one of the main features and strengths of the collections of the SciELO Network.

Ideally, national research agencies adopt these paths as integral parts of their national scientific research and communication programs and policies — SciELO has supported them through a common methodology, platform and services that have resulted in the development of the SciELO Network.

The SciELO Network has established a systematic solution for the indexing, publication and interoperability of quality journals at the core of the national research and education systems. It is an Open Access solution focused on promoting the ubiquitous presence on the Web of the journals and the research they publish. With over 16 years

of continuous operation without interruption, the magazines that make up the SciELO Network maintain a growing presence on the Web, as evidenced by the indicators of the Ranking Web of Repositories, operated by the Spanish Higher Council for Scientific Research.

The adoption of the action guidelines regarding professionalization, internationalization and financial sustainability, on the occasion of the SciELO 15 Year Conference, represents the collective response of the SciELO Network to the innovations that are shaping the future of scientific communication, such as continuous publication, increasing use of social networks, publication of research data in open repositories, etc. The next three years will mark the passage from the SciELO Network to a new level of operation, characterized by the significant improvement of editorial processes, publishing formats and characteristics, dissemination and interoperability, and research and magazine evaluation.

The expected improvement of policies, programs, and national systems of research development and evaluation, with the appropriate valuation of national periodicals of quality, will mark a decisive step forward for research conducted in Latin America as a whole. This progression will continue with the support of the SciELO Program through the development of the national SciELO collections, which are and will continue to be led by agencies and institutions that support research that contributes to the financing of the basic functions of indexing, publishing and interoperability.

RedALyC

The Network of Scientific Journals from Latin America, the Caribbean, Spain, and Portugal (RedALyC) is a program of inter-institutional collaboration created over 10 years ago at the Autonomous University of the State of Mexico (*Universidad Autónoma del Estado de México, UAEMEX*), which operates a regional periodicals library that compiles full-text, OA contents of Ibero-American journals and provides specialized scientific information services through its portal.

Various circumstances, such as those outlined earlier in this chapter, impose differing restrictions on the dissemination of scientific knowledge produced by Latin American research communities, especially in the fields of social sciences, arts and humanities (SC-A&H), and in the major languages of the region, Spanish and Portuguese.

As a consequence, different studies share the limited visibility and sub-representation of Latin America and the Caribbean (LAC) in international databases, such as the Web of Science and Scopus, which ultimately affects not only the composition of their collec-

tions, but also the bibliometric indicators and rankings that these databases use (Alperin, 2014; Collazo-Reyes, 2008). Faced with this unequal situation and the opportunity to take advantage of the potentialities of Internet, initiatives like RedALyC⁹ are generated.

RedALyC makes the most of these opportunities by offering a technological platform capable of disseminating knowledge, based on the OA philosophy. To this end, it has simultaneously generated representative and contextualized databases, which not only maximize the visibility of science generated in countries at the margin of the scientific debate, but they also provide useful and relevant indicators for longitudinal monitoring that captures more effectively the advancement and composition of communication networks and scientific collaborations (Aguado-López & Becerril-García, 2014; Babini, 2006; Bernal, 2013; Delgado, 2011; Miguel, 2011; UNESCO, 2013).

Characteristics

In its simplest conception, RedALyC is an online periodical library for querying, downloading, and sharing scientific articles. However, RedALyC offers a range of information services that make the portal a tool that supports the scientific community.

By developing a comprehensive database (with standardized data of all the articles published between 2005 and 2013), RedALyC has managed to become a window that underlines the academic output of the Latin American region. The portal searches content by article, author, journal, discipline, institution and country, or by keywords, year of publication and line of research. At the same time, it allows the user to track information according to the list of countries, institutions, and disciplines, or to access maps, graphs, and statistics generated by the RedALyC-Fractal Scientometrics Lab (LabCrf).

RedALyC also provides various services for editorial teams and those responsible for following up on the scientific performance of institutions. Through the Integrated Information System RedALyC (*Sistema Integral de Información RedALyC, SIIR*), RedALyC facilitates management tasks, registration, and normalization of publishing information associated with the database, enriching the learning of local publishers and bringing them more and better tools to strengthen their publications.

9 This does not question the significant efforts of Latin American countries to increase their presence in international databases in recent years or the efforts of companies to expand their coverage of Latin American journals in their databases (Aguado-López, Becerril-García, Leal-Arriola, & Martínez-Domínguez, 2014; Beigel, 2013; Gingras & Mosbah-Natanson, 2011; López-López, 2010; Russell & Ainsworth, 2011; UNESCO, 2010; Vessuri, Guédon & Cetto, 2013).

The archive indexes journals of diverse disciplines, and although it has consolidated its representation in SC-A&H, since 2006 it receives applications from journals of exact and natural sciences. RedALyC recognizes the strong local roots and specific language of the Latin American scientific output, supporting publishing projects, based primarily at public universities, and including academic communities more effectively in scientific reflection and debate.

To be accepted in RedALyC, journals must pass an evaluation process, divided into three modules, which share the application of international standards – such as blind review by peers, employment of an editorial committee, and publication of original research results – that, among other things, seek the quality and relevance of the contents of the database, while setting the standards for the ratification of publications by the international scientific advisory committee.

In addition, RedALyC contributes to evidence-based decision-making, providing useful information about the results achieved by the production, communication, and collaboration strategies chronicled by the countries and institutions that publish in its collection. From the indicators proposed by the LabCrf, it is now possible to characterize the editorial practices of participating entities, identify behavioural patterns of research communities, and distinguish institutional networks by knowledge area and discipline.

It is worth noting that RedALyC has contributed to the performance of Latin American journals across all services listed above: the portal gives them visibility; the system supports the professionalization of editorial work; and the indicators and tools enable various stakeholders to monitor scientific output. We confine ourselves here to highlighting the characteristics and scope of the database and indicators that have been built, which we anticipate will serve as a window into the impact RedALyC has had on the region.

RESULTS

The periodical and bibliographic information obtained from the indexed publications in RedALyC is organized according to data from the 'Journal Collection' and the 'Scientific Production 2005-2013'. Regarding the former, the database has 353,200 items, published in 917 journals from 1969 to date, which are distributed by articles, 84.4%; reviews, 6.3%; other documents, 4.9%; and publishers, 4.4%.

The 2005-2013 universe, to which the scientometric indicators are applied, includes 198,810 works disseminated in 889 standardized magazines where, by way of example, the information from 107,716 articles is reviewed, 87.8% related to SC and 12.2% to A&H. Among disciplines with more than 2,000 articles, education and psychology

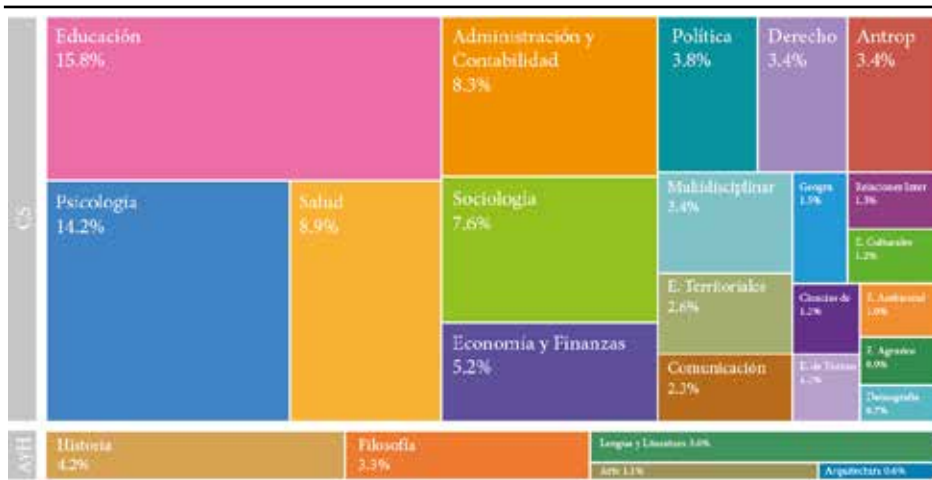
Figure 1
Structure of the Information Available at RedALyC Database

Journal Collection	REDALYC	Scientific Production 2005-2013
917	<i>Journals</i>	889
530	Social Sciences	514
105	Art & Humanities	105
265	Science	253
17	Multi-Discipline	17
	<i>Countries</i>	146
22	Editors	17
167	Producers	146
	<i>Institutions</i>	
472	Editors	458
25.743	Producers	16.994
	<i>Type of Materials</i>	
298.014	Articles	198.810
102.483	With Collaboration	66.864
195.531	Without Collaboration	131.946
15.746	Editorials	4.750
22.205	Reviews	10.791
17.235	Others	5.731
35	<i>Disciplines</i>	35

Source: designed by LabCrf (RedALyC-fractal Scientometry Lab) with data and methodology from www.redalyc.org & www.redalyc.org/met respectively. Date: September 2014.

contribute 29.9% to the total of both areas, followed by health, administration and accounting, and sociology, with 24.8%; economics and finance, history, and politics, with 13.2%; as well as law, anthropology, philosophy, and language and literature, with 13.2%.

Graph 2
Participation by Discipline SC-A&H 2005-2013

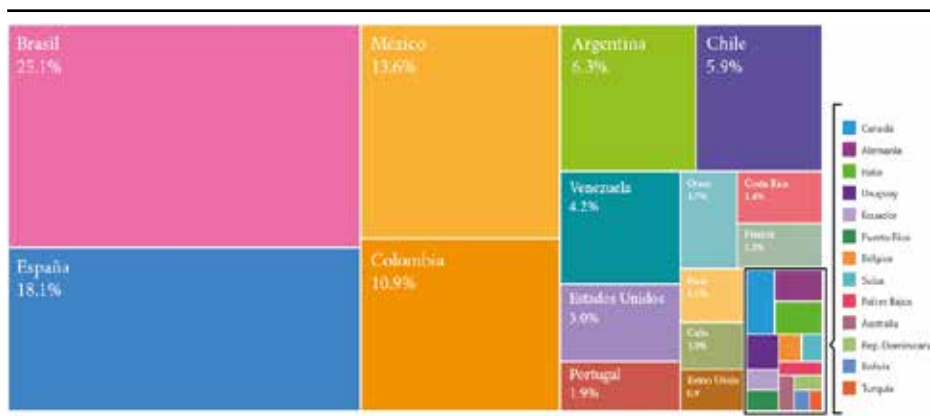


Source: designed by LabCrf (RedALyC-fractal Scientometry Lab) with data and methodology from www.redalyc.org & www.redalyc.org/met, respectively. Date: September 2014.

Even though 17 Ibero-American countries participate in the edition of journals from all the knowledge areas, 146 countries publish in them, 77.6% of them from outside Latin America; among them, USA, France, UK, Canada, Germany and Italy stand out.

Brazil is distinguished with 25% of the articles contributed to the SC-A&H, followed by Spain, Mexico and Colombia, with a combined share of 42.6%. Argentina and Chile follow with a combined 12.3%; Venezuela and the United States with 7.2%; as well as Portugal, Costa Rica, France, Peru and Cuba. These countries, mainly Latin American, concentrate 93.8% of the articles; among them, France, Costa Rica, Germany and Argentina lean more towards individual production, while Brazil, Portugal and Spain produce more in collaborative terms.

Graph 3
Participation by country in SC-A&H



Source: designed by LabCrf (RedALyC-fractal Scientometry Lab) with data and methodology from www.redalyc.org & www.redalyc.org/met, respectively. Date: September 2014.

Downloads recorded by the RedALyC portal between 2012 and 2013 amounted to 107,073,181, which averages 4.5 million downloads per month, primarily associated with Mexico, Spain and Brazil in Ibero-America, and the United States, Canada, China, Ukraine and Germany in the rest of the world.

RedALyC makes increasingly dynamic flows of information exchange possible, where the design and structure of the portal facilitate access by any user to high quality scientific knowledge. This makes knowledge a common good, whose products can be read, downloaded, shared and cited without financial, legal, physical, social or cultural restrictions of any kind. Hence, the program is challenged to share its experience in using technology to expand the sphere of social responsibility of universities by putting knowledge into more direct contact with society, especially following the recent legislative reforms that mandate open access to scientific knowledge derived from publicly-funded research projects.

Because quality is not the same as prestige, it is an intellectual obligation to discuss not only the distinction between the two concepts, but also the relevance and feasibility of using them in both evaluating journals and accounting for the results of scientific production in Latin America. It should be recognized that the various constraints editorial teams face, associated with the availability and retention of human and financial resources, demand from actors like RedALyC a portfolio of services with comprehensive tools for more

efficient editorial management and training, in order to permanently position publications within the discussions of their disciplines.

The need to transcend the dilemma of publishing globally and perishing locally versus perishing globally and publishing locally has motivated RedALyC to open its directory of journals so that any researcher can propose journal articles to publications in the archive; thus, currently, RedALyC is striving for its journals to be viewed by researchers as sources of dissemination, given that in addition to involving a large number of peers to dictate its contents, its digitization makes it possible for articles to reach more readers around the world.

Although bibliometric databases have contributed to sorting and prioritizing the scientific sphere, it is a fact that their results are limited and may not be generalized to a context as complex as the Latin American; this situation requires alternative indicators that are equally useful for learning about the performance of research and documenting factors and behaviours determinant of the process of scientific construction itself.

Tracking scientific output in journals indexed in RedALyC has revealed further internationalization of the works' origins, a significant diversification and increase in the evaluation and co-authorship networks, and a significant exposure by way of consultations and content downloads. Undoubtedly, this information will clarify whether centre-periphery interactions around science are being modified, how the scientific map is being reshaped towards multi-polar territories through the use of regional OA journals and databases, and how globalized the local and regional discussion has become and how localized the global debate has grown. In that sense, OA has shown to be the best solution to the constraints that prevent scientific knowledge from being part of a larger conversation and ongoing dialogue (Guédon, 2013).

REFLECTIONS ON OPEN ACCESS JOURNAL SYSTEMS

The initiatives referred to in this chapter have contributed to Ibero-America's growing knowledge about the scientific and scholarly journals they publish. Additionally, they have done it in an organized, methodical and cooperative manner, which requires great efforts, as well as human and financial resources. The results are beginning to be reaped.

Our publications have overcome the ostracism in which they were immersed up to 20 years ago, by acquiring visibility and recognition that transcends the geographical and cultural boundaries of Ibero-America. The three initiatives discussed in this chapter have generated a series of tools to better understand the problems that our science is currently dealing with: how science and culture are communicated in our countries, the relationships that exist between authors and institu-

tions in the region with other areas of the world, and how our publications contribute to global scientific communication.

The leadership exhibited by these three initiatives in promoting OA to scientific information from a regional, cooperative and non-commercial model, is of particular value, given the global trend of privatization and agglomeration in all areas, including the production and dissemination of knowledge. These and many other initiatives existing in the region have adopted the OA movement and integrated it into the realities of Latin America.

Over time, academic institutions, government agencies, and evaluation systems of academic output have begun to awaken to the value of the editorial work involved in the production of our journals, and the need to professionalize this work. From within the region, the contributions of Latindex, SciELO and RedALyC to this process are recognized. Within the sphere and scope of each of the three systems, there are still certainly many challenges to be faced, but these could be better tackled with a regional cooperative front that incorporates and enhances the experience accumulated by each one of them.

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Chapter 3

KNOWLEDGE AND OPINIONS ON OPEN ACCESS IN ARGENTINA, MEXICO AND BRAZIL

THE BENEFITS OF OPEN ACCESS (OA) are significant for all participants in the process of scientific communication. One of the fundamental premises of this movement is to ensure that all scientific knowledge produced is part of the universal commons (Gómez & Bongiovani, 2012). However, a certain resistance to change by researchers in the practices of scientific communication has been noted. Despite the difficulties, the movement has achieved significant progress in most countries, especially in Latin America, where OA initiatives have been extensively promoted.

The variety of OA indices and portals to digital journals in the region, especially Latindex, SciELO, and RedALyC, provide an outstanding portrayal of this situation. At the same time, they ensure the criteria for evaluating those journals, helping the region support the growth of its publications, especially Open Access ones. They are also complemented by the use of the Open Journal System (OJS) platform for managing and publishing journals and journal portals, managed, in most cases, from universities (Alperin, Fischman, & Willinsky, 2008). The influence of these initiatives promotes and socializes the OA philosophy in the academic and scientific fields in the region.

However, despite these initiatives and systems clearly aligned with the OA movement, there is still confusion and ignorance about the meaning of OA, its implications for the region, and the potential benefits to researchers. In order to understand the challenges facing the OA movement in the region, this study investigated the knowledge, opinions, and attitudes about OA in three of the Latin American countries with the highest scientific production.¹

RESEARCHERS' OPINIONS AND ATTITUDES

Our study is not the first to attempt to explore this issue. A large-scale study on opinions and attitudes of 4,000 senior researchers from 97 countries clearly indicated a need to sensitize authors about the OA publishing system. In particular, it was found that the level of knowledge about OA was low, with 82% of authors saying they did not know 'anything' or did know only 'a little' about OA (Rowlands, Nicholas & Huntingdon, 2004). However, in the same year, Swan and Brown (2004) compared the level of knowledge and attitudes about the OA model among authors publishing in this mode and those who did not and found that almost two thirds of those who had not published in OA were familiar with the concept. In the early years of the OA movement, these studies, apparently contradictory, were the main source of information on the OA's model of knowledge dissemination. The study of Swan and Brown (2004), supplemented by those of Cooning and Younce (2009) and Mann, von Walter, Hess, and Wigand (2009) helped us to understand that, as the OA model was becoming known, confusion about the relationship between OA and the quality of the journals was also being generated.

To understand how OA is seen in relation to academic careers (and therefore to researchers' evaluation systems), Cooning and Younce (2009) surveyed more than 300 Social Sciences and Humanities researchers who publish in OA journals, according to the DOAJ database (Directory of Open Access Journals). They found

1 The chapter is based on the results of the project 'Open Access and Academic Evaluation. Knowledge and opinions of assessors of research professors' careers in relation to Open Access journals (OA)', conducted by a team of researchers from universities that are headquarters of the CLACSO Network member centres: Paola C. Bongiovani and Nora Moscoloni of the National University of Rosario (UNR), Carolina De Volder, from the University of Buenos Aires (UBA), Argentina; Sely M. de Souza Costa and Fernando Lima C. Leite from the University of Brasilia (UNB), Brazil; Teresa Rodríguez from the University of Guadalajara (UDG), Mexico; and Nancy D. Gómez from the Carlos III University of Madrid, Spain. <http://accesoabier-toyevaluacion.wordpress.com/acerca-de/>.

that peer review and the prestige of the journals — not the journals' access model — were still the factors that drive the decision on where to publish. However, there is evidence that up to 60% of researchers believe that OA journals are low quality (Mann et al., 2009) and therefore, publishing in said journals could jeopardize the positive assessment of their publications and the possibilities of obtaining funding for new research.

Of course, opinions and knowledge about OA are constantly changing. Interest about the views on OA over time led Xia (2010) to analyze previous studies (1990 to 2008) in a time series. He found that researchers are increasingly knowledgeable about OA journals but still worry about the low status and lack of peer review of these journals (something that is not substantiated in reality). The study identified that researchers fear their careers could be adversely affected if they publish in OA journals.

This opinion does not seem to be completely wrong, or at least it is not in disagreement with the views of researchers from the studies conducted to date (Hurrell & Meijer-Kline, 2011). In their review of the literature, Hurrell and Meijer-Kline (2011) note that according to studies about researchers' opinions (Andersen & Trinkle, 2004; Coonin & Younce, 2010; Harley, Earl-Novell, Arter, Lawrence & King, 2007; Mann et al., 2009; Nowick, 2008; Swan & Brown, 2004; University of California Office of Scholarly Communication, 2007; Xia, 2010), OA publications have a slightly negative or neutral effect in advancing researchers' careers. However, there were not any specific studies up to that moment, and the authors posited the need to conduct research on the knowledge and attitudes regarding OA publications of those researchers on evaluation committees assessing scientific-academic careers.

In 2010, the SOAP project (Study of Open Access Publishing) provided an opportunity to study researchers' attitudes on OA publications worldwide. Of the 53,890 scientists who participated in the survey, responses from 38,358 active researchers from various disciplines from 162 countries (Dallmeier-Tiessen et al., 2011) were analyzed. The results of the study revealed that, at the beginning of this decade, attitudes about OA were generally positive. For 89% of researchers, publishing in OA was considered beneficial to their research areas, the percentage being higher in Social Sciences and Humanities than in other fields. Among the main reasons are that OA: improves the way the scientific community works (36%), provides a better financial-economic model for scientific communication (20%), and is a relevant alternative to the achievement of the common good (20%). In addition, 71% of researchers said that

they had published in OA in the last five years, and from the remaining 29%, nearly half expressed that they have no reason not to. However, SOAP's study does not provide only positive remarks about the OA movement: 39% and 30% respectively identified the cost per publication and the low quality of the journals as major barriers to OA (Dallmeier-Tiessen et al., 2011).

Some studies about the views and practices of researchers in relation to OA also began to be carried out in Latin American countries. Gómez et al. (2008) showed that, in Chile, the level of knowledge about OA journals is between average (49%) and high (31%); however, from the latter group only 18% publishes in them, citing that the universe of journals in which they are interested in publishing their work is limited, and most are not OA. Sánchez Tarragó and Fernández Molina (2008) in a survey of Cuban researchers found similar results.

In Argentina, in a study based on responses from researchers who participated in the 2010 global survey (as part of SOAP), 73% of researchers say they know about the existence of OA journals in their respective fields, with the higher percentage of positive responses in Agriculture and Life Sciences (84%) and Medicine (81%) than in Physics and Astronomy (68%) and Social Sciences and Humanities (61%). Furthermore, 94% of researchers say that the publication of articles in OA periodicals would be beneficial to their research field, with an almost equal spread across the four fields (Bongiovani, Gómez & Miguel, 2012).

Discussions on the opinions of OA in the region are not in vain. Not only there is a considerable number of OA journals in existence (Miguel, 2011), but an additional potential has also been identified to deliver a significant percentage of its production in the open modality: 27% by the golden road and 43% by the green road, in the case of Argentina (Miguel et al., 2012). In fact, in Social Sciences and Humanities, 35% of the journals chosen by Argentinean researchers in which to publish are already OA.

In this scenario, there are indications that OA has begun to take root in the region in a positive way. A study by Delgado Troncoso et al. (2014) found that two of the main elements that exert the most influence when choosing an article to read was that the article be Open Access and that it be published in a prestigious journal in the discipline. Among the main factors affecting researchers' choices of a magazine in which to publish were the international recognition of the journal within their discipline, the dissemination that the journal could provide for their articles, the influence it has in the improvement of their academic careers, and whether or not it

charges authors for publishing. ‘International recognition’ include combinations of national, regional and global indexing; the presence of the journals in databases; and each journal Impact Factor. However, Open Access still did not appear among the main reasons to choose a journal in which to publish.

This is also evident in another Latin American study by Sánchez Tarragó, Caballero Rivero, Domínguez and Molina (2014). In this case, the authors find positive perceptions regarding publishing in OA, but conclude that researchers are paying more attention to the prestige of the journal and the Impact Factor, to the detriment of other considerations such as an Open Access policy or whether the journal is free.

However, studies regarding knowledge and opinions about OA in Latin America are still limited. Given the importance of OA in the region and the role of OA initiatives (Chapter 2), it was essential to study the regional situation in greater detail. For that reason, a survey was conducted with researchers in their role as evaluators, in the three countries with the highest scientific production in Latin America (Babini, 2011): Argentina, Brazil, and Mexico.

CASE STUDIES: ARGENTINA, BRAZIL AND MEXICO

The main objective of the study, the results of which are presented here, was to ascertain the knowledge, opinions, and attitudes about publishing in OA journals of researchers on evaluation committees that assess the scientific-academic careers of their peers in the area of Social Sciences in Argentina, Brazil, and Mexico.

A survey was conducted of a sample of researchers who were members of committees evaluating Social Science research in Argentina, Brazil and Mexico. In the case of Argentina, the researcher sample was determined using the public Bank of Evaluators available on the website of the Ministry of Education. For Brazil, the public listings of researchers who sit on Area Committees were consulted on the websites of CAPES and CNPq. Finally, in the case of Mexico, the sample of researchers was determined by consulting the public listings of the evaluation committees of the National Research System (*Sistema Nacional de Investigadores*) for the Social Sciences area on the CONACYT website. The data collection method was managed through the online survey manager, Survey Monkey. A statistical analysis of the survey results was performed using frequency tables and cross tabulations, complementing with the statistical program SPSS for statistical significance calculations, using Chi-square tests.

In Argentina, public and private universities are responsible for higher education. In these institutions, full- or part-time professors, generally, carry out research as a complement to teaching.

In terms of public policies in science and technology, in Argentina, the Incentive Program for Research Professors at the National Universities, created in 1993, stands out. The objective of the program is to encourage the integration of research and development activities into teaching at national universities, contributing to the promotion of science technology, and transfer of new knowledge. According to data from the Ministry of Education, currently, 28% of the teaching staff of national universities conducts research within the program. Peers evaluate professors who research and who aspire to obtain the rank of research professor. The Bank of Evaluators is organized by discipline and is composed of research professors, category I or II, or with an equivalent background. The production in scientific research and technological development is one of the aspects evaluated under the program, considering the rank as in the evaluation of reports of research results. In every case, the members of the Bank of Evaluators Incentive Program for Research Professors are the more senior researchers with the most experience in their subject areas.

Meanwhile, research in Brazil is conducted mainly by researchers involved in graduate programs offered by institutions of higher education (universities, particularly the federal ones) and less so in research institutes. Since the implementation of the postgraduate model in the late 1960s, the Federal Government has invested in training at the graduate level, through grants from the Training Coordination of Higher Education Personnel (*Coordenação de aperfeiçoamento de pessoal de nível superior, CAPES*) of the Ministry of Education and the National Council for Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico, CNPq*) of the Ministry of Science.

Considering that most Brazilian scientific activities are carried out in relation to postgraduate programs, CAPES has significant influence, as it is responsible for the periodic evaluation of the programs. Assessment procedures are very rigorous, a factor in the success obtained by postgraduate activities in Brazil. Evaluation criteria include the assessment of infrastructure, training of research professors, scientific productivity, the ability to train professors and doctors, among others. The CNPq, through area advisory committees, assesses the productivity of Brazilian researchers. Annually, there are project selection processes through nationwide calls. The evaluation criteria of scientific production

and promotion vary, depending on the disciplines. Area committees, both from CAPES and CNPq, constantly evaluate the research activity in Brazil, and they are formed by leading researchers in each field of knowledge. These committees are renewed every two years, and the scientific community, whose appointments are approved by CAPES and CNPq, as appropriate, elects their members.

In Mexico, the study was conducted with the participation of researcher members of the National System of Researchers of the National Science and Technology Council (*Consejo Nacional de Ciencia y Tecnología, CONACYT*)². CONACYT is a public agency of the Mexican federal government dedicated to promoting the development of science and technology. The National System of Researchers (SNI) was created in 1984 to promote the development of research activities to strengthen their quality, performance and efficiency. It works through collegiate bodies consisting of researchers from the highest scientific, technological, and humanities levels. Their evaluations are the result of collective discussions among peers and take into account the regulatory system, as well as the researchers' academic and institutional backgrounds, and their scientific and technological outputs. It recognizes Mexican researchers by peer evaluation, appointing them as National Researchers, which signifies the quality and prestige of their scientific contributions. It also assigns economic incentives that vary according to the level achieved (candidate, level 1, 2, 3 and emeritus).

RESULTS

KNOWLEDGE ABOUT OPEN ACCESS

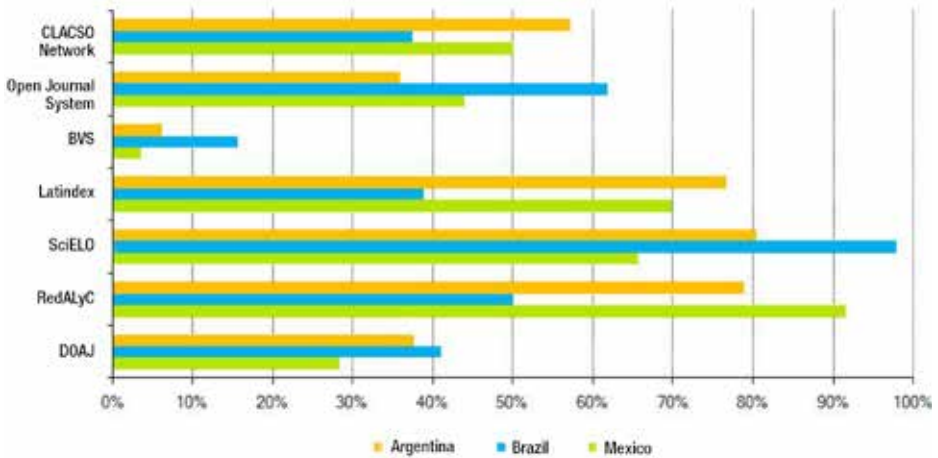
Social Science researchers who are members of evaluation committees in Argentina, Brazil and Mexico, do have knowledge of Latin American OA initiatives. In Brazil, 70% of researchers have knowledge of OA Initiatives, as well as 61% in Mexico and 55% in Argentina. It is worth noting that both Brazil and Mexico are the countries of origin of the three major initiatives in the region (Latindex, SciELO and RedALyC). This 'local' effect leads the three initiatives to be best known in their home countries than in any other (Latindex and RedALyC in Mexico and SciELO in Brazil).

SciELO is the most recognized in Brazil (by 98% of respondents), but it is also recognized in Argentina and Mexico (80% and 66%, respectively). In Mexico, RedALyC is the most recognized, with 92% (in Argentina and Brazil by 79% and 50 %, respectively).

² <http://www.conacyt.gob.mx/>.

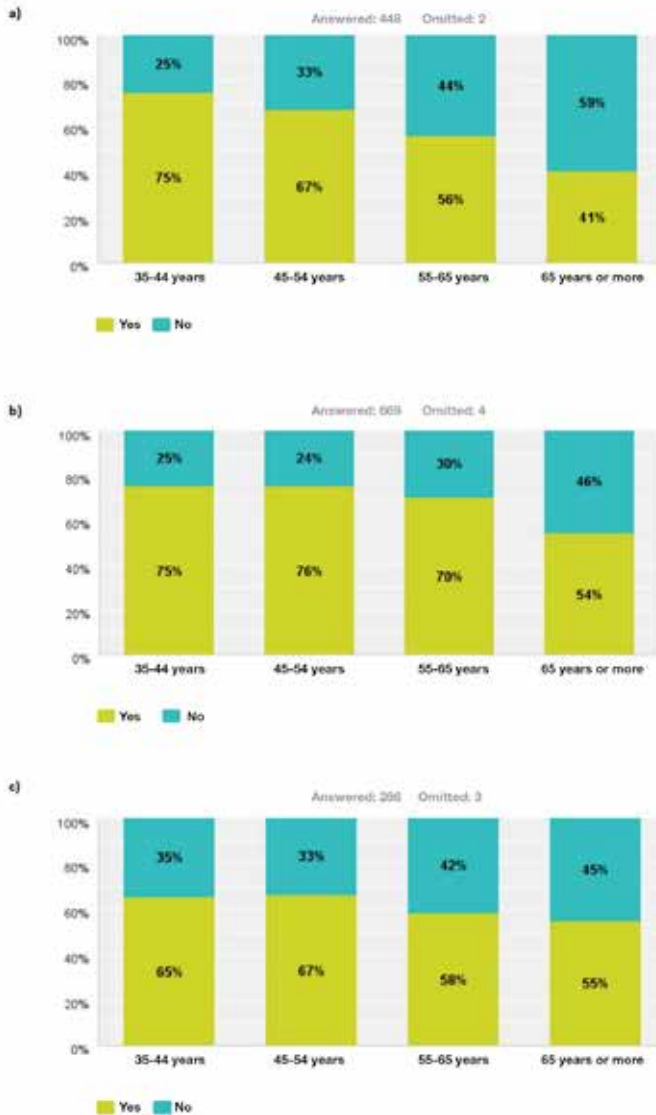
Latindex is not far behind, recognized by 77% of respondents in Argentina, 70% in Mexico, and 39% in Brazil (Figure 1).

Figure 1
Knowledge about Open Access Initiatives in Argentina, Brazil and Mexico



In all three countries, the age of the researchers is associated with the knowledge of OA initiatives, with the youngest ones exhibiting a higher percentage of knowledge of the initiatives (Figure 2), perhaps indicative of the role of Open Access in future generations of researchers.

Figure 2
 Knowledge about Open Access Initiatives by Age of Researchers
 (Argentina n= 448, Brazil n=672 and Mexico n=286)



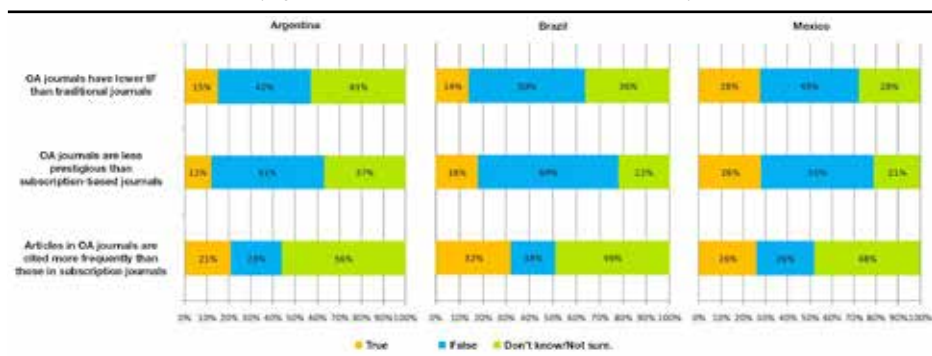
OPINIONS ON OPEN ACCESS

According to our survey, the majority of researchers do not yet consider publishing in OA to have a positive value in their assessments as researchers. In the best case, 47% of researchers in Brazil considered that publishing in OA journals would be viewed positively (36% in Mexico and 35% in Argentina). Conversely, few argue that this claim is false (15% of researchers from Brazil, 16% from Argentina and 34% from Mexico).

What is clear is that some of the myths about OA are disappearing. In a majority of cases, for the three countries, researchers correctly identified that OA journals are usually peer reviewed (78% in Brazil, 70% in Mexico, and 66% in Argentina). Similar percentages recognize that OA journals typically reach more readers than subscription magazines (74% in Brazil, 66% in Argentina, and 66% in Mexico).

However, there is still confusion and a lack of knowledge about some important issues of OA, among them, a key part of its definition. In Argentina, for example, only 59% believe that OA means free access to all readers (72% in Brazil and 70% in Mexico).

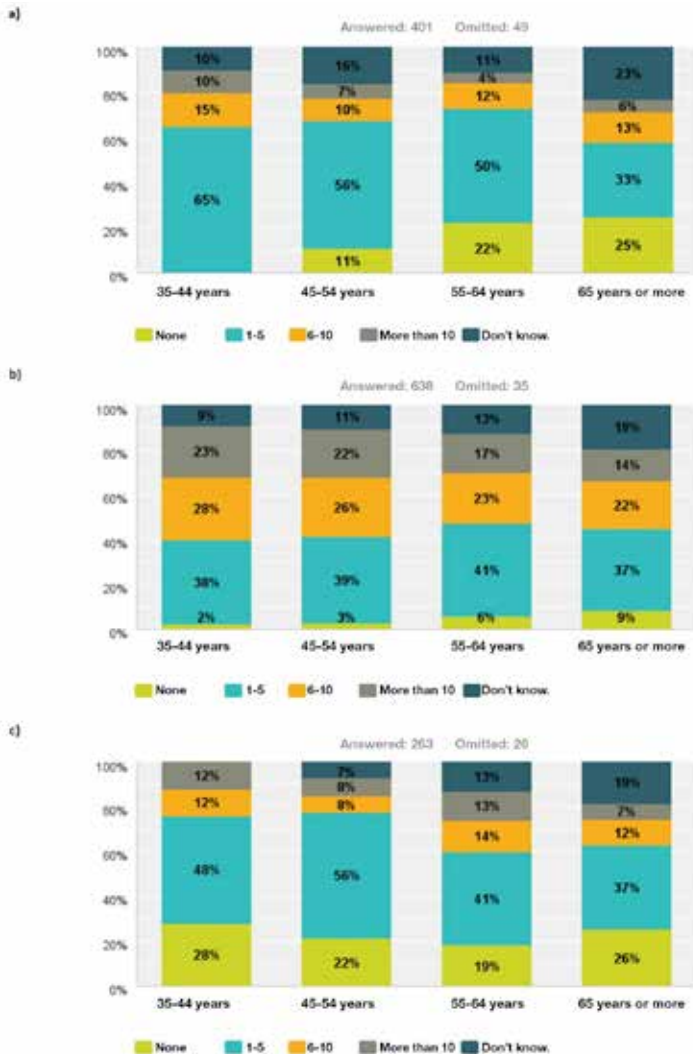
Figure 3
Knowledge and Opinions about OA Journals Associated with Prestige
(Argentina n=410, Brazil n=639 and Mexico n=208)



The opinions about the prestige of OA journals also indicate lack of awareness. For example, while 51% of researchers in Brazil consider that OA journals are no less prestigious than subscription journals, 12% think they are, and 43% did not know. Regarding Impact Factor, 50% of researchers in Brazil think it is false that OA journals have a lower Impact Factor, while 28% in Mexico think they do have a lower Impact Factor. Only between 21% and 32% of researchers say that articles published in OA journals are cited more frequently than those published in subscription journals (Figure 3).

As with the knowledge about OA initiatives, slight differences of opinion are observed in the three countries according to age range. However, it is noted that younger researchers generally report more negative opinions about the prestige or impact of OA journals.

Figure 4
Open Access Articles Published in the Last 5 Years, by Age
(Argentina n=401, Brazil n=638 and Mexico n=263)



Despite the myths, misinformation, and ambivalence about OA, a large majority of researcher-evaluators from the three countries have published in OA journals in the last five years. In Argentina, it is 65% of the researcher-evaluators; in Brazil, 83%; and in Mexico, 70%. Again, in Argentina and Brazil, differences by age are observed: younger researchers tend to publish more in OA than older researchers (Figure 4). To better understand this phenomenon, responses about the most important factors affecting the choice of where to publish articles were analyzed.

FACTORS TO EVALUATE JOURNALS

Two series of questions were posed, relating to journal evaluation. The first concerns how researchers decide where to publish their articles, the second to the way they evaluate journals where their peers have published.

When choosing where to publish articles, factors include whether the journal is Open Access or Latin American, but these are not among the aspects highlighted by researchers. First, a large majority of respondents (86% in Brazil, and 80% in Argentina and Mexico) considers the prestige and quality of the journal as important. Second, the relevance of the journal for the community and/or region was regarded as important by more than 70% of researchers in the three countries.

As when choosing the journal in which to publish, the OA status of a journal was considered only a minor aspect in evaluating their peers and was even considered an unimportant factor in a number of cases (39% in Mexico, 33% in Brazil, and 31% in Argentina).

Without a doubt, that a journal is peer-reviewed has remained the most important factor when considering the work of others (about 85% of researchers in each country emphasized it as very important). With national differences, the value of this assessment appears to be linked to the reputation of the journal's publisher: researchers point to the publisher's prestige as being a very important factor when evaluating (70% in Mexico, 61% in Argentina, and 43% in Brazil).

The indexing of the journal in different databases is considered a very important factor at the time of evaluation for approximately half of the researchers in the three countries. Here again, differences are noted in the recognition and valuing of OA initiatives. It is emphasized that in the case of researchers from Argentina and Brazil, it is more important to be indexed in some of the regional databases (Latindex, SciELO) than in the Web of Science. RedALyC was not considered in the question (Figures 5a-5c).

Figure 5a
 The Most Important Factors to Evaluate Publications
 Argentina n=398)

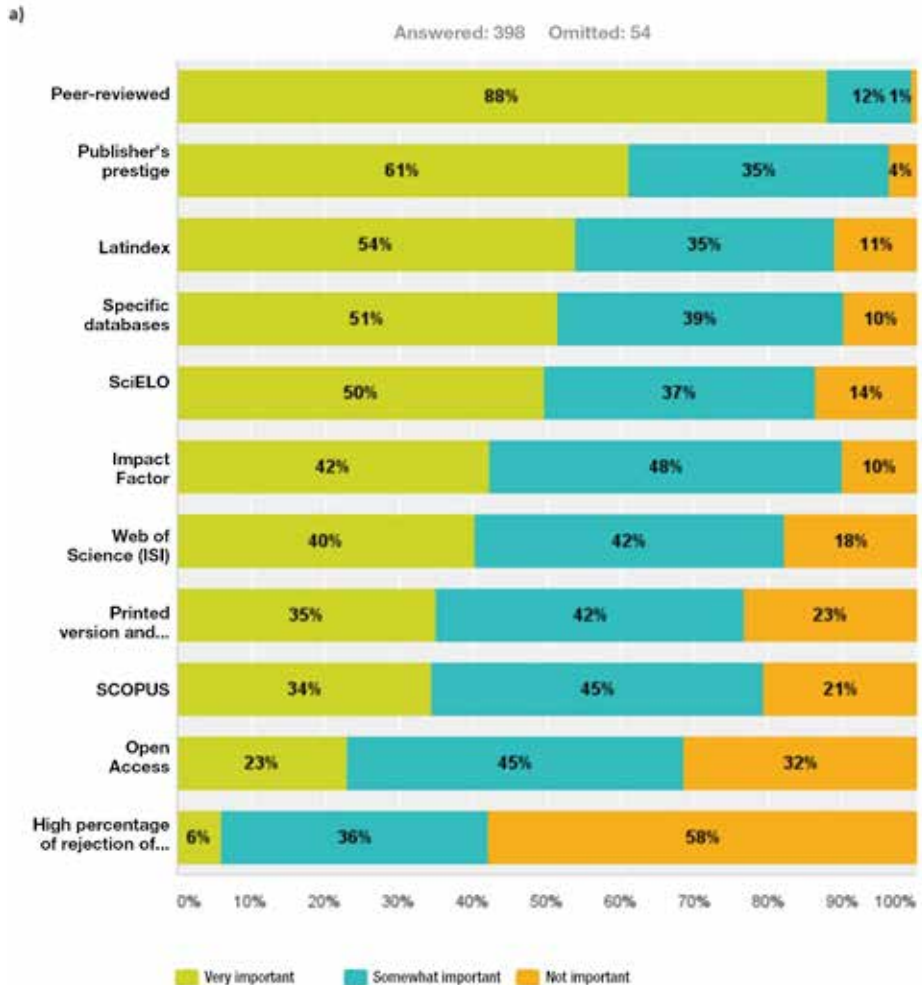


Figure 5b
The Most Important Factors to Evaluate Publications
(Brazil n=640)

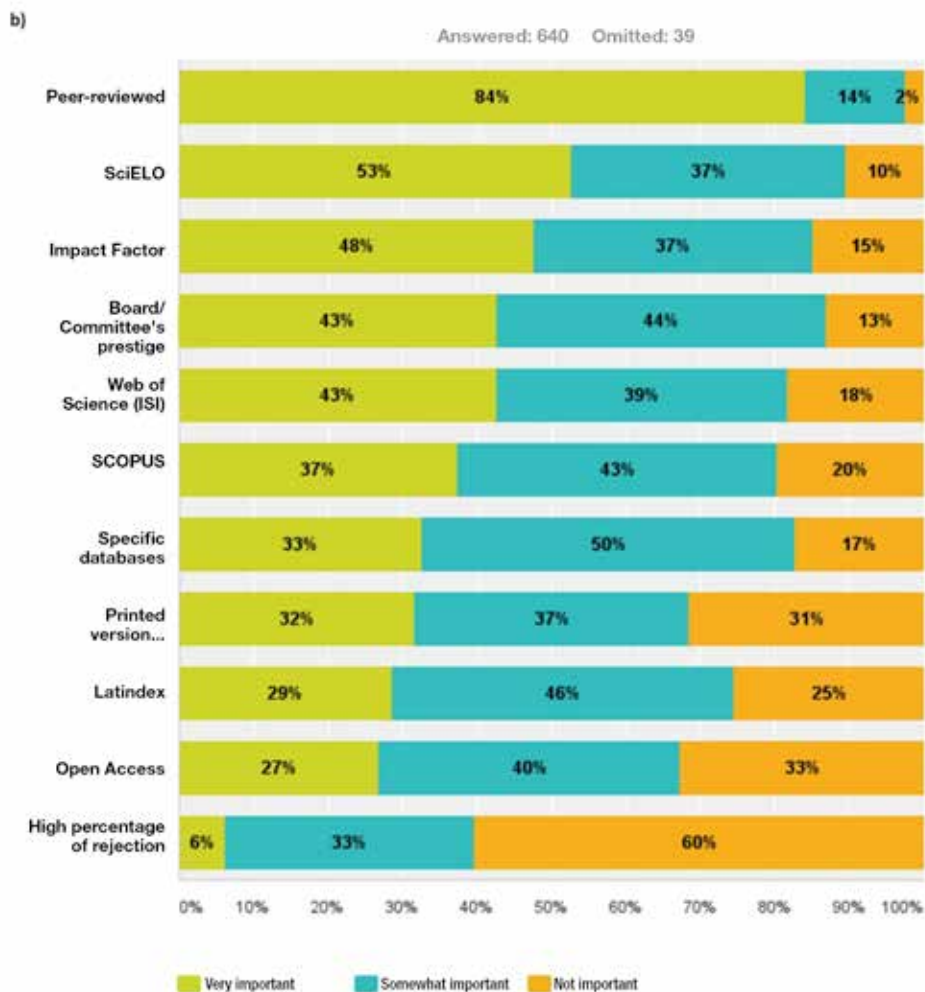
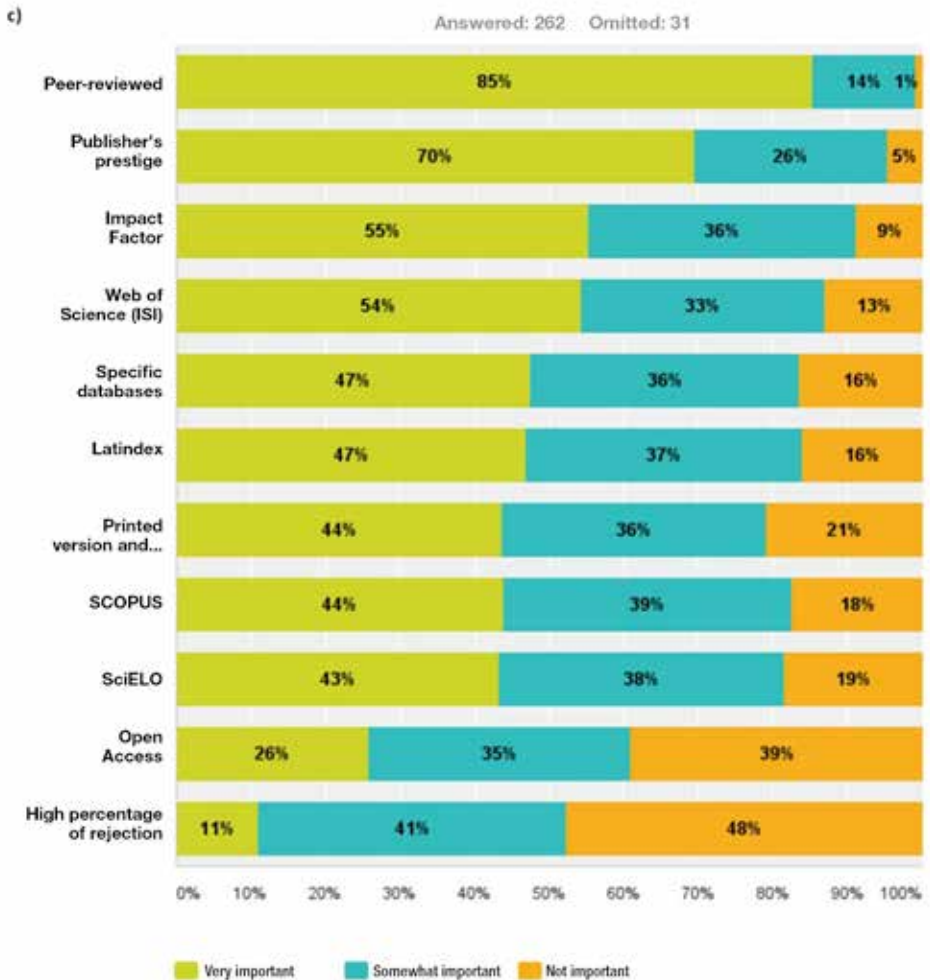


Figure 5c
 The Most Important Factors to Evaluate Publications
 (Mexico n=262)



CONCLUSIONS

Latin America is moving forward with a firm step towards OA, but there are still major challenges for this endeavor to strengthen. The results presented here are encouraging. Researchers surveyed show an extensive knowledge of OA initiatives in the region, while also publishing in OA journals, especially among the new generations of researchers. This would lead us to think that over time, and with continuing OA initiatives and policies in the region, widespread knowledge of OA would likely be reached in the not too distant future.

One hypothesis is that the very success of OA in the region, evidenced by the high percentage of regional OA journals, has created in the minds of researchers an association between the OA model and local journals, which are usually perceived as being of lower quality because they are always being compared with the so-called 'mainstream' journals. In this sense, the results of the survey could be seen as evidence that OA has become the '*de facto*' model of the region.

On the other hand, there is evidence of an abiding lack of understanding about what OA means. A number of researchers do not yet understand that the definition of OA implies that the full text of a work is freely available on the web. In turn, editors of the journals involved in OA initiatives seem not to understand the full definition either. Furnival and Miranda de Almeida (2014) conducted a study on copyright policies of journals in SciELO Brazil. They found journals that, while declaring to be OA and being indexed in the DOAJ, adopt as their policy to require researchers to cede their author rights, a practice that means that the authors themselves suffer restrictions on the freedom to self-archive their articles in an institutional repository, among other constraints.

Despite these confusions, it is worth mention that very strong networks have been created in Latin America to make OA possible, not only through the initiatives mentioned here, such as SciELO and RedALyC, but via *La Referencia*. Which is a project encompassing nine Latin American countries with the key objective of sharing and giving visibility to the scientific output of institutions of higher education, through institutional repositories. Major legislative advances in favor of OA to scientific information through digital repositories support this initiative.

Legislation has been passed in Peru³, Argentina⁴ and Mexico.⁵ Of these regulations, the law from Argentina is the strongest, in terms of

3 http://roarmap.eprints.org/984/1/1188_Sustitutoria_27MAR2013.pdf.

4 <http://www.senado.gov.ar/parlamentario/parlamentaria/317437/downloadPdf>.

5 http://www.dof.gob.mx/nota_detalle.php?codigo=5345503&fecha=20/05/2014.

establishing responsibilities for each actor involved in the processes of scientific research, in providing Open Access to its scientific production and research data (Bongiovani & Nakano, 2011). Curiously, Brazil's bill has not yet been approved, despite having been the first bill of Open Access in 2007.

Seen this way, Latin America has made tremendous strides in promoting OA but still has a long way to go. One of the main challenges is to transform the work culture of researchers and consumers of scientific articles. The responses analyzed in the study presented indicate that the OA model for journals — despite being adopted and accepted, and having even become law in many countries — is still less relevant for researchers when they publish and evaluate their peers. However, this result has to be seen in the context of the confusion that exists around OA, since the same researchers surveyed report that to be indexed in SciELO, a portal that only publishes OA journals, is considered to be more important than to be indexed in Web of Science, the system from which the Impact Factor originated. In the countries where the study was conducted, there are national journal portals, and access for researchers is automatic and immediate. Therefore, it is possible that they will not know whether the journal is OA or has subscription fees (paid through national consortia). It would be important to conduct qualitative studies to determine if they indeed know the access models of the journals in which they publish.

All this is to say that it is apparent that OA, however OA is understood, seems to be an unavoidable reality. Fortunately, Latin America has developed its own OA model, one that is not yet fully understood internationally. We propose the need to continue on this path, using what has so far given results in promoting the growth of OA: institutional mandates, based on national laws, for self-archiving; and further strengthening of OA journal portals (such as SciELO, RedALyC and portals of academic journals), always maximizing the quality criteria.

On the other hand, about the evaluation of the scientific production of researchers, it has been noted that there is a need to work on the revision of the current system of evaluation of scientific production from the national science, technology and innovation systems, together with researchers in different assessment bodies. It is necessary to build a new set of broader indicators, advocating for unrestricted access to knowledge.

The future of the dissemination of scientific knowledge in Latin America is undoubtedly Open Access. However, as we have shown in this chapter, there are still differing levels of unawareness, as well as acceptance of the OA model among the main actors of scientific communication. The speed with which this model consolidates will

be related to the work in regional, national and institutional policies to improve the training of researchers in these areas and with the OA systems' capacity to provide valued services to the community, create new standards that strongly support the cultural change, without neglecting the strengthening of current infrastructures of OA journals and institutional repositories.

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Chapter 4

EVALUATION SYSTEMS OF SCIENTIFIC JOURNALS IN LATIN AMERICA

INTRODUCTION

Since the 1960s, the regulation of scientific policies in several Latin American countries began to be organized around two key components: a) implementation of models that would allow the evaluation of scientific output published in journals; and b) implementation of models that would allow the evaluation of the quality of scientific journals, considering primarily their history, regularity, frequency, origin, thematic specialization and inclusion in bibliometric indexing systems (Costa & Yamamoto, 2008; Ferreira & Krzyzanowski, 2003; López-Cózar, Ruiz-Pérez & Jiménez-Contreras, 2006; Ornelas, 2004; Vessuri, 1995). During the 1980s, the *Instituto Brasileiro de Informação em Ciência e Tecnologia* (IBICT) proposed a model for evaluating scientific journals in which objective parameters sought to ensure the basic functions of a serial publication: standardization, duration, frequency, indexing, dissemination, content collaboration and division, and authority (Braga & Oberhofer, 1982). In the nineties, Brazil and Mexico established initiatives to define a core set of journals from Latin America (LA) in different areas of knowledge, in order to generate a list of the best periodicals in the region and reduce the large number of low-impact publications (Krzyzanowski, Krieger & Duarte, 1991; Vessuri, 1995).

In recent years, with the intensification of scientific production at the global level, various agencies in the countries of the region, especially in those with more lower-quality publications, have been concerned with assessing scientific output, in order to qualify it and promote its visibility (Mesa Fleitas, Rodríguez Sánchez & Savigne Chacón, 2006). In fact, in the countries of LA where the most active publication assessment models are found (López-Cózar et al., 2006), there are more similarities than differences regarding criteria (Ferreira & Krzyzanowski, 2003; Mesa Fleitas et al., 2006).

Overall, assessment models for scientific journals have considered their multidimensional aspects: to achieve a basic level of quality, a journal must meet criteria regarding the quality of information, as well as the scientific and editorial quality (López-Cózar et al., 2006). In summary, the criteria are divided into submission (or format) and merit (or content), but primacy is given to the parameters that can be measured objectively (Braga & Oberhofer, 1982).

This assessment of periodical publications is also used for managing the systems for the admission and permanence of journals in databases (indexing criteria) or collections of electronic libraries. Such assessments consider general parameters: content and standardization. Regarding the content: the quality of articles, editorial staff and consultants are evaluated, in addition to criteria for the approval of texts, institutional and geographical diversity of the authors, journal dissemination and inclusion in databases. Regarding standardization: format, cover, ISSN, summary, bilingual summaries, use of descriptors, standardization of bibliographic reference listings, citations in the text, instructions to authors, regularity of publication, periodicity, length of time in circulation, dissemination, indexing and graphical presentation (Ferreira & Krzyzanowski, 2003).

The use of measurements introduces the need to generate a set of indicators to evaluate scientific production. The most important of them, the Impact Factor (IF) — from the *Institute for Scientific Information* (ISI) — has served as a measure of quality in different contexts, for example, in the evaluation system of scientific journals in Brazil, where this indicator has been increasingly used, despite acknowledgement of its limitations. In that sense, the ISI is used as a reference for recognition and prestige in the international scientific community and for having built a cutting-edge bibliography worldwide (Guédon, 2010; López-Cózar et al., 2006). While it is appropriate for assessment of journals, ISI ends up selecting publications primarily from the core countries and less so from countries considered 'peripheral' to the production of knowledge, in languages other than

English, which leaves the evaluation and even visibility of scientific production in these regions incapacitated (Mesa Fleitas et al., 2006).

Whereas visibility is one of the great challenges of Latin American science, the contributions of regional databases, pillars of the Open Access movement, have strongly facilitated the recognition of Latin American science in international rankings. Hence, it can be concluded that the visibility achieved by the research produced in the countries considered 'peripheral' within the global scientific system, is due to the systematization of the scientific literature in these regions in their own bibliographic indexing systems and databases (Packer, 2009).

Regional initiatives to evaluate the visibility and impact of Latin American science attempt to break the socioeconomic, political and scientific disparity in relation to the core countries. This is why it is important to consider the structure of renowned regional databases: the *Sistema Regional de Información en Línea para Revistas Científicas de América Latina, el Caribe, España y Portugal* (Regional Online Information System for Scientific Journals from Latin America, the Caribbean, Spain and Portugal - Latindex), the *Red de Revistas Científicas de América Latina y el Caribe, España y Portugal* (Network of Scientific Journals from Latin America and the Caribbean, Spain and Portugal - RedALyC), and the Scientific Electronic Library Online (SciELO) (Guédon, 2010).

Besides the Brazilian case (Packer, 2009), there are relatively few studies (Penkova, 2011) about the policies promoting research in the region that fostered the production and sustainability of scientific journals in Latin America. Consequently, in this study, the aim was to map the evaluation systems of scientific journals used in Latin American countries in order to characterize their criteria and relationships with regional databases. Specifically, we ask the following questions: How has the Latin American community assessed its scientific publications? What characteristics have been valued when defining the quality of a scientific publication?

METHODOLOGY

In order to achieve the proposed objectives, a study of documents has been carried out, analyzing the websites of governmental regulatory bodies that promote science, technology and innovation (STI) in Latin American countries. Available information in reports, editorials and other standard communications on the subject was gathered in order to identify characteristics of the evaluation of scientific journals. The information was complemented with specialized literature and informal chats with researchers in the field.

Through these procedures were identified the Latin American nations that had evaluation systems of scientific publications, and two lists were created:

- 1) STI agencies of countries in LA;
- 2) Evaluation systems of scientific journals existing in those countries.

After identifying the evaluation systems in Brazil, Colombia, Argentina, Costa Rica, Cuba, Mexico, Chile, Peru, and Venezuela¹, they were described and grouped according to the characteristics of each system (whether the country had its own system with stratification, its own system with index, or whether it was adopted from a regional database), the criteria employed and the similarities between these criteria and the characteristics required by Latindex, RedALyC and SciELO, in order to be admitted and remain in their collections. The articulation of the information obtained resulted in a pooled analysis of scientific evaluation systems in Latin America and the Caribbean (LAC), allowing for considerations about the quality of scientific communication in the region and its dissemination and impact on the international circuit.

RESULTS AND ANALYSIS

The results presented here are divided into two sections. First, the evaluation systems of periodical publications in Latin American countries are presented and divided into three evaluation models, defined by their complexity. In the second section, the focus is on the criteria used by national systems, which are compared with the parameters used by regional information databases.

JOURNAL EVALUATION SYSTEMS IN LATIN AMERICAN COUNTRIES

The document search in websites of government agencies of STI in LA highlighted a diversity of levels of organization and dissemination of information concerning national systems of STI in the region. There are journal evaluation systems in nine countries in the region, namely: 1) Argentina, 2) Brazil, 3) Chile, 4) Colombia, 5) Costa Rica, 6) Cuba, 7) Mexico, 8) Peru, and 9) Venezuela, classified into three groups according to their characteristics, as shown in Table 1.

1 Although exhaustive, the document search did not intend to cover every evaluation system of scientific publications in LA. It should also be noted that the specifics of the evaluation systems referred to herein are identified by date, that is, they refer to models adopted in 2013, subject to frequent changes in general, and following the trends of international scientific and educational policies.

Table 1
Journal Evaluation Systems, Coordinated by Governmental Bodies of LAC Countries

Group	Country	Journal Evaluation System			
		<i>Evaluation System</i>	<i>Year of creation</i>	<i>Regulatory Bodies (acronym)</i>	<i>Regulatory Bodies (full name)</i>
Grupo 1	Brasil	Qualis	1998	CAPES	<i>Coordenação de Aperfeiçoamento de Pessoal de Nivel Superior</i>
	Colombia	Índice Bibliográfico Nacional - PUBLINDEX	2002	COLCIENCIAS	Departamento Administrativo de Ciencia, Tecnología e Innovación
Grupo 2	Argentina	Núcleo Básico de Revistas Científicas Argentinas	2001	CAICYT	Centro Argentino de Información Científica y Tecnológica
	Costa Rica	UCRIndex	2003	UCR	Universidad de Costa Rica/ Vicerrectoría de Investigación
	Cuba	Registro Nacional de Publicaciones Seriadas	2003	CITMA	Ministerio de Ciencia, Tecnología y Medio Ambiente
	México	Índice de Revistas Mexicanas de Investigación	1993	CONACYT	Consejo Nacional de Ciencia y Tecnología
Grupo 3	Chile	Programa Revistas Científicas Chilenas	s.d.	CONICYT	Programa de Informaciones Científicas
	Perú	Portal de Revistas Peruanas Científicas y Técnicas	2010	CONCYTEC	Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica
	Venezuela	Revenyct (Índice de Revistas Venezolanas de Ciencia y Tecnología)	2002	ULA	Universidad de los Andes

GROUP 1: COUNTRIES WITH THEIR OWN ASSESSMENT SYSTEMS THAT GENERATE STRATIFICATION OF SCIENTIFIC JOURNALS

Qualis (Brazil) and *Publindex* (Colombia) are among the largest and oldest systems, and they stand out because they have an evaluation model of higher complexity. The key features of these two systems are the assignment of concepts of quality and the classification of publications by levels. Thus, the gauge of the quality of a publication ceases to be the simple fact of its inclusion in the evaluation, focusing more on verifying whether the publication appears in the higher strata of said classification. Another feature is that the two systems do not only evaluate national publications but also assign concepts to international journals (in which publications from national authors are included).

Qualis was created in 1998 and is actually a ‘mediating activity’. The objective of the evaluation of Brazilian periodicals is to contribute to the improvement of graduate programs in the country, through

evaluation of the quality of scientific output of these programs. Over a three-year period, all scientific journals with articles by professors and students of postgraduate programs are included in the assessments conducted in each of 48 fields of knowledge. The stratified levels are: A1-A2 (international level), B1-B2-B3-B4-B5 (national level), and C (local level). Specialists in each area of knowledge carry out the assessment and develop their own criteria according to the characteristics and peculiarities of the field. Thus, a journal might be evaluated from different fields and have a different concept in each one of them.

Publindex began in 2002 and has an indexing service (which evaluates and indexes national journals according to its own criteria) and another of ratification (which evaluates foreign publications in which research data are published that are associated with Colombian higher education institutions); in this case, the quality is evaluated according to the databases in which these journals are indexed. Journals can be classified into six levels (A1, A2, A3, A4, B and C).

GROUP 2: COUNTRIES WITH THEIR OWN ASSESSMENT SYSTEMS THAT GENERATE JOURNALS' INDEXES (WITHOUT STRATIFICATION)

These systems are primarily concerned with national journals, and the result of their assessments is the construction of an online index or catalogue, with the objective of bringing together national journals that meet editorial quality standards and are thus certified by the systems. As a result, these evaluation systems also have as an objective the accessibility and visibility of the national output. They are: the *Núcleo Básico de Revistas Científicas Argentinas* (Argentina), the *UCRIndex* (Costa Rica), the *Registro Nacional de Publicaciones Seriadadas* (Cuba), and the *Índice de Revistas Mexicanas de Investigación* (Mexico). Such systems use their own criteria and assign a certificate with an expiration date (two or three years); at the end of that period, the journals are reassessed, to determine their continuation on the list.

GROUP 3: COUNTRIES WITHOUT AUTONOMOUS ASSESSMENT SYSTEMS THAT ADOPT POLICIES TO STIMULATE SCIENTIFIC PUBLISHING WITH EVALUATION CRITERIA FROM REGIONAL DATABASES

Chile, Peru, and Venezuela have developed policies for their respective STI agencies, aimed at stimulating scientific publishing, as well as the visibility of their journals. However, no specific criteria for evaluation have been identified that were established independently by these agencies. In the case of Chile, the program *Revistas Científicas Chilenas*, and in the case of Peru, the portal *Revistas Científicas Pe-*

ruanas, the selection criteria refer to SciELO-Chile and SciELO-Peru respectively, which, in turn, are derived from SciELO. The inclusion of Venezuela in this group owes to the lack of updated data about its evaluation system; the only indicator of the criteria for qualifying publications of the *Índice de Revistas Venezolanas de Ciencia y Tecnología* (REVENCYT) — which are: standardization, duration, frequency, distribution, international collaboration, content, editorial committee and evaluation by peers — was identified in Rosales, Bauste, Rodríguez and León (2008).

Regarding the groups identified in the national systems of evaluation of scientific publications in LA, it is clear that they find themselves at various stages of organization and consolidation. While there are established systems that increase their levels of complexity and thoroughness with each new evaluation, others use less complex criteria and are more oriented towards increasing visibility. Yet, since there is a strong affinity between the criteria of the systems — as we will show in the next section — we determined that the different systems are governed by common principles and converge towards the same tendency to value the measuring of the quality of the publications.

JOURNAL EVALUATION CRITERIA USED BY NATIONAL SYSTEMS

An analysis of all journal evaluation systems of the Latin American countries leads us to conclude that there are degrees of complexity in these mechanisms and that they have different purposes, although the common goal is to achieve high journal ratings so as to boost visibility in regional and international information databases. Using this characteristic, we analyze the criteria of the evaluation systems of the countries and classify them into categories (Table 2) to compare the parameters used in regional databases (SciELO, RedALyC, and Latindex). To do this, we include only countries classified in Groups 1 and 2; Group 3 was not included due to the absence of its own criteria and its direct adhesion to the criteria used by the bibliographic indexing systems. Additionally, it is worth noting that the relative importance of each criterion has not been compared, nor the specifics of its application in each national sphere (for example, authors from outside institutions must make up at least 60% of the share in Mexico, while in Argentina, it is only suggested to ‘mostly publish articles from external authors’, without determining a percentage). Such comparisons are beyond the scope of this research, but surely deserve attention in future studies.

Table 2
Criteria Required in the Evaluation Systems in LA and in the Regional Information Databases

Key	Category	Description
A	ISSN	Requirement of permanent identification, through the ISSN
B	Originality	Main publication of unpublished and original articles (as opposed to reviews, interviews, congress proceedings and others)
C	Peer evaluation	Requirement of anonymous peer sanction and explicit criteria for judging articles
D	Periodicity and regularity	Requirement of minimum frequency and/or timeliness
E	Years since established	Requirement of minimum time (one to three years) of existence of the journal, before it can propose its evaluation
F	Instructions to authors	Requirements related to the clarity and visibility of the instructions to authors (subscription regulations, information about the evaluation process, etc.)
G	Structure of the articles	Requirements concerning the standardization of articles, such as the standardization of references, titles, abstracts and bilingual keywords, institutional affiliation of authors, dates of receipt and acceptance of articles, etc.
H	Minimum number of articles	Requirement of a minimum number of articles per year (or per issue), depending on the field of the periodical publication, or even a consistent number of articles among the different issues of the journal
I	Institutional information	Requirements referring to the provision of explicit information about the publishing institution and its nature (university, research institute, scientific or professional association, graduate program, etc.)
J	Editorial structure	Obligations concerning the existence of one (or more) decision-making bodies (editorial board, editorial committee, advisory board, scientific council, etc.), composed of peer experts in the journal's field of knowledge and responsible for setting the editorial guidelines
K	External origin	Preponderance of published articles by authors from institutions other than the institution that publishes the journal
L	Distribution and	Requirement of information regarding the print run and distribution of the journal (in the case of print journals) or download report and other information about the online
M	Indexation	Requirement of admission and permanence in databases, bibliographic indexing systems, directories, portals, and national and/or international repositories as a
N	Impact Factor and other	Requirement of IF (especially JCR, even though sometimes others are mentioned) or h-index and other measures relating to the number of citations of articles
O	Relevance in the field	Prestige of the journal within the scientific community, due to its antiquity and/or importance in its area of expertise.

Table 3 compares the occurrence of these criteria in SciELO, RedALyC and Latindex, and in the evaluation systems of the countries of Group 1 (Brazil and Colombia) and 2 (Argentina, Costa Rica, Cuba and Mexico).

Table 3
Criteria Established in the Evaluation Systems of LA and Regional Information Databases

Bases/Country		Categories*															Total (categories)	
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
Bases	Latindex	X	X	X	X		X	X		X	X	X	X	X				11
	RedALyC	X	X	X	X	X	X	X	X	X	X	X	X	X				13
	SciELO	X	X	X	X	X	X	X	X	X	X	X	X	X	X			14
Total (bases)		3	3	3	3	2	3	3	2	3	3	3	3	3	1	0		
Group 1	Brazil	X	X	X	X	X	X	X	X	X	X	X		X	X	X		14
	Colombia	X	X	X	X	X		X	X	X	X	X	X	X	X			13
Group 2	Argentina	X	X	X	X			X			X	X		X		X		9
	Costa Rica				X				X			X		X				4
	Cuba	X	X	X	X	X		X			X		X	X				9
	Mexico	X	X	X	X	X	X	X			X	X	X	X				11
Total (countries)		5	5	5	6	4	2	5	3	2	5	5	3	6	2	2		

*The categories follow the headings of Table 2.

A high level of similarity is observed between the criteria used by Latindex, RedALyC, and SciELO. Of the 15 categories, 12 are unanimous, namely: a) 11 criteria concerning the presence in the 3 databases of category A: ISSN; B: Originality; C: Peer review; D: Frequency and regularity; F: Instruction to authors; G: Structure of the articles; I: Institutional information; J: Editorial structure; K: External source; L: Distribution and accessibility; M: Indexing; and b) 1 criterion concerning the absence in the 3 bases of category O: Relevance in the field.

Two other categories (E: Years since established and H: Minimum number of articles) were present in 2 of the 3 databases — RedALyC and SciELO — another factor that reinforces the convergence between them.

Regarding category N: Impact Factor and other measures, this was observed only in SciELO, which, added to the fact that this database was the one with the highest number of categories (14), highlights the fact that it not only has a higher level of specification criteria, but also that it stands out from the rest in the use of measures.

Concerning the national evaluation systems, a strong convergence between the criteria used in different countries has been verified. Two categories, D: Frequency and regularity and M: Indexing, are unanimous (present in six countries), which shows that they are highly valued elements. We can consider periodicity and regularity as minimum features a serial publication should achieve, and they also demonstrate responsive and consistent efforts by the editorial team. Thus, indexation in databases (with emphasis on regional and international databases) appears to be the most valuable element with which to measure the editorial quality in the region, highlighting the concern of national agencies to accord visibility to science in the periphery.

Six other categories are present in 5 countries: (A: ISSN, B: Originality, C: Peer review; G: Structure of the articles, J: Editorial structure, and K: External source). These are categories that have high value in the region, referring to a primary formal requirement (in the case of ISSN), up to fundamental elements generally considered useful in measuring the quality of editorial work: the standardization of the structure and presence of explicit information about the articles' metadata (abstracts and bilingual keywords, authors' institutional affiliation, etc.); the existence of committees composed of expert peers from different institutions and nationalities; the acceptance criteria of the evaluations by expert peers, and the institutional and national diversity of the authors of the articles.

In general, national systems use common criteria to measure the quality of their periodical publications. Even in the case of the evaluation conducted in Costa Rica, where the use of only four categories was established, one has to consider that the main criterion from *UCRIndex* is precisely the evaluation by Latindex (responsible for 70% of the final score). Thus, other elements would already be implicitly taken into account, since they are evaluated by Latindex, and the lack of explicit references to other categories does not mean at all that they are not valued.

Only in the Cuban evaluation system was the external origin not mentioned. However, this is a highly valued element in evaluation policies in LA, each time that the dissemination of scientific output from the region directly impacts the world.

In turn, the categories E: Years since established, H: Minimum number of articles, and L: Distribution and accessibility, indicate criteria that are also significantly valued in the journal evaluation systems in the region, although of lesser importance than other categories already mentioned: category E is present in four countries, while H and L appear in three countries.

Only two countries considered the rest of the categories, two each. These categories are: F: Instructions to authors (Brazil and Mexico), I: Institutional information (Brazil and Colombia), N: Impact Factor and other measures (Brazil and Colombia), and O: Relevance in the field (Brazil and Argentina). Regarding this last one, its objective is to assign references to the prestige of the journal in the country's scientific community, due to its recognition and importance in a given field of knowledge. Such a listing would allow the consideration of a non-measurable criteria that, especially in the Brazilian case, would prevent or dampen the tendency to lower the level of 'traditional' (in the sense of having a long history in its field) publications, which, given the case, would have had a poor performance in quantitative criteria.

In fact, the countries of Group 1 (the *Qualis* system, from Brazil, and *Publindex*, from Colombia) employ systems with a higher level of complexity and with a larger number of evaluation criteria, considering that from 15 categories, 14 were observed in the Brazilian case and 13 in the case of Colombia. This group also draws attention because it is the only one using bibliometric indicators (especially the IF) in its evaluations. This result points towards an alignment of Brazilian and Colombian evaluation policies with the guidelines for science policy of the central countries, heavily based on bibliometrics. Although the limitations of such criteria to measure quality are clear, its valuation constitutes a strong generator of visibility of the scientific output of these countries, suggesting that this should be discussed in the other national systems.

Among the countries in Group 2, Mexico features 11 categories, followed by Argentina and Cuba with 9 categories and, finally, Costa Rica with 4 categories. Although the low Costa Rican adherence to the categories revealed a less functional evaluation, it is worth remembering that the country, besides its own criteria, also uses the criteria from a regional database (*Latindex*), which reveals that the national systems of this group are different from Group 1, not only because Group 1 presents its results in stratified levels, but also and above all, because of the consistency in the evaluation in terms of publishing, and because of the use of measurements essential for assessing the impact of publications.

FINAL THOUGHTS

This study was devoted to identify and compare the evaluation systems of the scientific publications in the Latin American countries. In spite of the diversity of evaluation systems and of the degree of visibility of information about the criteria used in each country, we see that,

in fact, the ranking of scientific journals is a central element in the STI policies of the countries of the region.

Existing systems were found primarily to be organized under two models: a) one, focused on more complex and demanding evaluations (highest number of criteria to be met by journals) and the establishment of different stratified levels to classify journals; b) another, based on the creation of indices that assign a certification of quality, and therefore, ensure visibility and access to science that takes place in the region, traditionally characterized as peripheral under the prism of the more consolidated networks of production and dissemination of scientific and technological knowledge. We have also found a third group c), which uses criteria of the regional databases, SciELO and Latindex, to build a portal of national journals in these databases. We have not characterized this last group as having an autonomous national system; since it is a derivation of other systems to promote the publishing, rating and visibility of periodicals produced in these countries.

This study found a high equivalence between the criteria used by the national systems of evaluation of scientific publications in Latin American countries and the characteristics required by SciELO, RedALyC, and Latindex for indexing journals in their databases. These results show not only the determination of countries to qualify their publications but also demonstrate the degree of development of these regional STI policies.

The 15 categories that group the criteria used in the evaluation systems of scientific publications in the region, organized here, are not intended to replace the mechanisms of existing evaluation systems, but they serve to analyze which features are valued in national systems. Through this framing, it has been possible to identify the strong valuation of the indexing of scientific journals published in Latin America (as a unanimous criterion in the studied countries) and albeit indirectly — as it is not presented as a criterion in itself — the valuation of Open Access, through the common reference to regional databases with this feature (SciELO, RedALyC and Latindex). Based on the models analyzed, we conclude that the tendency that concentrates greater efforts in national evaluation systems is to consolidate and give greater visibility to the scientific literature.

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Chapter 5

EVALUATING THE IMPACT OF OPEN ACCESS INITIATIVES WITHIN ACADEMIA AND BEYOND

INTRODUCTION

Latin American countries (LAC) have a rich history of contribution to the world's store of knowledge and this contribution has increased recently. Between 2000 and 2010, the number of papers by Latin American authors listed in Thomson Reuter's Science Citation Index (SCI) has increased in more than 9% per year, reaching almost a 4.4% share of world papers — 70% more compared to 2000. At the same time, the share of Latin American scientists in the SCI grew steadily from 2.3% to 3.4%. A crucial challenge for the region, however, has been, and still is, to find ways to enhance the use and impact of scientific knowledge on economic and social dimensions.

Some analysts in the region have argued that the mismatch between knowledge production and knowledge uses in LAC can be explained in part by the historical isolation of the scientific systems in the region, most of which were inspired by a linear model of innovation that conceptualizes science as exogenous to the productive and social systems (Albornoz, Matos Macedo & Alfaraz, 2010; Sutz & Arocena, 2006). With the aim of overcoming this limitation, a considerable number of initiatives has been implemented over the past few years in the region that connect local science and knowledge production with several economic and social systems, such as the various

funding schemes to support public/private partnerships in research. Another particularly interesting initiative, because of its focus on the conditions of accessibility of science (or the supply side) and because of its orientation to a wide audience (not only the productive sector), are the Open Access (OA) portals, which are oriented to guarantee free and unrestricted online availability of research outputs.

Through OA portals, knowledge users — researchers and students, naturally, but also professionals, practitioners, civil servants, educators, and others — from around the world can gain increased access to LAC knowledge (Swan, 2012). These initiatives, though not initially oriented to amplify the effects of science on development, can play an important role in helping to reduce the historical mismatch between scientific knowledge and development by maximizing its impact through greater visibility, reach and usage of the research outputs within a wider audience in the region.

Interestingly, OA has diffused to most research-intensive universities and national science in Latin America (Alperin, Fischman & Willinsky, 2011). Also, it seems that Latin American journals are using the OA publishing model to a far greater extent than any other region (Alperin et al., 2011), in part thanks to the two most well-known OA initiatives in Latin America: SciELO (Scientific Electronic Library Online) and RedALyC (Red de Revistas Científicas de América Latina y el Caribe, España y Portugal), both of which offer free full-text access to more than 800 journals. The former was initially inclined towards Natural Sciences, while the latter to Social Sciences, but both have become multidisciplinary and are seen to be converging now (Babini, 2011).

Previous studies have found that OA can increase the impact of science in the form of citations (half of the 65 studies conducted on this issue argue that OA increases citations in average 200%). However, this is not the only impact that OA can have. OA can maximize the audience of the articles published towards other types of users beyond academia. In LAC, a great deal of the research is written in Spanish or Portuguese and is mostly local; this kind of research then might not be cited in the SCI but can still have an impact on development by contributing to policy and media debates, training programs, etc. In this article we contribute to the understanding of the impact of LAC science moving beyond standard bibliometric analysis, by exploring the impact that research outputs published in OA portals is having not only on the academia, within and outside LAC, but also on other communities within the region, with a potential impact on development. More specifically, we evaluate the impact of different types of scientific outputs posted on OA portals in LAC, on: (i) academia (within and outside LAC), (ii) policy making processes, (iii) universities, and (iv) media.

We do so by developing a unique database with wide regional and time covertures. The analysis is exploratory and we work with a sample of articles gathered from two Latin American OA portals (SciELO and RedALyC) covering seven countries (Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela) over the period 1969-2013. In spite of being exploratory, our analysis shows some interesting insights about the potential impact of OA portals to connect LAC science to their users. First, the impact across different types of users changes with the disciplines (i.e., the disciplines with more academic impact such as Agricultural and Life Sciences are not the ones most widely quoted in policy documents, media or education). Second, countries differ widely in the number of articles that they have in OA, and in the use that they make of articles published in OA. Not surprisingly, Brazil, a leader in the region, is one the countries that make the most use of OA, but countries like Chile and Peru, latecomers, are also increasingly using it. Finally, analysis of the links between different types of impacts shows that articles that are more often used or quoted within academia, are also quoted more often within policy, media and education, which suggests that articles considered to be of a high academic standards are the ones most widely cited among other audiences.

This chapter is structured as follows. The following section discusses previous research and explains the research questions tackled in the present study. This is followed by a section that describes the data and methodology, which then leads to the main analysis and results. Finally, we present some general conclusions.

VISIBILITY AND ACCESSIBILITY OF SCIENCE

From visibility derives usage, and from usage derives impact (Swan, 2012, p. 29). The 'visibility of science' refers to the extent to which a scientific research (usually comprised in a research article) is found and used by others (see, among others, Chan & Costa, 2005; Gaillard, 1989; Garfield, 1984; Gibbs, 1995; Meneghini & Packer, 2007). In general, it is assumed that all scientific articles are equally visible to other authors or users; and that the most relevant of them within a certain thematic area will be the most widely cited or used in general. However, this is not necessarily the case. The language in which scientific articles are written, the degree to which they are readily available either physically or in electronic versions (in libraries, databases, etc.) and the type of journal in which they are published, all affect their visibility.

Existing studies have found that articles typically published in journals, which are included in top databases such as the Institute for

Scientific Information (ISI)¹, have a larger probability to be found by scientists when searching for new discoveries in their field. This is coupled with scientists preferring to consult the journals considered to be the most prestigious, which is often seen as those that are included in these databases. To make matters worse, like with works not included in these databases, the language in which the article is written also matters. In a scientific world in which English is a sort of *lingua franca*, researches that are not published in English become less likely to be found and used by other researchers.²

It is not surprising that research produced and published in developing countries has particularly severe problems of visibility. Top databases as ISI have a very poor coverage of journals edited in less developed regions (Alperin, 2014; Cetto, 1998; Gaillard, 1989; Garfield, 1984). In 1984, Garfield already noticed that only few Latin American and the Caribbean journals were covered in the 1982 SCI edition. Some years later, Gaillard (1989) pointed out that approximately one third of the scientific articles from developing countries in the fields of Biological and Agricultural Sciences and Rural Technology were published in journals from the industrialized world covered by the SCI. This phenomena has been named by Gibbs (1995) 'the lost science in the Third World' and continues to be observed to this day. Gibbs pointed out that 'although developing countries encompass 24.1% of the worlds' scientists and 5.3% of worlds' research spending, most leading journals publish a smaller proportion of articles by authors from these regions' (Gibbs, 1995, p. 93). He also warns of a vicious cycle regarding the lack of visibility of research published in journals edited in Latin America: 'domestic journals did not gain prestige and international circulation because local scientists published their best results abroad, but Latin American researchers published abroad because domestic journals did not take their results to the scientific world' (Gibbs, 1995, p. 95). Some studies provide recent evidence on this issue (see, for example, Alperin, 2014; Collazo-Reyes, 2006; Collazo-Reyes, Luna-Morales, Russell & Pérez-Angón, 2008; Gottdiener, 2006; Luna-Morales & Collazo-Reyes, 2007). For instance, Collazo-Reyes (2006) found that only one scientific paper of the 775 most cited main-

1 Thomson-Reuters (formerly known as Institute for Scientific Information, ISI) in the USA, and Scopus, which belongs to Elsevier in the Netherlands, are nowadays the most widely recognized scientific databases. They cover the most highly cited journals in the world, and provide a large historical series of many of these journals.

2 Meneghini and Packer (2007) quote the case of the German scientists who in 1930s found a significant causal link between smoking and lung cancer, and published their findings in German. Due to the language barrier, their findings remain largely ignored until 1960s when scientists from US and UK re-discover the finding.

stream papers (all having 100 citations or more) from the Latin American and the Caribbean scientific community published between 1995 and 2003, was published in a local journal. Furthermore, Gottdiener (2006) found that out of the 63 research articles published by Mexican physicists with more than 100 citations from 1959 to 2000, none of them was published in a Latin American or Caribbean journal.

The other barrier for communication and accessibility of scientific research, which is related to the ‘visibility problem’, is the ‘journal-affordability’ problem (Harnard & Brody, 2004). The scholarly communication system has largely relied on institutional subscribers paying for access to online databases of journals. This system works only when academic and scientific institutions can afford to pay for all existing titles. However, this is not always the case. Limited library budgets combined with increasing journal prices have generated what is commonly described as the ‘serials crises’. That is, that each university can afford a limited and decreasing number of the available research articles. The journal affordability problem seriously affects the degree to which users access all available research. For instance, Rowlands and Nicholas (2005) collected evidence from more than 5000 researchers and showed that high journal prices deprive scientists from accessing the journal literature. In the same vein, Sparks (2005) reported that half of surveyed researchers in the areas of Medical and Biological Sciences and Arts and Humanities have difficulties to access journal articles.

OA initiatives have been launched with the aim of addressing these two problems simultaneously. OA literature is scientific literature that is ‘digital, online, free of charge, and free of most copyright and licensing restrictions’ (Suber, 2011). OA literature can be accessed free and unrestricted either through scientific articles published in OA journals³ or through scientific articles that are published in a non-OA journal but which are also self-archived on the web⁴. The expectation is that OA might enhance the use of science via increasing the visibility of science and facilitating its access.

In the last years, there has been an increased awareness and popularity of OA across the scientific community, with non-profit and commercial publishers alike successfully building businesses around

3 OA journals allow online open access to anyone who is interested in their articles without charging subscription or access fee.

4 Authors can upload a free version on their own websites, in the universities websites or any other practical alternatives for “free” publishing on the web. A very popular self-archive mechanism is ArXiv, a preprint electronic repository originated at Los Alamos National Laboratory, which was created in 1991 (Marcondes & Sayão, 2003).

OA. This kind of publishing, pioneered by the Public Library of Science (www.plos.org) and BioMedCentral (www.biomedcentral.com), was supported by many declarations and statements worldwide such as the Berlin Declaration,⁵ the WSIS Declaration,⁶ the Bethesda Statement⁷, the Budapest Open Access Initiative,⁸ the Wellcome Trust Statement⁹ and the IFLA Statement.¹⁰ In the years 2002-2003, the initiative on OA publishing and its mission became formalized: authors guaranteed that their researches published in scientific articles should be freely accessible through internet to be read, printed, used and distributed without economic, technical or legal barriers. Since then, there has been an increasing number of OA journals in the world. In 2012, there were 8,519 OA journals and almost one million OA articles.¹¹

Existing studies have found that OA articles are more used than non-OA articles by researchers. Authors are more likely to read, use and cite articles that are available in an OA model than other type of articles. The methodology utilised usually compares differences between average citation counts to OA articles and non-OA articles (see, for example, Antelman, 2004; Lawrence, 2001; Kurtz et al., 2004a, 2004b; Hajjem, Harnad & Gingras, 2005; Harnad & Brody, 2004). This research pointed out two important results: (i) OA articles usually receive higher citations than non-OA articles, and (ii) this effect varies widely across scientific disciplines. For instance, Hajjem et al. (2005) based on a study of ten distinct disciplines (Biology, Psychology, Sociology, Health, Political Science, Economics, Education, Law, Business and Management), found that the magnitude of the derived OA/Not OA ratio varied by subject field and year of publication between 25% and 250%. Thus, the different citation practices in different scientific areas make it problematic to generalize results across subject areas.

5 See http://oa.mpg.de/files/2010/04/berlin_declaration.pdf.

6 See <http://www.itu.int/wsis/docs/geneva/official/dop.html>.

7 See <http://legacy.earlham.edu/~peters/fos/bethesda.htm>.

8 See <http://www.budapestopenaccessinitiative.org/>.

9 See <http://www.wellcome.ac.uk/About-us/Policy/Policy-and-position-statements/wtd002766.htm>.

10 See <http://www.ifla.org/publications/ifla-statement-on-open-access-to-scholarly-literature-and-research-documentation>.

11 Statistics found in The Dramatic Growth of Open Access Series at http://poet-iceconomics.blogspot.ca/2013/07/june-30-2013-dramatic-growth-of-open_4.html.

UNDERSTANDING THE IMPACT OF LAC SCIENCE

The aim of this research is to contribute to understanding of the impact of LAC science by exploring the impact that research outputs published in OA portals are having not only within academia but also on other communities within the region, with a potential impact on development. More specifically, we are interested in understanding the impact of different types of scientific outputs posted on open access portals in LAC, on: (i) academia (within and outside LAC), (ii) policy-making, (iii) universities, and (iv) media.¹²

Nevertheless, impact is not easily defined or measured. Work in this area is still in the early stages and there are no established frameworks on which to build. We will measure impact by citations, as is common practice in bibliometrics, but also by looking at references and mentions of the articles in government documents, press articles and educational programs, as is increasingly common in altmetrics.

As discussed above, previous studies have found that OA can increase impact in the form of citations (half of the 65 studies conducted on this issue argue that OA increases citations in average 200%). However, this is not the only impact that OA can have. What OA can do, it is argued, is to maximize the audience of the articles published, so that the ones that are worth citing, referencing or mentioning stand the maximum chance of being seen and having an impact on the wide community (Swan, 2012). In LAC, a great deal of the research is written in Spanish or Portuguese and is mostly local, i.e. it has not been conducted following an international agenda but is instead potentially related to questions that are locally or regionally relevant and that may influence current policy debates. Such research might not be cited in other academic articles, but can still have an impact on development by contributing to policy and media debates, training programs, etc., in the region. This is a largely unexplored area, and the few studies on the usage of biomedical articles suggest that of the 420,000 unique users per day of the 2 million items in that database, 25% are from universities, 17% from companies, 40% from 'citizens' and 18% from 'Government and others' (Swan, 2012).

We propose to contribute to expand our knowledge, about the different kind of impact that LAC science published in OA portals can have, by developing an unique dataset with wide regional and time coerture that puts together LAC publications of different genres, authors, institutions along with the citations and references of these publications and authors in different types of documents including

¹² This list of possible outputs was our original proposal, however, as we will discuss later we made adaptations due to problems accessing relevant sources.

academic papers, press releases, governments reports and university web pages. These will allow us to investigate the extent to which different kinds of constituencies are using the scientific knowledge from LAC posted in the OA sites, and at the same time to explore important issues such as:

- a) Are there significant differences across disciplines, in the extent to which scientific articles published in OA portals are being used by different types of constituencies? Are there significant differences across countries?
- b) Are the same papers quoted within academia also quoted by other communities?
- c) Are there any biases across disciplines (as about authors' affiliations, etc.)?

METHODOLOGY AND DATA

COLLECTING THE DATA: GENERAL OVERVIEW

The diffusion of web-based journals provides an exceptional opportunity to retrieve valuable information about the diffusion and impact of knowledge creation. These sites usually include organized information about the papers they host, making it relatively easy to collect and process the data. Given a particular paper in any collection, it is possible to find information about the paper's own characteristics such as title, references, location of the source, and year of publication, etc. Additionally, it is also possible to use this data to evaluate the impact of a particular paper by looking, for instance, at other works that cite or mention it. All this information can also be linked to institutions and therefore geographically.

We developed an internet crawler (or 'spider') in order to retrieve this data. Crawlers generate a series of queries to servers that host web pages and receive back information regarding the specific query sent. Once the information is received, web pages' codes can be filtered and the desired information retrieved.

The specific web crawler we built worked by retrieving information from the web in stages according to the nature of the queries that needed to be sent to servers.

On a first stage, it 'visited' the OA sites and automatically generated queries for all papers hosted. As an output of this process, we created an organized dataset with information (metadata) on hosted papers, such as title, authors, date of publication, affiliation of the authors, etc.

Secondly, and using the dataset we already had, we generated a new series of queries using the most popular search engines (Google, Bing, etc.) in order to retrieve information on the web about the impact of those publications. We were interested in four types of impacts:

- Academic: Scholarly articles that have used and cited any of the documents on our database
- Impact on education and training: Training programmes and seminars within Universities that have quoted the same articles.¹³
- Policy: Government reports that reference the titles of the articles collected.
- Repercussion on media: Newspaper articles that have referenced titles or authors in our database. A newspaper rarely cites a paper by its title; therefore, strict searches using titles were left us with very few observations. In order to address this issue, we explored three different methods to find a paper: first, we looked at citations by its title, and second we looked at citations of the authors. In order to look for authors we used two different approaches. For the first approach, we looked for pages that contain the full name of all the authors as they appear in the papers.¹⁴ The second approach relaxes this condition, allowing for any combination of the name or missing parts but it requires that at least some random selected words from the title should appear on the webpage link. For instance if the authors are 'Sergio Petralia' and 'Anabel Marin' then a page mentioning 'Sergio Gabriel Petralia' and 'Anabel Marin' are considered provided that there is at least some words related with the title in that page. The reason is that a page containing references to someone called 'Sergio Marin' would be also considered. The idea of the extra requirement is to filter false positives.

We used different software for each part of the data collection. We accessed information on OA portals using the R Statistical Software, in order to create the index of documents. Later on, for massive queries involving text analysis and digesting documents we used Lucene and Heritrix.

¹³ For this part of the algorithm, we needed to work by crawling every page exhaustively in order to relate the characteristics of the documents to syllabuses.

¹⁴ If the name of the author is 'Sergio Petralia' then articles quoting 'Sergio Gabriel Petralia' are not considered.

DATA

Our sample population includes 247,998 articles published in 752 journals in OA, from 18 countries (plus 1 international organization), in 36 disciplines, over the period 1969-2013. The data shows a broad coverage of countries, years, and disciplines. The distribution by countries shows three types of countries: 1) Mexico, Brazil, Colombia and Spain, making up over 10% of articles, 2) Chile, Argentina and Cuba with between 3% and 10% of articles, and 3) all the others with less than 2%. Just a few disciplines stand out with over 5% of articles: Medicine, Biology, Agricultural-Sciences, Psychology, Education, Sociology and Health. The rest have a similar share of papers. Finally, the data by year shows a significant increase over the years.

From this initial population of papers, however, given to time and resource restrictions, we had to limit our search to a smaller sub-sample.¹⁵ Our criteria was to randomly choose 10% of the papers published by a selected group of countries: Peru, Venezuela, Argentina, Chile, Colombia, Mexico and Brazil, in 2010, in the following disciplines: Agricultural-Science; Biology; Medicine; Language and Literature; Multidisciplinary (Social, Arts, and Humanities), Environmental Studies, History, Economy and Finance, Education, Chemistry, Information Sciences, Health, Physics, Astronomy and Mathematics, Engineering, Computer Sciences and Agricultural-Studies.

Table 1
Distribution of Different Types of Publications by Country

Country	Total Publications SCI (2010)		Total Publications Pascal (2010)		Number of Articles in our Sample per Country (2010)		Population
	Total (1)	% (2)	Total (3)	% (4)	Total (5)	% (6)	% (7)
Argentina	8,469	13%	3,104	15%	57	5%	3.6%
Brazil	36,155	55%	9,518	47%	432	37%	22.1%
Chile	5,162	8%	1,806	9%	66	6%	6.8%
Colombia	2,798	4%	961	5%	243	21%	15%
Mexico	10,171	16%	3,801	19%	265	23%	23.4%
Peru	766	1%	339	2%	40	3%	1.4%
Venezuela	1,385	2%	365	2%	55	5%	5.2%
Sample countries	64,906	99%	19,894	99%	1,158		
<i>Total Latin America</i>	<i>65,331</i>		<i>20,068</i>				

¹⁵ This is, among other things, because the web engines available to perform the searches, such as Google, do not let you do more than 300 searches per day.

In Table 1, columns (5) and (6) show the distribution of articles selected by country. Columns 1 to 4 show the distribution of SCI and Pascal articles by countries, as reported by the SCI and the RIDCYT, (Red Iberoamericana de Ciencia y Tecnología) to provide an idea of the association by country, between the number of papers in open source journals and other indexed journals.

We initially started with 1,200 articles; however, data was cleaned in several steps. First, for each type of impact we drop observations above the 99% in two successive rounds. Then, we performed an analysis of the quality of the data by hand to drop false positives, this is, observations that have wrongly appear to have quotations when they do not have them. The main sources of false positives are the articles that have a title that is very broad and can induce misleading results. We selected randomly a sample of 100 observations and checked manually if any hits of policy or university were false positive. The results indicated that none of them were a false positive. This means that, in this subsample, 100% of the searches done were true positives. Finally, we manually checked the titles, which were not selected in the previous sample, that were more likely to be false positive because they are too broad (e.g., '*Rectas perpendiculares*').

The results of those manually selected titles indicates that, in the case of policy and universities, only the collected impacts of 6 articles induced false negatives as their titles are sentences that can be found in document. This accounts for, at most, 0.5% of the original sample, we drop these observations. When it comes to results found in online newspapers, the story is very different. The results obtained by searching by authors names were very ineffective; the problem is that most of the hits were indeed false positives. In fact, when the paper had only one author the probability of a false positive is greater than 90%, this probability decreases with the number of authors. Nevertheless, given this rate of potential mistake, we end up reporting the results of the searches that focused on the full title of the articles. These results, however, should be interpreted with care, since they are very likely to under-estimate the true impact.

Our final sample ended up in 1,158 articles: 37% from Brazil, 23% from Mexico, 21% from Colombia, 6% from Chile, 5% from Venezuela and Argentina and 3% from Peru. The distribution of articles across countries in our sample is relatively consistent with the one observed in the population. Only Brazil and Mexico change order (see the last two columns of Table 1). However, the importance of countries within the journals included in the OA analysed and the SCI and Pascal publications does not coincide. Argentina and Brazil, for instance have higher shares within SCI publications than the shares that

have in OA sites. The opposite happens with countries like Colombia, Mexico, Peru and Venezuela.

Table 2 shows the number of newspapers and universities investigated by country. We have included in our sample 226 newspapers, this is a preliminary selection based on previous research, which has collected data from newspapers, so the distribution of newspapers by countries does not follow any specific pattern. The same happens with the Universities, we have 1,206 collected from indexes developed in previous works that have selected universities by country.

Table 2
Newspapers and Universities Samples by Country

Countries	Newspapers	Share	Universities	Share
Brazil	39	17%	366	44%
Mexico	41	18%	140	17%
Colombia	20	9%	95	11%
Argentina	59	26%	98	12%
Peru	9	4%	54	6%
Venezuela	25	11%	29	3%
Chile	33	15%	57	7%
<i>Total</i>	<i>226</i>	<i>100%</i>	<i>839</i>	<i>100%</i>

RESULTS

DESCRIPTIVE ANALYSIS

A first overview of the data shows that each paper received in average 2 academic citations (median of 1). However, given the high number of papers that do not receive citations, the median is only 1. The maximum number of academic citations of a paper in our sample is 46. The average policy impact of each article is less than 1, meaning that each article received less than 1 citation in policy documents and, given that 86% of the articles did not receive any citation, the median is 0. However, 1 article received 86 citations. With media, given that we are working with mentions of full titles in media articles, we have very few observations. Indeed, 99% of the articles have not been mentioned in the media by their full titles, but a few have received a lot of citations, 1 article has received 86 citations and another one, 12 citations. Finally, in education, each article gets quoted in average 14

times, but the median is 5, given that around 20% of the articles have not received any citations within Universities. A few articles have received more than 100 citations.

Table 3 shows the distribution of the total articles surveyed, as well as the academic impact, policy impact, media impact and impact on education, by type of discipline. We group disciplines in four types: (a) Agricultural-Sciences: Agriculture and Environment; (b) Life Sciences: Biology, Chemical and Health Sciences; (c) Hard Sciences: Computing, Engineering, Multidisciplinary Sciences and Physics and Mathematics; and (d) Social Sciences: History, Economics, Education, Multidisciplinary Social Sciences and Literature.

Table 3
Number of Articles and Citations by Discipline Grouped: Total and Average

Discipline	Articles	Academic		Policy		Media (Title)		University	
	Total	Total	Average	Total	Average	Total	Average	Total	Average
Agricultural Sciences	237	538	2.27**	615	2.59*	2	0.01	6,674	28.64
Life Sciences	417	1,064	2.55**	221	0.53	92	0.22	9,057	21.7
Hard Sciences	227	270	1.19	27	0.12	0	0.00	10,311	45.8
Social Sciences	277	407	1.47	510	1.84	831	3.00	7,018	25.8
<i>Total</i>	<i>1158</i>	<i>2279</i>	<i>1.97</i>	<i>1,373</i>	<i>1.19</i>	<i>925</i>	<i>0.80</i>	<i>33,060</i>	<i>28.8</i>

The first point to notice is that the average impact on the different types of audiences varies with the type of discipline. Within the academic field, Life Sciences are the ones that register the largest number of citations, followed by Agricultural, Social and Hard Sciences. The test of differences (Bonferroni), however, shows that the differences are significant only in favour of Life and Agricultural Sciences. Nevertheless, if we look at the impact on policy we found that articles published within Agricultural Sciences are by far the ones with more citations in policy documents, followed by Social and Life Sciences. The test shows that the differences are significant only in favour of Agricultural Sciences against all the others.

Within media and education there does not seem to be significant differences between disciplines. The discipline with far more media citations within media is Life Sciences, followed by Social Sciences. The differences, however, given the small number of positive results, are

not significant. The same happens with citations within Universities. In this case, articles within Hard Sciences are the ones more quoted within the Universities; however, the differences are not significant.

Table 4 shows the number of articles and average impact within different types of audiences, across countries. The countries with higher number of academic citations of OA articles, in average per article, are Brazil, Chile and Peru. The only two significant differences, however, are between Brazil, Colombia and Mexico. The countries where articles receive more policy citations are Peru, Venezuela, Brazil and Argentina, but Peru is the only one with significant differences over almost all the others (except for Venezuela), included Brazil and Argentina.

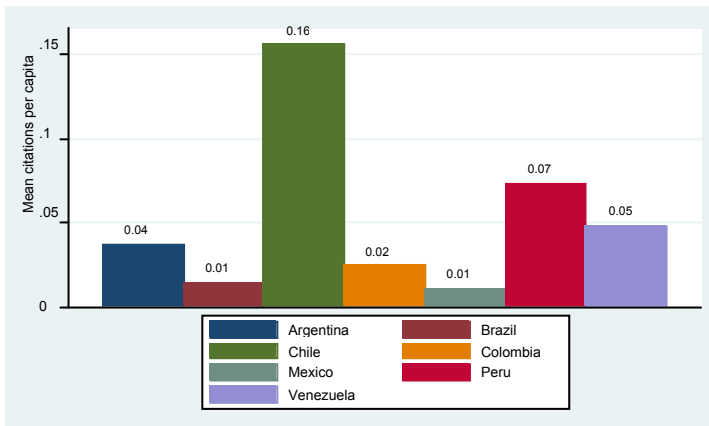
Table 4
Number of Articles and Impact by Country

Country	Articles	Academic Impact		Policy Impact		Media (Title) Impact		University	
	Total	Total	Average	Total	Average	Total	Average	Total	Average
Argentina	57	85	1.49	74	1.30	1	0.0	234	4.11
Brazil	432	1,235	2.86**	1,029	2.38	3	0.0	13,776	31.89
Chile	66	175	2.65**	2	0.03	2	0.0	798	12.09
Colombia	243	277	1.14	17	0.07	258	1.1	9,869	40.61
Mexico	265	339	1.28	0	0.00	101	0.4	4,699	17.73
Peru	40	91	2.28	150	3.75**	0	0.0	369	9.23
Venezuela	55	77	1.40	101	1.84	560	10.2	3,315	60.27
<i>Total</i>	<i>1,158</i>	<i>2,279</i>	<i>1.97</i>	<i>1,373</i>	<i>1.19</i>	<i>925</i>	<i>0.8</i>	<i>48,886</i>	<i>42.22</i>

The size of the different countries analysed, however, is significantly different. Brazil, for instance, has around 201M inhabitants, while Chile has 16M. It is likely that articles are more used within the countries than outside, so articles developed by scientists from larger countries are more likely to receive a citation. Graph 1 shows the number of academic citations per capita by country.

In this case, Chile clearly stands out followed by Peru and Venezuela, with significant differences in favour of Chile, regarding all the others, Peru over Brazil, Colombia and Mexico, and Venezuela over Brazil and Mexico.

Graph 1
Academic Citations per capita by Country (Average)



To analyse and interpret media and university citations by country we need to be careful because the number of newspapers and universities analysed within each country was not selected randomly, it was recovered from previous investigations. We cannot be sure, therefore, that the differences in the number of citations observed within media and universities across countries are not affected by the different number of newspapers and universities explored. Table 5 shows the observations, for these two types of impacts, relative to the number of newspapers and universities by countries.

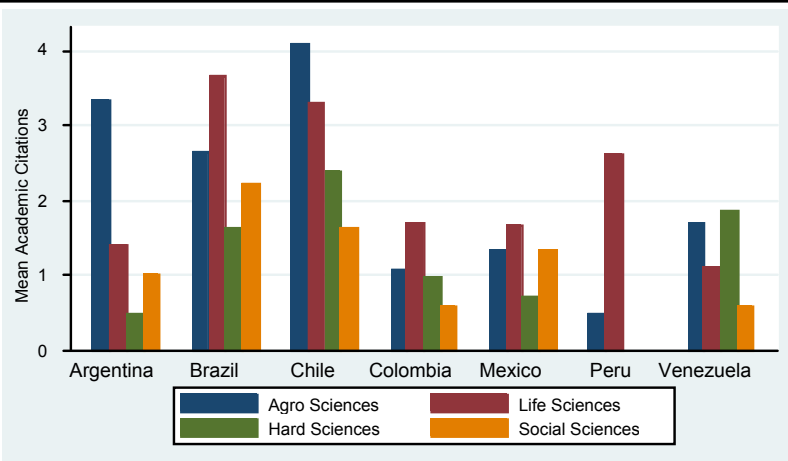
Table 5
Media Impact and Impact on Education by Country Relative to the Number of Newspapers and Universities Searched

Country	Articles	Media and Educational Impact relative to Number of Sources	
	Total	Media (Title)	University
Argentina	57	0.00029	0.070
Brazil	432	0.00017	0.818
Chile	66	0.00091	0.366
Colombia	243	0	2.031
Mexico	265	0.0092	0.432
Peru	40	0	1.025
Venezuela	55	0	2.411
Total	1,158	0.0022	1.022

Compared with what appears in Table 5, Venezuela loses its ranking as the country whose articles have higher impact on media. Mexico is the country which articles have received a higher number of citations in the media. The test of significance of mean differences across countries, however, is not significant. Colombia is the country where articles are more often cited within universities, followed by Venezuela, Peru, Mexico and Chile. Argentina and Brazil are the ones with less use of articles within Universities. The test corroborates the significance of the differences only in some cases: 1) Colombia relative to Argentina, Brazil, Chile and Mexico; 2) Venezuela relative to Argentina, Brazil and Mexico; 3) Peru relative to Brazil.

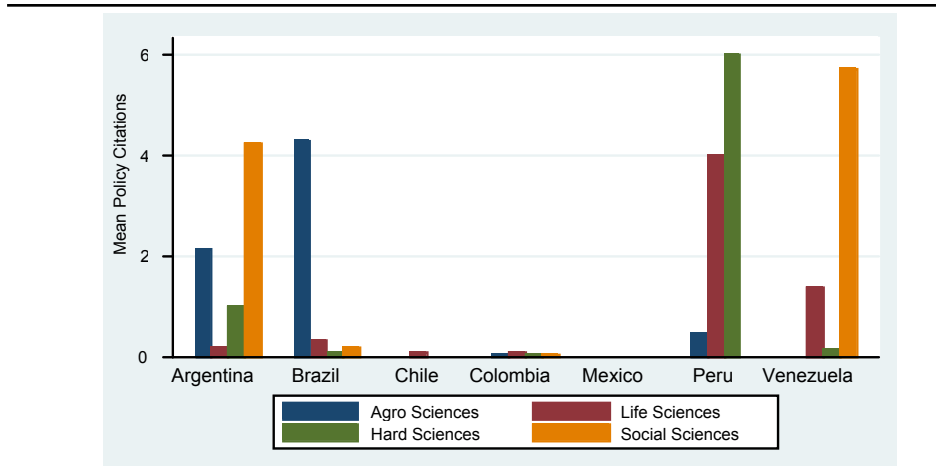
We also analysed the different types of citations by country and by discipline, such as the impact of academic citations shown in Graph 2. Here we can see that Agricultural Science articles receive more citations in Chile and Argentina, Life Science in Brazil and Chile, Hard Science in Chile and Venezuela, and Social Science in Brazil, Chile and Mexico. For countries like Peru, the only two important disciplines, in terms of academic citations, are Life Sciences and Agricultural Sciences, however, for a country like Mexico articles within all the disciplines receive citations at a similar rate, the same for Brazil, Venezuela and Colombia. Chile is among the countries whose articles have higher impact in the four different types of disciplines analysed. Articles from Argentinean authors, on the contrary, while having a large impact in Agricultural Sciences, have very low impact in Hard Sciences.

Graph 2
Academic Citations by Country and Type of Discipline (Average)



The second case is the impact of policy citations. The policy articles with more citations within a country are those within Hard Sciences in Peru and those within Social Sciences in Venezuela. In Argentina, the articles that have received more mentions in policy documents are articles within Social Sciences; in Brazil, articles within Agricultural Sciences. In Chile, Colombia and Mexico, articles do not get quotes in policy documents in any discipline. Graph 3 shows this situation.

Graph 3
Policy Citations by Country and Type of Discipline (Average)

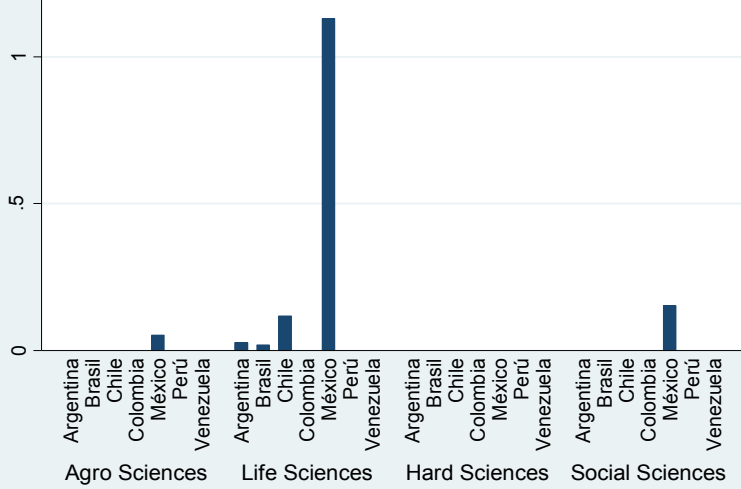


In the case of media citations (shown in Graph 4) Mexico is by far the country in which articles have been more quoted in three disciplines: Life Sciences, Social Sciences and Agricultural Sciences. Then, in Chile, Argentina and Brazil media has made some mentions of OA articles, but only in Life Sciences.

Finally, by looking at citations within Universities we can see the importance within academia of Agricultural Sciences in countries like Argentina and Colombia, which stand out with the higher number of citations when we desegregate by discipline. Graph 5 shows the situation.

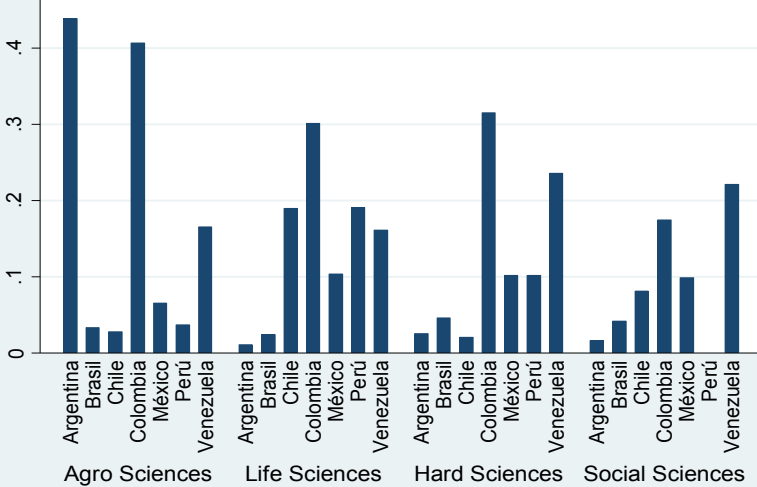
Graph 4
Media (Title) Citations by Country and Type of Discipline (Average)

Media Impact Titles by type of discipline and country (Average)

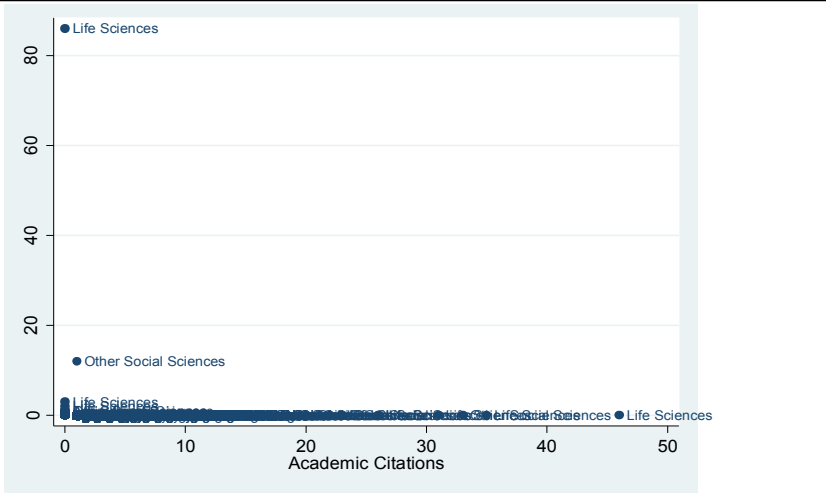


Graph 5
University Citations by Country and Type of Discipline (Average)

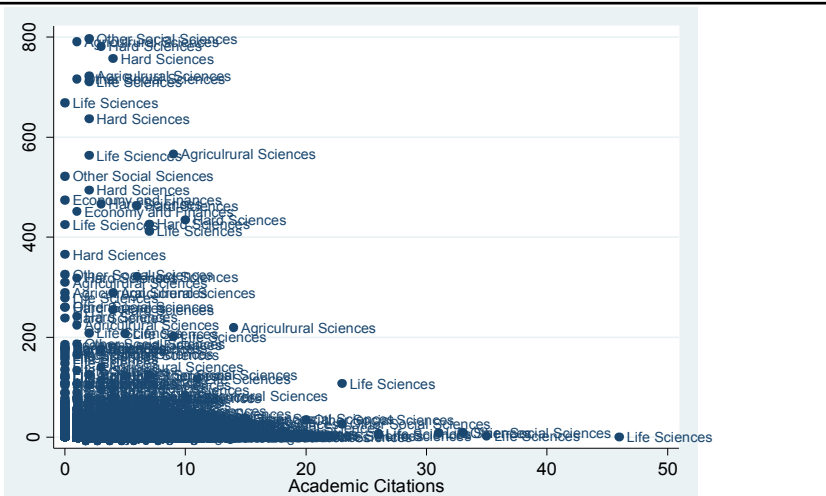
University Citations by Discipline and Country (Average) (Rel)



Graph 7
Scatter Media (Title) and Academic Impact



Graph 8
Scatter University and Academic Impact



A better way, thus, to identify the existence and significance of the possible associations, is to run an estimation that consider the several associations at the same time and that allows to control for differences across countries and types of disciplines. Given the characteristics of

the dependent variable, a counting variable with a high share of zero values, we decided to run a Poisson regression. This is used to model count data and contingency tables and assumes that the response variable Y has a Poisson distribution and that the logarithm of its expected value can be modelled by a linear combination of unknown parameters. Sometimes, a Poisson regression model is known as a log-linear model, especially when used to model contingency tables. Tables 7 and 8 show the results of the two regressions that converged, for policy and university impact.

Table 7
Policy Citations Regressed on University, Academic and Media (Title) Citations

Poisson Regression	Dependent Variable: Policy Citations
Academic Citations	0.030 (0.006)***
University Citations	0.005 (0.001)***
Media (Title) Citations	3.157 (0.537)***
Control by Country	Yes
Control by Discipline	Yes
Observations	1,102
R-squared	0.5364

Notes: Standard errors between parentheses. *** denote significance at the 1 per cent level.

Table 8
University Citations Regressed on Academic, Policy and Media (Title) Citations

Poisson Regression	Dependent Variable: University Citations
Academic Citations	0.013 (0.002)***
Policy Citations	0.018 (0.002)***
Media (Title) Citations	0.010 (0.002)***
Control by Country	Yes
Control by Discipline	Yes
Observations	1102
R-squared	0.1717

Notes: Standard errors in parentheses. *** denote significance at the 1 per cent level.

For policy and university impact, both regressions show that all the other types of citations are significant and positive, once we control by country and discipline. This suggests that the same articles get cited across different types of constituencies. We can be interpreted this as an indication that primarily articles that receive citations within academia, are used to formulate policies and develop subject outlines within Universities. It can also be interpreted as an indication that open access sites might be encouraging positive feedbacks between academic, teaching and policy uses of scientific research. However, more research needs to be performed to confirm these important observations.

CONCLUSIONS

Scientific research is becoming increasingly important for knowledge societies. LAC countries have a long tradition of research but a low record of impact of this research. Recent OA initiatives, which have diffused very rapidly in LAC, have contributed to increase visibility of LAC science. In this research, we explore the extent to which this might have contributed to increase research use among different types of communities. Our research is exploratory, but it suggests some interesting issues that need further research. First, the impact across different types of users change with the disciplines: the disciplines with more academic impact (i.e., Agricultural and Life sciences) seem to be important for the economic structure of most of the countries analysed, but are not same disciplines that are most widely cited in policy documents, media or education. Second, countries also differ widely in the number of articles that they have in OA, but also in the use that they make of those articles. Not surprisingly Brazil, the first country to take the initiative to develop an OA platform in the region, is one the countries that uses it the most, but countries like Chile and Peru are increasingly using it. Finally, analysis of the links between different types of impacts shows that articles that are more often used or quoted within academia, are also quoted more often within policy, media and education, which suggests that high quality articles (by academic standards) are also more widely quoted among other audiences.

One interesting question to continue researching is whether differences in the usage of articles within and outside academia might be related to the economic structure of the countries. It is striking, for instance, that in countries like Argentina, Chile and Brazil, countries with a strong agricultural sector, all have Agricultural Sciences among the disciplines that are most widely cited within several different types of audiences.

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Chapter 6

**SCIENTIFIC JOURNALS MADE
IN LATIN AMERICA**

SCIENTIFIC JOURNALS MADE in Latin America are themselves a very interesting phenomenon to study. In them, a series of paradoxes, that defy any simplistic attempt to understand the processes of scientific communication of a very heterogeneous region, intersect. All of the chapters in this book have presented (in their own terms) paradoxes — and like all good paradoxes, they offer us the opportunity to reflect and draw conclusions that go beyond the apparent contradictions. In this chapter, we highlight these contradictions in order to analyze and understand them, going back to the three issues with which we began this book: access, visibility, and the scientific and social impact of the research produced and published in Latin America. At the same time, we would like to make a series of recommendations that might help understand the paradoxes, to contribute to solving the challenges present in the scientific communication model from the region and other regions of the ‘Global South’.

Before entering the series of paradoxes, we want to express our support to a couple of features that distinguish this heterogeneous system of scientific journals, which are (a) the extensive and intensive use of Open Access models (OA) and (b) the mainly utilization of public funds for publication and access. Likewise, we want to emphasize

our belief in the need to study and understand the benefits and limitations of the scientific journal system in order to maximize its contribution to the development of the region, and if we are to be ambitious, to the development of the global scientific system.

PARADOXES

We see the first of the paradoxes precisely at the junction between the national/regional and the global. One popular view suggests that these journals and the field of scientific communication in Latin America are of little relevance, with scarce ‘global’ recognition, yet, as the chapters of this book suggest, scientific journals continue to grow, multiply and consolidate, and are increasingly recognized, used and appreciated inside and outside the region (Alperin, 2014; Alperin, Fischman & Willinsky, 2011; Babini, De-Volder & López, 2013)¹. As Cetto et al. (Chapter 2) point out, in Latin America, journals have been strengthened by regional initiatives such as Latindex, SciELO, and RedALyC. While these initiatives help journals to consolidate their own identities — following an internal logics and dynamics to each region and in dialogue with conditioning disciplines — at the same time, scientific journals are approaching international standards of editorial quality (aligning their characteristics with the global system) (Alperin, Fischman & Willinsky, 2011). That is, they become nationalized / regionalized and globalized simultaneously.

At the same time, the financing model, used to provide access to these journals and regional initiatives, creates another paradox. The tradition of employing a model of public, non-commercial financing — without payment of fees from readers or authors — of scientific journals has allowed the expansion of OA in the region and fuelled the success of many journals and regional initiatives. Without major business interests in the scientific journals published in Latin America, a system of self-promotion and registration with the highest number of portals and sites distributing scientific publications has developed, with the result, intentional or not, of maximizing the common good.

The paradox is that this very model strengthens the OA movement in the region, and given the visibility and impact of some publications,

1 The reflections in this chapter stem from the findings and work over several years through the IDRC-funded project, ‘Quality in the Open Scholarly Communication of Latin America’ (grant reference # 106660-001) and the UNESCO-funded project, ‘Open Access Indicators: Assessing growth and use of OA resources from developing regions’, both of which studied Latin American scholarly communications and OA in great detail. As both authors participated in these projects, many of the references in this chapter draw on the authors’ own work.

these become attractive products for commercialization.² That is, the same model that guarantees access to knowledge as a public good is generating the conditions for some journals to move towards models of restricted access and use.

Another paradoxical dynamic was identified by Bongiovani et al. (Chapter 3), who demonstrate that, despite the large presence of OA in the region, still there are a very high percentage of researchers with very low levels of knowledge about what OA actually is. That is, OA has been adopted without knowing what it is and without understanding the implications of doing so.

To understand this dynamic, it is necessary to note that there is in the region a very rooted tradition of considering the knowledge produced by universities as a public good. While this tradition was more a wishful thinking than a reality, we have no doubt that it prepared the scientific field for OA to take root in the region, even if it was not known well what it is. Our own studies (Alperin, 2014; Alperin, Babini & Fischman, 2014; Alperin, Fischman & Willinsky, 2011) confirm the importance of that tradition, without denying that the influence of research institutions with limited budgets (Fischman, 2008, 2012), the significant increase in graduate programs, and the need to train new generations of researchers, together with the challenges of access and visibility (Alperin, Fischman & Willinsky, 2011; Fischman, Alperin & Willinsky, 2010) are very relevant issues in the massive use of OA in Latin America. Some could describe these uses as naïve and be content with the fact that OA is widely used. For us, the same lack of knowledge and widespread presence of erroneous opinions about what OA means is a factor to consider, because it threatens the sustainability of this model by generating much ambiguity about what OA is and how to consider it in the evaluation systems and incentives for academic and scientific careers.

As the work of Mafalda et al. (Chapter 4) presents, these evaluation systems and incentives are very different. However, the analysis they present highlights the paradox that emerges from the simultaneous demands of *quality* and *quantity*. This tension is not unique to Latin America, but it is perniciously impacting on the region, particularly in the places where

Science and technology communities are in a consolidating process. There is no consensus, not even in the more advanced, global assessment systems on which are the best models to use to determine

² The most recent example of this phenomenon is seen in the case of Brazil, where large commercial publishers entered a process of competition for the 'best' Brazilian journals (Novais, 2014).

the quality of scientific output published in journals, its scientific impact, relevance at the level of professional fields, and social contribution (Cagan, 2013; Vessuri, Guédon & Cetto, 2013). The general trend is to focus on indicators that can be simply quantified, even if these indicators do not provide the necessary information to meet the objectives of the assessing entity (Alperin, Babini & Fischman, 2014; Vessuri, Guédon & Cetto, 2013). The results of the research discussed in this book are conclusive: increasingly, there are more journals published in Latin America and many of these have improved in quality, but if evaluation parameters are merely stated, while other criteria are used instead, based on indirect measures of quality which have an anti-regional bias, such as the *Impact Factor* or the *Journal Citation Ranking*, the impression is that the majority of journals did not generate quality increases (Beigel, 2014; Meneghini, Mugnaini & Packer, 2007; Meneghini, Packer & Nassi-Calò, 2008; Mugnaini, Digiampetri & Mena-Chalco, 2014).

The data presented by Marin et al. (Chapter 5) indicate that even when research published in journals produced in Latin America influences public policy in some countries, this kind of impact has not been incorporated as an important indicator in evaluation systems, which creates another paradox related to the use of the OA model of regional publications. The OA model was conceptually designed primarily to help strengthen the notion of the 'common good', by eliminating the possible barriers to knowledge generated by publicly funded research, which is necessarily regarded as a public good (Babini, De-Volder & López, 2013; Gentilli, Saforcada & Babini, 2014). As already noted, in the region, OA was adopted not by adherence to the conceptual model or ideological preferences, but by a confluence of factors whereby the long tradition of valuing knowledge as a public good appears as a major influence. This scenario begs the question of why those values are not reflected in the evaluation systems of Latin American scientific journals.

We understand that this series of paradoxes in the region indicates that there is a state of great confusion regarding how to evaluate scientific journals. On one hand, we have evidence that the system is evolving and progressing in an extraordinarily positive way: increasingly, there are investigations produced and published in the region (Alperin, 2014; Latindex, 2014); the journals are consolidated and standardized with high editorial standards (Alperin, Fischman & Willinsky, 2011); the regional initiatives, such as the digital libraries CLACSO, Latindex, La Referencia / Red CLARA, RedALyC, and SciELO have excellent levels of national and international recognition (UNESCO, 2014; SPARC, 2013); the access to scientific publications is

universal, with more OA journals than any other region of the world (Alperin, 2014; Haider, 2005; Miguel, Chinchilla-Rodríguez & Moya-Anegón, 2011); and removing barriers of access to digitized content was achieved by maintaining a non-commercial model of OA (Gentili, Saforcada & Babini, 2014).

On the other hand, these same developments have also been viewed negatively: the growth in the number of journals leads many people to wonder about the quality of what is being published (Miguel et al., 2011); the process of homologation of scientific journals appears to be replicating the patterns established in the regions referred to as central to the global system of scientific knowledge production (Beigel, 2014; Haider, 2007; Vessuri, Guédon & Cetto, 2013) and the international recognition of some journals is generating interest among foreign publishing companies, which are buying journals produced in Latin America with a long history of public funding and could become restricted-access journals (Novais, 2014; Packer, 2014). As in any paradoxical situation, both ways are partially correct, and in order to avoid circular arguments, we want to offer a series of recommendations.

FACING THE PARADOXES

We believe that a good way to resolve the paradoxes generated around scientific journals produced in Latin America is to continue to expand the support to national and regional OA initiatives: those mentioned in this book and others. It is imperative to formalize the non-commercial OA model to include national and regional portals of journals and institutional repositories. Formalizing OA will allow the consolidation of the advances, achieved in the scientific communication system of the region, and the capitalization on the investment done (Babini, 2011). We believe in the importance of establishing mandates and regulations that support OA,³ so that researchers who publish their work in journals with restricted access (whether in Latin America or not) also make a version available in a regional OA repository.

OA mandates through repositories provide additional guarantees, so that even if the journals published in Latin America end up being managed by commercial entities or cease to be OA, the knowledge produced in the region would remain accessible. These mandates or laws must be endorsed by a strategy that supports the consolidation of local collaboration systems of regional repositories.⁴

3 There are already OA regulations in Argentina, Mexico and Peru, and a draft has been debated in Brazil.

4 In the region, Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Venezuela and El Salvador have initiated the creation of national systems of digital reposi-

Although this book has focused on scientific journals made in Latin America, we believe in the importance of university digital repositories, as they can contribute significantly in making available all the scientific and academic output of a university in its multiple formats. These digital repositories show a greater diversity of production formats, in addition to articles: theses, books, research reports, conference presentations, multimedia, and research data (OpenDOAR). Although the journals remain the principal vehicle of the scientific communication system, these products are also important and should be considered.

To address the aforementioned paradoxes, we believe it is best to seek alternatives that avoid the repetition of models in the hope that tomorrow they will have a different result. A more direct way to evaluate attributes related to the impact of science produced in Latin America is to remove the focus from the assessment of journals and place it on individual products — whether articles or other work. We suggest to encourage the use of article-level (output) and alternative metrics (Altmetrics).⁵ Metrics at the level of individual works, rather than journals, would expand the focus of attention not only to the knowledge circulating in academic journals, but also to all forms of scientific knowledge distribution in the region.

Article-level metrics do not rule out citations, but provide an invitation to look beyond the number of citations (or some other value derived from citations) and allow a multi-dimensional consideration of the issues related to the scope and impact of scientific work (Piwowar, 2013; Priem, Taraborelli, Groth & Neylon, 2010). Comprehensive assessments at the level of individual output, based on multiple indicators, would take into account contributions that today are still invisible, even when they could be key to a study, and in turn allow the emergence of collaboration models and dialogue among journals produced in Latin America (Alperin, 2013).

The current situation, whereby journals are produced in Latin America as representatives of the Global South trying to reach journals of the Global North, reminds us of Zeno's paradox of Achilles and the Tortoise.⁶ As it could not be otherwise, the terms are again para-

tories, which, in turn, make up a Latin American federated network called Reference, with support from IDB.

5 Altmetrics are indicators, usually collected on individual articles, which include academic citations but supplement that information with information on the citations of these articles in newspapers, blogs, Facebook, Twitter, reference management systems, and other parts of the social Web.

6 For those who do not remember it, the paradox is the following: Achilles, who is

doxical. For many, journals published in the North, in English, and with very high Impact Factors, would be the most Achillian journals, that is, the fastest, most agile and the model to follow. However, if we take the issue of penetration and use of OA, the ones who really are the Achilles of the story are the journals published in Latin America.

If, like Achilles, the Latin American journals try to catch up with the Northern ones by adopting their models, indicators and even their language of communication (the tortoise that has an advantage over us but moves slower), they will never catch up with them. It does not matter how fast they manage to adapt, because every time they get closer, the others will have advanced a little farther. The solution to this paradox requires thinking about to whom does this race favours, and maybe, that instead of running in the same direction that the journals from the Global North are going, it is more useful, relevant and scientifically productive to understand that, in this case, establishing a model based on competing to show who has the highest Impact Factor is not the way to ensure that the scientific knowledge can be used.

As in the joke about the drunk who looks for the keys where there is light and not where they might have fallen, it does not make much sense to understand the paradoxes that we have presented from the perspective developed in the Global North, in the leagues of journals with high Impact Factor, or in journals where there is more light from the spotlight of global scientific attention.

Perhaps, as we said at the beginning, OA is not the key, but a good way to find solutions. In that sense, we believe that conceiving a non-commercial OA model formed by the scientific journals produced in Latin America, is correct, and that is Latin America which truly has the advantage. Seen this way, we do not care so much whether we are winning the race against the global tortoise, and we can dedicate ourselves to further consolidating something good made in Latin America. The only thing we cannot do is to stop or stop moving 'ahead'.

very fast, is going to run a race against a tortoise. As the tortoise is slower than him, and Achilles is sure of himself, he gives the tortoise a head start. At the beginning, Achilles quickly covers the distance that initially separated them, but in that time, the tortoise has advanced. Again, he quickly covers the distance that the tortoise had advanced, but discovers that the tortoise advanced once again. It goes on like this, and he never manages to catch up with it.

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The Latin American Council of Social Sciences (CLACSO) is a non-governmental international institution created in 1967 on the initiative of UNESCO, institution with which it holds Associative status. At present, it brings together 394 research centers and over 650 post-graduate programs in Social Sciences and Humanities (master and doctorate studies) located in 25 countries in Latin America and the Caribbean, United States and Europe.

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